The Relevancy of the US Dollar Peg to the Economies of the Gulf Cooperation Council Countries (GCC)

by

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Abstract

Nominal exchange rate stability has long been considered as a policy choice for many oil-exporting economies, including the GCC countries. The main motives for such policy choices include the desire to import credibility to domestic currencies, stabilize oil revenues and in turn government revenues (given their role in fiscal budget of these oil-based economies) and to avoid Dutch disease, particularly for those countries which have been trying to promote their non-oil exports. Recently however, with respect to the GCC countries, the advantages of exchange rate stability/peg have been overshadowed by adverse domestic and global developments. The recent surge in the GCC countries' inflation rates that coincided with depreciation of the currencies of these countries due to the depreciation of the US dollar, has led to increasing public pressure for an upward revaluation or even a de-peg from the US dollar to an exchange rate regime that will ensure higher price stability.

Accordingly, this thesis was put forth to provide a scientific opinion of the viability of the existing US dollar peg in the GCC countries, by focusing on the link between changes in exchange rate and inflation. To this end, the study attempted to assess the risk to the domestic inflation rates of the GCC countries arising from fluctuations of the US dollar against the currencies of the major trading partners of these economies. Based on a thorough review of the relevant literature, some empirical estimations were carried out using some econometric methods, and it was discovered that the amount of pass-through or impact from changes in exchange rates to inflation rates in the GCC economies is incomplete and moderate, with an average of around 23% in the long-run. Furthermore, an average long-run pass-through of around 23% does not signify a high risk from fluctuations in the foreign exchange market for domestic prices in the GCC countries. In other words, the volatility of exchange rates of the currencies of the GCC countries does not necessitate the adjustment of the money supply in these economies. These findings lent further support to the relevancy of the existing fixed exchange rate regime for maintaining stable inflation in the economies of the GCC countries. The findings were also supported by the performance of the GCC economies over the past two decades, despite some periods of dollar fluctuations. A retrospective analysis indicates that on average, inflation has been stable in the region over the past two decades.

The study provided evidence for the important role of the fiscal policies of the GCC countries in affecting the recent impact from exchange rate to inflation rate in these economies, which

suggests that these policies form a key macroeconomic tool in these countries, particularly given the lost independence of the monetary policy under the existing pegged exchange rate regimes. Moreover, the study suggests lowering the influence of fiscal policies on the link between exchange rate and domestic prices, or inflation in general, in the GCC countries by pursuing gradual steps toward domestic development in the economy, particularly given the limited absorptive capacity of these economies due to the shortage in supply bottleneck.

The study was also extended to identify the potential alternative exchange rate regime if the GCC changed their focus from inflation to other, evolving, national objectives like international competitiveness. Based on the existing literature and the optimum currency theory, the study suggests that the GCC countries should consider moving gradually from their current single peg toward a more flexible exchange rate in order to avoid abrupt change that would disturb the existing market credibility. As an initial step, the study recommends moving toward a basket peg of two currencies, namely the US dollar and the Euro, that account for a large share of the GCC economies' international trade and non-trade financial transactions.

Finally, the study also concluded that an upward revaluation as a remedy for the recent inflationary development is an unsatisfactory solution, particularly if the same set of circumstances continued into the future. If this was the case, then the process would have to be repeated again, thus triggering the possibility of speculation attack.

Table of Content

List of Tables

List of Figures

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Declaration

I declare that, except where explicit reference is made to the contribution of others, that this thesis is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature

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Chapter One

General Thesis Introduction

1. Introduction

This chapter provides an overview of the core matter of this thesis, which is the relevancy of the current US dollar peg to the economies of the GCC countries, initially focusing on the importance of exchange rate policy in general to the economic environment.

The exchange rate regime represents the mechanism by which a country manages its currency in respect to other currencies. It is has recently been argued that exchange rate policy has had a significant role in shaping many macroeconomic outcomes during the past few decades (Frenkel and Rapetti, 2010). Furthermore, the choice of exchange rate regime is assumed to have some implications for the behaviour of the nominal exchange rate (NER)[1], a key macroeconomic variable that influences the behaviour of several other relevant, nominal and real variables such as the inflation rate, the balance of payments, output and employment, and the rate of economic growth. For example, with respect to inflation rate, movements in NER are assumed to directly affect the price level through the share of traded goods in the consumer basket, and to indirectly affect the level through expectations and aggregate demand. With respect to the expectation channel, the behaviour of NER is assumed to play an important role in affecting inflation expectations and firms' price-setting mechanism, particularly in countries with relatively high inflation (Taylor, 2000).

NER is also regarded as an asset price and is therefore assumed to influence the expectations and behaviour of economic agents in financial markets. Moreover, it has been common to use foreign currency (dollarization) in setting nominal contracts, particularly in nations plagued with high inflation, such as many Latin American countries where myriad financial assets and real estate prices are dominated in US dollars (Savastano, 1992). As a result, when

[1] The nominal exchange rate (NER) is normally defined as the domestic price of foreign currency. An increase in NER reflects a nominal depreciation and a decrease reflects a nominal appreciation. Furthermore, spot exchange rate means current exchange rate and forward exchange rate means exchange rate that is quoted and traded today but for delivery and payment on future. Further discussion is provided in MacDonald (2007).

dollarization is prevalent, the stability and the robustness of the financial and payment system becomes prone to variations in NER.

Movement in NER is assumed to influence the real sectors through its affect on real exchange rate (RER). RER is normally defined as the nominal exchange rate adjusted for the difference in the price level or, alternatively, as the relative price between traded and non-traded goods (Edwardo, 1989). It has been systematically documented that movements in RER follow movements in NER relatively closely over the short and medium-run (Obstfeld and Rogoff, 1995, Taylor and Taylor, 2004, MacDonald, 2007). Additionally, RER is viewed as a key variable in determining the external and internal equilibrium in the economy, as it affects resource allocation and level of activity. It is also assumed to affect the trade balance through its influence on exports and imports, while its influence on net exports is also important in determining output and employment level.

It has been recognized that maintaining a competitive RER is a key development strategy (Williamson, 2008). This notion of a competitive RER has received more relevance in recent years, particularly in development economics. The rapid recent economic growth in emerging nations such as China, which has been trying to maintain a competitive trade position by continuing to suppress the appreciation of its currency, has contributed in this regard. This view has also been supported by a number of empirical studies (*e.g.* Hausmann et al, 2005, Levy-Yeyati and Sturzenegger, 2008, and Razmi et al. 2009) that have documented significant associations between competitive RERs and higher economic growth. That has led to the assumption that the choice of exchange rate policy is not neutral for economic growth, particularly if it is steered towards maintaining a stable and competitive RER, or at least avoiding overvaluations (Commission on Growth and Development, 2008). Accordingly, the exchange rate regime can have a significant influence on some key economic policy objectives including price stability, domestic financial stability and robustness, external and internal balances, and economic growth and development (Frenkel and Rapetti, 2010).

The choice of exchange rate regime gained greater attention in international finance following the collapse of the Bretton Wood system in the early 1970s (Kato and Uctum, 2007). Moreover, exchange rate regimes are classified by the rules followed by the monetary authorities regarding the degree of intervention in the foreign exchange market, and therefore by the degree of official commitment in the determination of NER (Frenkel and Rapetti, 2010). They have been traditionally divided into two categories fixed, and floating, exchange rate regimes. Fixed exchange rate regimes are normally defined as the commitment of monetary authority to intervene in the foreign exchange market to maintain a certain fixed parity for the currency against another single currency or a basket of currencies. Floating exchange rate regimes are normally defined as the commitment of the monetary authority to entirely leave the determination of the NER to be set by the market forces through supply and demand.

Furthermore, between the fixed and floating exchange rate regimes, there exist other, alternative, systems that maintain limited flexibility. These are known as intermediate or soft regimes. They include crawling peg, basket peg, adjustable peg, and exchange rate bands[2]. However, there is still no consensus over the optimal exchange rate regime or over the factors that make a country choose a particular exchange rate regime (Kato and Uctum, 2008). According to Frankel (1999, 2003), no single exchange rate regime is right for all countries, or at all times, and the choice of a right exchange rate regime depends primarily on the circumstances of the country in question, as well as on the time.

However, based on the traditional theoretical literature, the most common criteria for determining the optimal exchange rate regime is macroeconomic and financial stability in the face of nominal or real shocks (Mundell, 1963). The conventional view is that fixed exchange rates are more useful in achieving macroeconomic and financial stability in reaction to domestic nominal shocks such as shifts in money demand[3]. On the other hand, flexible exchange rates are traditionally preferred to isolate the economy from real shocks, such as changes in the demand for exports or in the terms of trade (Friedman, 1953)[4]. The traditional literature was generally set in an era that was broadly characterized by strict capital controls, relatively stable exchange rate, low inflation rates, and economic growth.

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[2] Further details on the intermediate regimes is provided in Frankel (2003), Reinhart and Rogoff (2004), and MacDonald (2007).

[3] The idea here is that there is no need for interest rate changes or price level changes as the money supplies can automatically adjust to changes in money demand (Fleming, 1962, Mundell, 1963).

[4] Under floating exchange regime, exchange rate can adjust quickly and help to restore the equilibrium in the economy, without any need to changes in the price level. For example, a fall in the world 's demand for a country's exports will be encountered automatically by a depreciation in the country's currency and a fall in terms of trade, thereby leading to offsetting stimulus in aggregate demand (MacDonald, 2007).

In the context of increasing capital flows due mainly to financial deregulation and reductions of barriers to financial flows, and large external shocks, the modern debate on exchange rate choice has focused on the trade-off between low inflation (credibility) and economic growth (flexibility). Based on the literature, fixed exchange rate regimes help to impart credibility of low inflation polices from a foreign central bank and ensure a low inflationary environment (Dornbusch, 2001). Due to inflationary bias, in the case of a monetary policy with full discretion, the anti-inflationary central bank can provide more commitment to its intention by fixing the exchange rate to hard currency with stronger monetary discipline. In such cases, economic agents (e.g. workers, managers) would set prices on the basis of low inflation expectations since it is believed that currency pegging will prevent the central bank from pursuing expansionary polices by increasing money supply. Accordingly, the result will be lower levels of inflation rate at any given level of output[5].

The credibility view was mainly raised in the late 1970s and early 1980s. The literature in this regard was mainly built on Barro and Gordon's theory (1983) on monetary policy credibility. Almost simultaneously, and in contrast to the credibility view that argued for the fixed exchange rate regime, the consistency view that was originally introduced through the writings of Kyndland and Prescott (1977), called for retaining the flexible exchange rate regime when the potential inflation bias is stronger. According to this view, government restraints need to be established through a set of domestic institutions in order to guarantee that discretion is not misused, and economic policies are consistent and sustainable to maintain low inflation (Svensson 2000). For example, central bank independence was suggested as an approach to solve the time inconsistency problem associated with full discretion for monetary policy under floating regimes (Larrain and Velasco, 2001).

Furthermore, studies have shown that a flexible exchange rate regime can help promote higher economic growth as it enables the economy to have an independent monetary policy,

[5] Domestic inflationary can also originate on account of excessive government budget deficits (Obstfeld and Rogoff, 1995). Because of that, the credibility of the fixed regime is also justified on the ground of some political factors. It is argued that pegged regime is an instrument for governments to address credibility-deficits and dynamic inconsistency problems. Based on the credibility view, the fixed regime ties the hands of the policy makers to specific policy course (Carmignani et al., 2008). In contrast, other studies have showed the viability of flexible exchange rate regime when political cots are taken into account. E.g. Poirson (2002) and Carmignani et al., (2008), among many others.

providing the flexibility to accommodate foreign and domestic disturbance. Similarly, other studies have argued that fixed exchange rate regimes are associated with higher economic growth by reducing exchange rate uncertainty, thus promoting trade and investment and the better allocation of resources[6], preventing competitive depreciation or competitive appreciation[7], import financial stability[8], and allowing for more efficient adjustments when shocks are of a nominal nature (Corbo, 2003).

Within the context of the choice of exchange rate regime, this research aims to comment on the relevancy of the existing pegged exchange rate systems of the Gulf Cooperation Council countries (GCC)[9] with a special focus on the link between changes in the effective exchange rates of these countries' currencies and their domestic inflation. In particular, we investigate whether there had been some large significant inflationary effect from the recent depreciation of the GCC countries' currencies by quantifying the pass-through from changes in exchange rates into domestic consumer prices' inflation of the GCC economies which is missing in the literature. For the measurement of the extent of the pass-through, we relied on two different and commonly used econometric methods, namely the ordinary least square (OLS) and vector error correction methods (VECM).

Fiscal policies in developing nations are generally considered the main source for money growth and are believed to lead directly to an increase in the money supply due to less developed financial markets (Keran and Malik, 1979). In the case of the GCC economies, government spending forms the major stimulator for private sector. Accordingly, another part in this research attempts to analyze the influence of the fiscal policy actions in the GCC countries on the effect of changes in exchange rate on inflation.

[6] This issue is particularly emphasized in the case of developing countries that are featured with incomplete forward markets. Also some recent studies that have focused on developing countries were able to find some relationship between exchange rate volatility on trade and investment (Parsley and Rose 2001, Frankel and Rose 2002).

[7] Frankel (2003) has updated the interpretation of this advantage by the currency crises that took place in 1990s, where the strategy of improving trade balance through devaluation was viewed ineffective as such strategy spread between the neighbouring economies because they felt at a competitive disadvantage.

[8] One form of that can be through preventing speculative bubbles.

[9] The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates (UAE).

Along a somewhat different line, we also attempt to further analyze the viability of the existing exchange rate regimes of the GCC countries by considering an alternative pegging in the form of a dollar-euro basket peg instead of the current single US dollar peg. The choice for the currencies of the basket is based on the Optimum Criteria Area (OCA) theory that suggests adopting the anchor currency that minimizes the sum of the bilateral exchange rate fluctuations, weighted by the importance of each trade partner (Meissner and Oomes, 2009). The tests are twofold; the use of a Structural Vector Autoregression (SVAR) to investigate the significance of external shocks emanating from Europe and US on the GCC economies, and the use of the Johansen co-integration approach to test for the synchronous long-term movements between the business cycles of the individual GCC countries and their trading partners, the US and EU.

The following section provides a brief background on the fixed exchange rate regime of the GCC countries. Section three illustrates the mechanism by which the US dollar peg affects the inflationary environment in the GCC countries. Section four presents a brief about the role of fiscal policies in the GCC countries. An overview of the subsequent chapters is given in section five.

2. Exchange rate systems in the GCC countries

The US dollar has been the *de facto* anchor for all the GCC countries' currencies, with the exception of the Kuwaiti Dinar, for almost three decades. Except for a short period when it was exclusively pegged to the US dollar (May, 2003-May, 2007) pursuant to an agreement in the context of the GCC's monetary integration process, the Kuwaiti Dinar has been linked to an undisclosed weighted basket of currencies, in which the US dollar forms the major part given that most of the Kuwaiti's exports (oil) are priced in US dollar and the fluctuations vis-à-vis US dollar are rather limited[10]. Oman adopted the US dollar as its *de jure* and *de facto* anchor for its currency, the riyal, in 1973, while the individual currencies of Bahrain, Qatar, UAE, and Saudi Arabia were *de jure* tied to the SDR and *de facto* tied to the US dollar from the 1980s until 2003, after which these countries formally adopted the US dollar as their monetary anchor in a first step toward full monetary union.

[10] The Kuwaiti decision to retain to a basket peg was made on the ground of rising inflationary pressure from imports (IMF Staff Report,2009) .

The choice of the dollar as an anchor currency had been based primarily on the account of the dominance of this currency in the international oil trade. Continuing with the dollar has been due to a number of reasons, including the large share of stabilizing exports and fiscal revenues (since oil revenue constitutes the major part of the government budget), credibility of monetary policy under the peg[11], and to shield the value of the financial wealth which is mainly dollar-dominated, from fluctuation in exchange rate vis-à-vis the US dollar[12].

Pegging to the US dollar looks to have met the expectations of the GCC economies for a significant time. The existing dollar peg, along with the absence of significant capital controls, has set common narrow limits for the scope of local monetary authority interventions, as well as for the policies of interest rates and foreign reserves (Abed et al. 2003). The dollar peg has proven stable in front of large fluctuations in oil prices. It has helped in eliminating or at least reducing exchange rate risks and served to stabilize fluctuations in the GCC countries' financial wealth, which is largely dollar-dominated. It has also reduced trade and financial transaction costs and encouraged investment activities. Furthermore, in terms of internal stability, the peg looks to have maintained the purchasing power of the currencies of the GCC country members, as the average annual inflation rate during the period 1990-2002 ranged between a minimum of -0.23 (Bahrain) and a maximum of 3.3 (UAE)[13].

Furthermore, fixing with the US dollar has helped the GCC countries avoid nominal shocks from geopolitical risks feeding into the economy (Khan, 2009). It has also helped to maintain the international competitiveness of the GCC economies despite recent real term trade shocks relating to oil prices (Kumah, 2009). Moreover, the abundant international reserves have further underpinned the credibility of the peg and discouraged speculation against the currencies of the GCC countries.

[11] Given the delay in the development of various financial, economic, and institutional sides, fixing the currencies of the GCC countries to the currency of a nation with strong institutions and traditions of stability ensures credibility and confidence to the economies of the GCC countries (Sturm et al, 2008).

[12] On average revenue from hydrocarbon, based on 2008 data account for around 80% of government revenue, around 70% of export, and around 50% of GDP in the GCC economies.

[13] Other factors that are believed to have contributed to low inflation rates during the past two decades include open trade regime, flexible labor market, prudent fiscal policy (e.g. the introduction of oil funds to sterilize the effect of oil revenue), and benign global inflationary conditions (Iqbal, 2010).

However, some very recent economic developments in the region have, in some views, necessitated a shift in the overall macroeconomic policy framework of the GCC countries, including their exchange rate regime policy. Since the beginning of the current decade, and following the rapid economic growth facilitated by higher oil revenues, some inflation pressure has emerged in all the GCC countries, with average inflation measured by consumer price index increasing from around 0.2% between 1998 and 2002 to around 10% in 2008, and with some individual countries running at higher rates. Despite the presence of some debate regarding the potential causes of inflation in the GCC economies (e. g. cost push emanating from rising prices of different goods like foods and raw materials in the housing sector versus demand push due to rapidly rising public expenditure and the private sector) it is generally believed that the exchange rate regime adopted by the GCC countries has played a fundamental role.

The recent persistent depreciation of the US dollar against the currencies of the major trading partners (*e.g.* EU and Japan) of the GCC economies has apparently resulted in some significant cost effect by raising the prices in domestic currencies for a wide range of imported goods. The increase in domestic prices of imported goods has in turn suggested some further significant repercussions on the cost of domestic production, living and wage trends.

Furthermore, the inflationary pressure of the US dollar peg is believed to have been further accentuated through the volatility of international oil prices and the US dollar that has illustrated a clear divergence in the business cycles between the United States and the GCC countries (liquidity effect). For example, the recent high oil prices and depreciating US dollar called for the use in GCC countries of stringent monetary policy in order to contain the inflation response to monetary circulation. However, given the pegged system, the GCC economies were forced to follow the current expansionary policy of the US, which lowered its policy interest rates to resist recessionary tendencies as a result of the September 11 attack and the recent sub-prime market (MacDonald, 2010). Indeed the current situation of the GCC economies reflects the well-known ‘trilemma’ of a fixed exchange regime, an open capital market, and a lack of independent monetary policy.

The current scenario of rising oil prices also calls for an adjustment in the real exchange rate of the GCC countries. However, under the dollar peg such adjustment is only expected to take place via domestic inflation of the local currency, which is experienced by most of the GCC countries. The disadvantage of such a channel is that it is slow and can create inflationary expectations, which can result in further misalignment in the real exchange rate in the form of real overvaluation and, eventually, undermining competitiveness and long-term growth (MacDonald, 2010).

Also relevant to the issue of the real exchange rates in the GCC countries is the recent changing priorities of the local governments of these countries, who have begun to invest heavily in promoting internationally the competitiveness of their non-oil exports and in reducing reliance on the oil and gas sectors. The development of non-oil activities in the GCC countries has become more marked in the last few years as a significant share of oil revenues that characterized the recent period were employed to accelerate the diversification process in these economies. However, the effect of rising inflation on real effective exchange rate and, therefore, the competitiveness of non-hydrocarbon products is viewed as being of particular importance to the GCC economies.

In addition to the recent inflationary development in the region, recent global integration of the GCC economies into the international markets and the increasing integration of the financial sectors of these countries with global economies highlights the vulnerability of these economies to the effects of inflation pressures and underlines the need for evaluating/reviewing the existing macroeconomic policies, including the pegged exchange rate.

3. The US dollar peg and the structure of the GCC economies

Based on the existing structure of the GCC economies, one can further understand the impact of the pegged exchange rate regime on their economic fundamentals, and particularly domestic prices. The economies of the GCC countries heavily depend on the exports of the hydrocarbon products that form approximately, based on 2008 data, 80% of government revenue, 70% of exports, and 50% of the GDP. The strong reliance of the GCC countries on the demand and price trends of oil makes their economic growth vulnerable to the vicissitudes of the oil market. Sudden decreases in oil prices may cause recessionary impacts, while increases may trigger appreciation in real effective exchange rate, similar to the current scenario, which could threaten the market competitiveness of the non-hydrocarbon products and discourage the diversification efforts. The latter effect, which is also known as the Dutch Disease, can be magnified via the pegged exchange rate regime with the US dollar. Similar to the current scenario, the rapid and large increases in oil prices are reflected into higher revenues from exports that the dollar peg can turn into higher monetary circulation, particularly given the pro-cyclicality of fiscal policies in the GCC countries, amplifying the inflationary impacts of increases in international prices of oil (Fasano and Wang 2002).

Furthermore, the inflationary process in the GCC economies becomes more intricate when considering the structure of their labor markets. The GCC economies strongly depend on foreign workers, who normally migrate from neighboring countries such as India, Pakistan, Iran, Bangladesh, Egypt and Indonesia (Willett et al., 2009). On average, around 60% to 90% of the work force in the private sector is composed of expatriates, and most of the nationals are occupying the public sector[14]. The fact that the economic growth and the promotion of the non-hydrocarbon sectors are partly resting on the availability of a flexible global labor market makes the inflationary impact of the dollar peg of particular relevance for the GCC economies. In addition to creating a climate of tension and intolerance, the predominance of foreign laborers in the GCC markets highlights the risk of higher price instability through demands for wage increases due to factors including changes in exchange rates. For example, depreciation of the US dollar may drive up prices in domestic currency and worsen the living conditions of the working classes, particularly for foreign workers, fueling demands for wages increases and social tensions (Marzovilla et al. 2010).

The interaction between the exchange rate and inflation can also be seen from the trade patterns of the GCC economies. The GCC economies are characterized as being small, open to trade, highly specialized in the production of hydrocarbon products, with segmented labor markets dominated by foreign workers, having limited agricultural and manufacturing

[14] In addition to the fact that most of the nationals are absorbed by the public sector, the nature of working opportunities offered by the private sector forms another reason for the presence of high number of foreign labor in the work force of the GCC markets. The working opportunities that are available in the private sector can generally be classified as either too humble, or very specialized to be compatible with an essentially humanistic cultural education. Furthermore, despite the fact that generally the employment opportunities available in the public sector offer higher pay, the priority in recruitment is given to nationals. Other features that encourage the recruitment of foreign laborers is their willingness to accept low wages and the greater ease to discharge them (Marzovilla et. al 2010).

production, and depending heavily on imports for their consumer goods, raw materials, intermediate inputs, and capital goods. Such characteristics make the choice of exchange rate regime very relevant for the GCC countries (Marzovilla et al. 2010). The high dependency on imports, which formed on average around 40% of nominal GDP as of 2008, suggests that the pass-through from exchange rate can be burdensome for the GCC economies, resulting in increased costs of production and domestic consumer prices. Furthermore, a significant share of the imports comes from Europe (around 30% in 2008) which normally adopts the euro as the currency of payment for their exports. Due to the dollar peg, the recent depreciation of the US dollar compared to the euro implied a lower value of the currencies of the GCC countries and has led to rising prices in domestic currencies for imports[15].

4. Fiscal Policy in the GCC countries: role, structure and challenges

Like the case in many oil producing countries, particularly developing ones, fiscal policy in the GCC economies forms a key macroeconomic tool to sustain internal and external growth. The important role assumed by the fiscal policy in the GCC stems primarily from the economic characteristics of these countries. Given the fixed exchange rate regimes, unrestricted cross-border movement of capital, and the dominant role played by governments, fiscal policy represents the main instrument of demand management in the GCC countries (Al Faris, 2002).

Moreover, the significant role of the governments in the GCC countries is mainly attributed to the large share of hydrocarbon products like oil and gas in their economies. Revenue from hydrocarbon products forms on average around 70% of exports, and 60% of GDP in the GCC countries, hence, making government spending, and in turn fiscal policy, the main stimulator of real demand in these economies. Additionally, the less developed nature of these economies' financial system reflect higher role for the fiscal policy in these countries, particularly, with regard to money growth (Keran and Malik, 1979).

Similar to other oil producing developing countries, fiscal balances of the GCC countries are primarily influenced by cyclical development in the oil prices. Revenues from hydrocarbon

[15] The recent significant depreciation of the US dollar has, in addition to triggering inflationary impacts, caused further monetary losses to the economies of the GCC countries by reducing the monetary value of the these countries' external financial wealth, which is mainly dollar dominated.

products constitute by far the largest source of budgetary income, with an average of around 80%. Furthermore, the positive trade shocks in the form of higher oil prices over the recent years have further increased the weight of hydrocarbon revenue in the budget of these economies. In contrast, the contribution of non-hydrocarbon sources (e.g. direct tax, indirect tax, customs duties, etc) is comparatively low, reflecting enter alia, the difficulty of raising taxes with currently underdeveloped tax and customs systems and the lack of a need for higher tax revenues in view of oil wealth (Sturm and Gurtner 2007).

Expenditure side of the budget, on the other hand, is pro-cyclical to the prices in oil markets (Fasano and Wang, 2002). Fiscal policies in the GCC economies are very active during the periods of buoyant oil revenues. In periods of low oil prices (like those during 1990s) government spending in GCC countries is cut back rather than expanded, as one might expect if an active fiscal policy were being pursued. Also, similar to other oil producing developing countries, capital expenditure share have gained higher weight recently, following the recent increases in oil revenues, due to the urgency to build and expand physical and social infrastructure, keeping in mind that the GCC countries are still not fully developed in many areas. As of 2010, government revenue and expenditure formed on average around 45% and 32% of nominal GDP, respectively[16].

Further, despite the recent favourable fiscal stance, due to development in oil markets, the budget structure of the GCC countries reflect some key fiscal policy challenges, which are as well common to most oil-dependent economies (Sturm et al, 2008). The high dependency of the GCC countries on oil makes their fiscal policy highly vulnerable to external shocks due mainly to the fact that oil revenues are exhaustible, unpredictable, volatile, and largely originate from abroad (Barnett and Ossowski, 2002). Some of these challenges include how to avoid pro-cyclical policies that have characterized the conduct of fiscal policy in most oil exporting nations, particularly developing, and have led in many cases to inflationary conditions in economies facing supply bottlenecks and limited absorptive capacity like the GCC countries. Relevant to that is also the volatility of oil prices that disturb government spending and may translate into macroeconomic volatility and reduced growth prospect.

[16] Public dept is not an issue to the economies of the GCC countries. Similar to other oil producing nations, the GCC countries have utilized part of the recent windfall from the oil revenues to pay off significant share of their public debt. As of 2010, government debt stood on average around 19% of GDP.

Additionally, large volatility in oil revenue may lead to high volatility in real exchange rate and the increase in these revenues may lead to “Dutch disease”. Another challenge is the problem of intergenerational distribution of state-owned resources and how to avoid adjustment costs in expenditure when the price of oil has fallen, or the oil reserves has been exhausted, or both. There is also the challenge of how to ensure the quality of public spending in view of the limited administrative capacity to supervise spending and project development. A final challenge, which is mainly of long-run perspective, is how to reduce dependency on oil (Engel and Valdes 2000, Davis et al. 2001, Barnett and Ossowski 2002, Sturm et al, 2008).

Against the above challenges, number of optimal fiscal policy rules has been proposed as guidelines for countries that are dependent on the export of oil, like the GCC countries, and other non-renewable resources. Among the suggested solutions: i) to set up stabilization and savings funds to help achieve long-run fiscal sustainability, and for intergenerational equity[17]; ii) including the non-oil balance/non-oil GDP ratio, which is often seen as much better indicator of fiscal stance than the overall balance, in the formulation of fiscal policy; and iii) reducing the reliance in hydrocarbon sectors by promoting other trade and financial sectors and developing other revenue resources like tax and custom systems (Engel and Valdes 2000, Davis et al. 2001, Barnett and Ossowski 2002).

5. Overview on chapter two; Literature review on the causes of inflation and the pass-through of exchange rate

It is worthwhile to mention at the outset that with the exception of chapters three and four, the rest of the chapters are drafted in an independent format, so the reader need not go back and forth in the thesis. Accordingly, overlapping/duplication in information between the chapters should be expected.

Chapter two comes in two parts. The first part attempts to survey the broad theories of inflation by focusing on the debates between various competing schools of thoughts in economics. It also presents a further survey on a number of empirical studies examining the

[17] The GCC countries are owners of the world’s largest sovereign wealth funds (SWFs). Early SWF was established in Kuwait during 1950s, however, they are found now in all of the GCC countries, with the exception of Saudi Arabia, where the monetary agency continues to manage the entire foreign wealth on behalf of the government (Sturm et al, 2008).

importance of different determinants of inflation. In the second part, the research is narrowed down by focusing on the link between exchange rate and inflation, or the pass-through of exchange rate (ERPT). This section also includes some theoretical background on the link between exchange rate and domestic prices, the discussion of a host of factors that influence the pass-through of exchange rate, a deeper focus on the transmission from exchange rate into domestic inflation consumer price index as well as some other related and recent issues in the relevant literature. Similar to part one, part two also includes some empirical surveys on the extent of pass-through from exchange rate into inflation. Finally, in part two we have attempted to identify some potential caveats in the literature for future research.

Based on the literature, inflation is generally defined as a sustained increase in the general price level for goods and services in the economy, as expressed in a given price index. Identifying the determinants of inflation has long been a concern for macroeconomists as is known that controlling inflation is an important element of a stable and sustained growth. Furthermore, despite the extremely rich literature on the causes of inflation, the basic determinants of inflation continue to be disputed by economists.

Inflation is found to be a net result of the interaction of various factors in the economy and cannot be easily decomposed or attributed into/to specific kinds of factors. However, these determinants can be summarized into four major factors; demand-side factors, supply-side factors (cost-push), inertial factors (built-in inflation), and political/institutional-side factors. The first three sources together are close to what Gordon (1997) called the 'triangle model of inflation'. The presence of these different kinds of factors in explaining the dynamics of inflation lends support to those studies that view inflation as a macroeconomic and institutional phenomenon.

Demand sources of inflation may include nominal factors like money supply or real factors in the form of high demand on goods and low unemployment. These two sources of demand-pull inflation generally represent the view of the two mainstream schools of economics; monetarists and Keynesians. Moreover, persisting government deficits has been commonly viewed, particularly among monetarists and new classical economists, as a major demand side cause for inflation. This fiscal view of inflation is more relevant in the context of developing countries, where less efficient tax systems, political instability, and limited access to external borrowing make it easier for a government to rely on inflation tax.

On the other hand, supply or real shock factors of inflation include inter alia, sudden increases in oil prices, crop failures, extraordinary weather changes, exchange rate movements, import cost variations, and negative productivity shocks. These supply side factors of inflation generally represent the cost-push theory of the non-mainstream economists. It should be noted however, that both Keynesians and non-mainstream economists generally maintain a similar propagation mechanism, which implies changes in relative price levels that in turn induce continuous increases in the aggregate price level. The third source of inflation, the inertial factors, is induced by elements like expectations, stickiness of wages, and indexations. These factors are often linked to the price/wage spiral that involves continuous attempts by labor to maintain their real income and employers passing increases in wages onto consumers through higher prices as part of a "vicious cycle".

Politics can also be held responsible for at least partly causing inflationary effects, particularly in certain countries, where political institutions are granted discretionary power over the economic decision process. The inflationary process in a number of developing countries represents this case to a significant extent, where circumstances like inequality in income distribution, political instability, sustained government deficits, partisan politics, and the absence of an independent central bank are common.

Furthermore, the empirical literature on the causes and dynamics of inflation is vast and rich. Some very important elements that have contributed considerably in the growing empirical field of inflation include developments in the mathematical methods (econometrics and time series techniques) since the late 1970s, dramatic improvements in computing technology, and the availability of long data for most countries all over the world.

It was revealed that the findings of the empirical studies have confirmed to some extent most of the determinants of inflation as proposed by the theoretical literature. More specifically, the results of the empirical studies have shown that inflation is generally influenced by a mixture of variables stemming from the four categories of inflation determinants identified in the theoretical literature. Such results suggest that any study that attempts to empirically analyze the causes of inflation should consider including variables that represent factors from the four categories of determinants of inflation in order for the estimated model to adequately represent the real inflation process[18]. Finally, the results of the empirical studies also suggest that, in reality, the inflation process is dynamic and shocks to prices can be precipitated by different types of factors. In other words, inflation can be caused simultaneously by more than one factor stemming from the four categories of determinants of inflation identified above.

The second part of the chapter begins by presenting the theoretical basis for the link between exchange rate and domestic prices. According to Menon (1995), ERPT is defined as "the degree to which exchange rate changes are reflected in the destination currency prices of traded goods". Furthermore, the pass-through relationship draws its theoretical underpinning from the purchasing power parity (PPP) theory that assumes a full impact from changes in exchange rate to domestic prices. In other words, the PPP theory argues that any changes in exchange rates will translate into proportional movements in domestic prices.

Interest in analyzing the pass-through relationship began to grow following the collapse of the Bretton Woods system, and was further enhanced by the muted response of the US import prices to large swings in the US dollar during the 1980s, and the failure of inflation rates in industrial countries to accelerate after a major devaluation in the currencies of these countries in 1992 (Bache, 2006). More recently, the low responses of inflation rates in many East Asian countries after the financial crises of 1997-98 and in other developing economies (*e.g.* Mexico and Argentina) have sparked further research that aims to understand the adjustment puzzle or the incomplete pass-through.

Early literature on the exchange rate pass-through was based on microeconomic foundation that evolved mainly during the 1980s (Bache, 2006). The large subset of the early literature has focused on the analyses of the ERPT at disaggregated micro level (industry level) as it is more appropriate to precisely isolate the effect of the exchange rate on prices of the products (Ghosh and Rajan, 2007). Nonetheless, ERPT is also more often analysed at the aggregated macro level. such as analysing the effect of ERPT on the consumer price index, which is more relevant to monetary policy makers. It is this later effect that is the focus of this part of the chapter.

[18] Nonetheless, the selection of the independent variables should not be arbitrary. In other word, the independent variables from the four categories of inflation determinants should be based on the structure and economic conditions of the examined country/s.

Exchange rate can influence inflation directly and indirectly. The direct channel is through the prices of traded final goods and the prices of imported intermediate goods. The indirect channel is through the competitiveness of goods in the international markets and inflation expectations. Both channels become more important with an increase in the degree of openness in the economy.

Most of the analytical frameworks that underlie the empirical estimation of the influence of exchange rate on aggregate consumer prices were generally based on microeconomic foundations. The reduced form for the pass-through equation defines the price level as a function of exchange rate plus other hypothesised determinants of prices. For example:

$$P = f(S_t, P^*, Y)$$

where P_t is the domestic CPI, S_t is the exchange rate, P_t^* is the trading partner CPI, and Y is the output gap. Furthermore, the most two common estimation techniques for the ERPT are the single equation method and the structural vector auto regressions (VARs).

As per the empirical findings, the pass-through from exchange rate to inflation rate is incomplete even in the long run, and the exchange rate elasticity of inflation is less than the exchange rate elasticity of import prices. Generally, the size and the speed of adjustments decline along the different price stages; the impact of exchange rate changes is highest on import prices, then producer prices, and lowest on consumer prices.

Various micro- as well as macroeconomic causes have been proposed by the literature to explain the incomplete pass-through from exchange rate to domestic prices. The most popular microeconomic explanation is the strategy of PTM by imperfectly competitive firms. Other suggested causes include trade distortions (e.g. tariff, non-trade barriers), transportation costs, domestic content in the distribution of traded products and price stickiness in the local currency. Conversely, macroeconomic causes include persistence of changes in inflation and exchange rates, volatility of inflation and exchange rate, and the business cycle.

Some additional factors were advanced in the literature to explain the lower response of inflation rate relative to other prices in the distribution chain with respect to changes in exchange rate. The majority of these factors are primarily microeconomic-based, such as the composition of the CPI basket, distribution costs of tradable goods, availability of domestic substitutes, and the optimal pricing strategies of firms. Other factors include demand policies (monetary and fiscal policies) and institutional factors like price regulations, foreign exchange rate controls, and enhanced global competition.

Furthermore, the extent of pass-through is found to be asymmetric and depends on the direction of the change (depreciation or appreciation) as well as on the size of the change. The economic theories have identified various circumstances that could generate asymmetric exchange rate pass-through such as capacity constraint, market share, production switching, and menu costs.

It has also been revealed that the extent of ERPT to inflation rate is generally larger in developing countries compared to more developed ones. Such a difference is more often attributed to factors like the Baumol and Balassa-Samuelson effect, a high share of traded goods, high import content, and limited domestic substitutes which generally reflect the characteristics of small and more open economies. From a policy perspective, given the relatively high ERPT into inflation rate in developing countries the implication is that the monetary authorities in these countries should take into account the underlying relationship between exchange rate and inflation rate and the factors determining such relationship when designing the monetary and exchange rate policies for their economies.

The recent literature of ERPT is relatively focused on analysing the declining trend in the extent of pass-through from exchange rate to inflation rate. This decline has been a characteristic of both developed and less developed economies. Several plausible explanations have been presented in the literature for this potential decline including changes in monetary environment (a shift to a low-inflation regime), changes in the composition of import goods towards sectors that have lower rates of exchange rate pass-through, substitution between goods (from high-end selection of imports to lower quality substitutes) and the increasing importance of non-traded goods in consumption and structural reforms (particularly in developing countries). However, there is no consensus in the literature and the debate remains ongoing regarding the causes of the changed behaviour of the pass-through relation.

The analysis of ERPT in general and in particular the aggregate level for small open economies, especially developing ones, have had a smaller share compared to the larger and more developed countries. Studies on developing economies were spurred recently, as previously mentioned, in the wake of large devaluations in South East Asia, Latin America, and other emerging countries between 1994 and 2001. Nevertheless, the majority of these studies have focused on episodes of sudden large devaluations (e.g. currency crises) with less attention given to analysing the pass-through relation in economies that generally stable but are experiencing a sustained depreciation. Furthermore, studies of pass-through on developing economies have concentrated on particular regions like South East Asia and Latin America, while other economic regions like Africa and the Middle East have been mostly neglected. Accordingly, future studies of ERPT could further contribute to the literature by trying to redress this imbalance in country study coverage. Future studies on developing countries could also contribute by giving more attention to episodes of sustained depreciation over time, in addition to the analysed episodes of sudden large devolutions. Moreover, the diversity of the exchange rate regimes among the developing countries relative to the developed countries also offers other fertile grounds for empirical research to analyse effect of exchange rate regimes on the pass-through relationship.

5.1 Overview of chapter three; Exchange rate pass-through into inflation rate: a case study on the GCC countries using single equation method

The next three chapters; three, four and five, form three out of the four empirical chapters of this thesis. They attempt to comprehend and analyse the nature of exchange rate pass-through into domestic inflation in the GCC countries. The primary motivation for the work is, as discussed earlier, the recent inflationary pressures in the region that coincided with sustained significant depreciation of US. Such developments have led the public in most of the GCC countries to demand a de-pegging from the US dollar on the pretext that depreciation of the US dollar against the currencies of the major trading partners of the GCC countries has been the main cause for the dramatic rise in the inflation rates. The calls for an alternative exchange rate regime were further reinforced following the recent abandonment of the dollar peg by Kuwait in May 2007, toward a weighted basket of currencies. The decision of the Kuwaiti authorities was primarily motivated by the need to control inflationary pressures emanating from persistent depreciation of the US dollar against the major currencies.

Accordingly, the empirical work in the next three chapters is intended to evaluate the relevancy of the existing dollar peg of the currencies of the GGC countries by focusing on assessing the risk to domestic CPI inflation arising from fluctuations of the US dollar against the currencies of the major trading partners of the GCC countries. More specifically, an attempt will be made to try to quantify the extent of pass-through from changes in the nominal effective exchange rate of the individual GCC countries to their domestic consumer price index (CPI) inflation. Based on the estimated amount of ERPT into inflation rates of the individual GCC countries, conclusions will be drawn and policy implications suggested on the existing exchange rate policies of the region.

In addition, the choice of exchange rate regime by the GCC nations and the subsequent economic implications are critical topics that necessitate additional examination and in particular provide potential ramifications to the incipient GCC monetary union. Moreover, this work is assumed to further enrich the latest discussions on whether the individual members of the GCC countries need to consider their fixed exchange rate regimes following recent economic developments including evolving national objectives and deeper integration with global trade and financial markets. Accordingly, analyzing the ERPT into the regional member countries inflation rates, as in this study, would undoubtedly add value to the body of studies on the regional block as a whole.

Aside from its importance to the macroeconomic policies of the GCC countries, this study attempts to cover some of the caveats in the literature of ERPT. For example, by focusing our analysis on the GCC countries, which are small and less developed countries, we are redressing the imbalance in country study coverage regarding the analysis of ERPT (Menon, 1995). Furthermore, given the inconclusive evidence on the prediction of full pass-through from exchange rate to domestic prices of small less developed economies, this paper tries to further test such hypotheses in the context of the GCC countries. Unlike most earlier available studies, that focused on episodes of large sudden depreciations (De Grauwe and Tullio 1994, Amirtano et al 1997, Goldfajn and Werlang 2000, Ito et al. 2005), the focus of this study is economies that have experienced sustained depreciations in their currencies over a period of time. Moreover, we contribute further to the literature by employing monthly macrodata as opposed to most other studies that were faced with data availability and consequently used lower frequency data including quarterly times series. According to Choudhri et al. (2005) and MacCarthy (2007) using monthly frequency is considered more preferable in studying the pass-through.

We started our estimation in chapter three by employing an ordinary least square (OLS) technique to estimate the extent of pass-through from changes in the effective exchange rate of the individual GCC countries to their domestic CPI inflation. Single equation models are the most widely used in the literature and they are amenable to comparison with other recent empirical analyses of pass-through to domestic prices since most have been based on the estimates of single equation models (Amato et al, 2005).

Furthermore, for our econometric estimation we followed the literature and used the following pass-through relation:

$$p_t = \alpha_0 + \sum_{k=1}^{L} \alpha_{1,k} p_{t-k} + \sum_{k=0}^{L} \alpha_{2,k} s_{t-k} + \sum_{k=0}^{L} \alpha_{3,k} p^*_{t-k} + \sum_{k=0}^{L} \alpha_{4,k} p^{oil}_{t-k} + \varepsilon_t \qquad (1)$$

Where P_t is the domestic CPI, S_t is the nominal effective exchange rate, P_t^* is the trading partner CPI, P_t^{oil} is the oil price, and ε_t is the error term. The lagged price variable of home index indicates an adaptive inflation expectation approach and allows us to distinguish between short term and long term pass-through. Our hypotheses took the following form:

1) Short-run ERPT:

H_0: $\sum \alpha_{2i} = 0$ (No Pass-through)

H_1: $\sum \alpha_{2i} \neq 0$ (Pass-through exists)

2) Long-run ERPT:

H_0: $\sum \alpha_{2k} /(1-\sum \alpha_1) = -1$ (Complete ERPT)

H_1: $\sum \alpha_{2i} /(1-\sum \alpha_1) < -1$ (Incomplete ERPT)

Our null hypothesis for complete pass-through in the long-run is based on the proposition of the PPP theory and other additional findings in the existing literature of ERPT. For example, the ERPT into domestic prices is generally greater in small open economies like the GCC countries, with a relatively high share of traded goods, high imports, and limited local substitutes. There is also a view that pricing to market strategy (PTM) is less likely by importers in developing economies that are assumed to be price takers. Moreover, based on the monetary theory, a decline in the exchange rates can lead to an increase in the domestic prices only if it is being accommodated by the monetary authority, which lowered interest rate and increased aggregate demand and output. In fact, by considering the recent scenario of the GCC economies (from 2002 onward), it can be seen that the monetary stances in the GCC countries have been accommodative to the decline in the effective exchange rates of these countries' currencies vis-à-vis the currencies of their other non-US trading partners.

The estimation was based on monthly data to comply with a sampling that is more relevant to exchange rate variability and covered the period from January 2000 to December 2008. The rational for such a period is primarily due to the US dollar, to which the currencies of the GCC countries are pegged, showing some significant persistent fluctuations during that period, and therefore providing a fertile atmosphere to test the ERPT in the economies of these countries. Furthermore, due to lack of data for Qatar and UAE, the test was confined to only four GCC members; Bahrain, Kuwait, Oman, and Saudi Arabia. However, given the similarity in the structure and conditions of the economies of the GCC state members-large share of oil production in total, dependency on oil exports, highly import-dependent, and similar trading partners' weights, the inferred implications from the estimated results of the examined country members can be applied to the entire GCC area.

The main findings of the estimated model reflected a rejection of both the null hypotheses. The pass-through in the short-run was found statistically significant in number of cases for all the four countries. However, the magnitude of the coefficients turned out to be very modest, with maximum significant short-run pass-through of around 16% in the case of Oman. Accordingly, a 10% depreciation in exchange rate increased inflation rates (measured by changes in consumer price index) in the GCC region by a maximum of 1.6% in the short-run. On the other hand, long-run pass-through ranged between a minimum of 10% (Saudi Arabia) and a maximum of 69% (Oman), with an average of around 27%, thus clearly indicating the failure of the PPP theory in the context of the GCC economies, as the pass-through is incomplete in all the cases.

We have further stretched our estimation by using the import price index and producer price index as the independent variables in order to compare the ERPT on inflation with ERPT on other aggregate domestic prices[19]. Producer price index in all the four countries was found to be significant and more elastic then consumer price index, with an average extent of pass-through of less than one, and equal to around 21% in the short-run. However, the estimated

[19] Data for import price index is not available for any of the GCC countries, so alternatively we used the import unit values for emerging and developing economies, which is provided by the IFS of the IMF. Similarly, due to limited data, the producer price index for Kuwait was used as a proxy variable for the other three countries.

extent of pass-through into import prices is considerably higher than in producer and consumer prices, with an average magnitude of around 70% in the short-run. Of the aggregate price indices, import indices in all the countries of our sample are the most elastic and highest in reaction to changes in exchange rates. This can, of course, be explained by the fact that import price indices include the largest share of tradable goods compared to producer and consumer indices.

5.2 Overview of chapter four: Exchange rate pass-through into inflation rate: a case study of the GCC countries using Vector Error Correction Method

In this chapter we re-estimated the pass-through from changes in exchange rate to inflation rates of the GCC countries by applying a different method; a vector error correction method (VECM). This method differs from the previously estimated OLS method in that it focuses on the long-run or steady state relationship in the level of the variables (Bandt and Banrjee, 2008). Also, unlike the OLS method that a priori assumes the dependant variable as endogenous to movements in the independent variables, it allows for the endogenous determination of the variables.

Conventional theory in the literature of exchange rate pass-through (ERPT) states that the level of our variables is linked in the long-term[20]. According to Engel and Granger (1987), if a linear combination of two or more non-stationary variables is stationary, then these variables are said to be co-integrated, with the co-integrating equation interpreted to represent a long-run equilibrium relationship among the variables. The existence of co-integration implies the presence of a vector error correction representation showing the short run adjustment to the long-run equilibrium among the variables. The strength of the VECM is its ability to incorporate short-run dynamics with long-run equilibrium relations among the variables (Kim, 1998)[21].

The estimation in this chapter is carried out by using a co-integrating analysis with a Vector Error Correction Model (VECM). In our model, inflation is explained in terms of past

[20] According to the PPP theory, there should be a co-integrating relation between the exchange rate, the foreign price index, and the home price index, with a co-integrating vector of (1,1,-1) (Choudhri and Hakura, 2006).

[21] A VECM is a restricted version of vector autoregressive (VAR) model in first differences of variables with an additional error correction term, with the VAR equation being a priori restricted by the presence of a co-integrating relationship.

inflation, exchange rate, trading partner CPI, and oil prices (the same variables as in chapter three):

$$P = f(S_t, P^*, P^{oil}) \qquad (2)$$

Where P_t is the domestic CPI, S_t is the nominal effective exchange rate (NEER), P_t^* is the trading partner CPI, and P_t^{oil} is the oil price. The Johansen approach was used to establish the co-integration link between the variables. Our error-correction equation for the price level took the following form:

$$\Delta p_t = \alpha_0 + \delta_{ecm}(p_{t-1} - (\phi_1 s_{t-1} + \phi_2 p_{t-1}^* + \phi_3 p_{t-1}^{oil}) +$$
$$\sum_{k=1}^{L} \alpha_{1,k}\Delta p_{t-k} + \sum_{k=0}^{L} \alpha_{2,k}\Delta s_{t-k} + \sum_{k=0}^{L} \alpha_{3,k}\Delta p_{t-k}^* + \sum_{k=0}^{L} \alpha_4 \Delta p_{t-k}^{oil} + v_t \qquad (3)$$

The first line in equation (3) shows the long-run dynamics of inflation and the second line shows the short-run dynamics of inflation. The coefficient δ represents the speed by which the inflation rate converges to its equilibrium.

Furthermore, this chapter also utilized the results of the impulse response functions and the variance decompositions to further assess the link between exchange rate and inflation rates in the sampled countries. The impulse response functions illustrate the effect of a temporary shock emanating from an endogenous variable to other variables through the dynamic structure of the vector autoregressive (VAR) model. On the other hand, the variance decomposition indicates the amount of forecast variance in prices that can be attributed to exchange rate.

The estimates of the long-run pass-through from exchange rate to domestic prices in the GCC countries are significant in each of the four sampled countries. Moreover, the coefficients of the exchange rates in the four estimated models are less than one, which indicates that the PPP theory does not hold in the GCC countries, thus confirming earlier results of the OLS estimation. Nonetheless, the estimated individual long-run elasticity of prices to changes in exchange rate are significantly higher than those estimated using the earlier OLS technique, with an average of around 57%. A 10% depreciation of exchange rate in the GCC countries will increase inflation in the long-run by 5.7%.

The estimated pass-through using the VECM is found to be broadly similar to earlier estimates, regardless of the applied method, for other economies including industrial and emerging countries. For example, Gagnon and Ihrig (2004), who estimated the pass-through for 20 industrialised countries for the period 1971 to 2003, reported a pass-through coefficient that ranged between 0.02 (Sweden) to 0.53 (Greece). Other similar results were reported by Mihaljek and Klau (2001), who used OLS with quarterly data from 1981 through 2001 to analyse ERPT in 13 emerging economies. Their estimated pass-through for countries including Mexico, Hungary and Turkey ranged from 0.36 to 0.56. Choudhri and Hakura (2006), who estimated ERPT for different economic regions, reported an average pass-through for low and moderate inflation countries including industrial nations (inflation less than 10% and from 10% to 30%, respectively) that ranged from 0.16 to 0.35. However, in the moderate category, the majority of the estimates were from 0.3 to 0.60, an estimate which is similar in magnitude to our results. Other similar findings include those reported by Dobrynskaya and Levando (2005), who estimated a long-run pass-through into aggregate consumer price index of around 40% for Russia during the period 1995 to 2002.

Furthermore, the analysis of the impulse response functions illustrated low persistent inflationary effects from changes in the nominal exchange rates of these countries. In response to one standard deviation shock to the exchange rate (in the form of appreciation), the price level index exhibited sustained decline, albeit very modestly, for at least one year in every countries with exception of Bahrain, where the price level index took opposite path in the form of a persistent increase. On the other hand, the analysis of the variance decompositions showed that the variations in the consumer price index were predominantly explained by its own innovations, in all the four countries, followed by changes in exchange rates that explain around one quarter during the first year and increase to around one third percent in two year time[22].

[22] This results are rather comparable to the one reported by McCarthy (1999), who used a VAR model in investigating the pass-through of exchange rate in a set of nine industrial countries. From his variance decomposition analysis, McCarthy found changes in exchange rate to account for about 5 to 30 percent of the variations in consumer prices.

Following the estimation and analysis of the results from the VECM model, we attempted to present some explanation for the significant ERPT as well as the incomplete pass-through in the economies of the GCC countries. The increasing long-run pass-through in the GCC countries during the period of examination can be attributed to many factors including the degree of openness of the GCC economies, the recent persistent depreciation of the US dollar against the currencies of the trading partners of the GCC countries, the rapidly increasing domestic demand, and the expected potential ramifications to the incipient GCC monetary union. Moreover, the generally incomplete pass-through to consumer price inflation of the GCC countries can also be attributed to various other factors. For example the low share of traded goods in the CPI baskets of the GCC economies, the presence of PTM strategy by many firms dealing in the GCC economies, the presence of modern financial markets that facilitate hedging contracts, the composition of the import of the GCC economies, the credibility of the monetary environment, and some institutional factors like price regulations of some essential goods.

5.3 Overview of chapter five: Demand policies and pass-through of exchange rate: a case study of the GCC countries.

The work of this chapter represents a third attempt to estimate the ERPT into inflation rate of the GCC countries using the VECM of chapter five. However, the theoretical framework has been extended by including the role of demand policies in general and fiscal policy particularly in affecting the extent of pass-through following changes in exchange rate.

Furthermore, the link between demand policies and the extent of ERPT into domestic CPI inflation in this chapter is based on the work of Parsley and Popper (1998), who have theoretically argued that the estimates of the responsiveness of domestic prices to changes in exchange rates may reflect, in addition to other factors, the policies of the central bank during the period examined. Based on the proposition of Parsley and Popper (1998), the recent inflationary effect of exchange rate depreciation in the GCC countries during the period of our review (2000-2008) is believed to have been reinforced or sustained through higher money growth that in turn was triggered by expansionary fiscal policies because of higher oil wealth and, to some extent, by the pegged exchange rate system.

Furthermore, the contribution in this chapter stems from the fact that the study of Parsley and Popper (1998) was applied in the context of floated exchange rate regimes, while this study applies the model to fixed exchange rate regimes and to hydrocarbon based economies. Accordingly extending the model of Parsley and Popper (1998) to include fiscal policy has enriched the model.

The recent expansionary fiscal policies of the GCC countries are believed to have helped to both directly and indirectly influence the extent of pass-through from exchange rate to inflation in these countries. The direct influence is through higher government spending that leads to higher demand for goods and services, and eventually reinforces the spill over from depreciation of exchange rate to inflation in the GCC countries. The indirect influence is through its effect on wages. For example, if domestic prices begin to adjust following depreciation in the currency, wage adjustment would be expected to follow. However, adjustments in wages are assumed to depend on a number of factors such as the slack in the labour market and the state of aggregate demand (Ghars El-Din and Mohammed, 2005)[23]. If the economy is in a recession, wage adjustments will be weak, thus reducing the overall pass-through of the currency depreciation. Therefore, if the fiscal authorities in the GCC countries choose a restrictive fiscal policy following currency depreciation, this will weaken/moderate any chance of a wage-price spiral, thereby reducing the inflationary effects of depreciation.

Furthermore, given the fixed regimes with the US dollar, the monetary authorities in the GCC countries have been tracking the monetary changes in the US by similarly lowering their short term interest rates, thus accommodating the demand for higher nominal money balances due to lower real money balances because of the depreciation. Further downward pressures on domestic interest rates in the GCC economies during the period of our sample were stirred up through higher injunction of liquidity into the monetary system on account of higher oil revenues that facilitated credit and aggregate spending. Accordingly, given the active stance of both demand policies in the GCC countries during the period of significant depreciation in the exchange rate of the currencies of these economies, one would expect some influence of the

[23]The relatively high dependency on foreign labour makes inflation pressures in the GCC economies more sensitive to external factors like exchange rates. For example, depreciation in the exchange rates of the GCC countries' currencies will lower the purchasing power of the foreign labourers' remittances and hence the amount of wages required to attract them or to retain them in the GCC markets (Hasan and Alogeel 2008). It is worth noting that government expenditure in the GCC countries is the main exogenous factor that causes wage adjustment as the role of trade unions is negligible in these countries (Ghars El-Din and Mohammed, 2005).

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action of these policies on the extent of pass-through from exchange rate to inflation rates in the GCC countries, at least according to Parsley and Popper (1998).

With respect to estimation, the error correction model of chapter four was re-estimated with additional variables representing fiscal and monetary policies. After taking into account the action of the fiscal and monetary policies, the estimated coefficients of exchange rate are significantly lower, in all the four countries, than those estimated in chapter five. Average ERPT in the log-run is around 23%, which is similar to the average amount (27%) that we estimated in chapter three based on the OLS method. Moreover, the variance decomposition analysis indicated that variations in the price level index are explained by its owned lags, followed by variables representing demand policies respectively with a negligible role for changes in exchange rates.

The above results confirm the arguments of Parsley and Popper (1998) on the importance of economic policies on the pass-through elasticity from the exchange rate to prices, or generally on the relationship between economic variables of interest. It also further confirms that the domestic CPI inflation in the GCC countries is significantly influenced by changes in their exchange rate. However, the impact from exchange rate to inflation is also partly determined by the actions of demand policies in these countries.

5.4 Overview of chapter six and chapter seven: Literature review on the choice of exchange rate regime; a case study of the GCC countries

This chapter and the next attempt to complement our analysis and tests regarding the relevancy of the existing pegged exchange rate regime to the GCC economies. More specifically, in these two chapters we have attempted firstly to give a brief on the recent literature of the exchange rate regime in general, as in chapter six, and secondly to view the various alternative potential choices that are available to the GCC countries with regard to their exchange rate regimes. The second objective is carried out in chapter seven, which also attempts to empirically test the possibility of pegging the currencies of the GCC countries to a dollar-euro basket against the current single US-dollar peg.

As an overview of the recent literature of exchange rate regimes has been included in the introduction to this chapter, and in order to avoid unnecessary overlapping, this chapter will now discuss chapter seven, which forms the fourth empirical chapter of this thesis.

The essence of the work of chapter seven is to empirically analyse the feasibility of a dollar-euro basket peg as an alternative exchange rate regime for the currencies of the GCC countries. The chapter begins by discussing the circumstances that have cast doubt on the viability of the current single US dollar peg and led to the recent increasing public pressure to de-peg from the US dollar. Section two of this chapter includes an overview of these circumstances.

The chapter also includes a discussion of various factors that make the analysis of exchange rate regime of the economies GCC countries of great importance, regionally and worldwide. It was revealed that the importance of analysing the economies of the GCC countries stems in general from their recently increasing role as global investors and trade partners, and their crucial role in the global energy markets. Furthermore, together with other oil-exporting nations, they have become part of the international policy debate on global imbalances.

Chapter seven also included a comprehensive survey on studies that have attempted to discuss the alternative exchange rate regimes for the GCC countries. According to the surveyed literature, the most widely analysed exchange rate choice for the GCC economies is a corner solution in the form of currency union, particularly in empirical literature. Most of the studies in this regard have been motivated by the political and economical willingness and commitment of the state members to form a single currency for the entire region. In fact the commitment to form a single currency originally dates back to the foundation of the union between the six state members in early 1980s.

In general, the assessment of the surveyed studies regarding the possibility for the GCC countries to form a single currency was based on analysing the applicability of the traditional OCA criteria to these economies, as well as on the monetary and fiscal convergence. All in all, these studies found the GCC countries unready to form a single currency as they lacked significance in inter-regional trade and capital mobility, and showed asymmetry in shocks and business cycles. Other factors included delays in meeting the convergence criteria and a delay in establishing harmonised systems and institution building; namely the harmonization of monetary policy framework, payment and settlement systems, regulatory and supervisory structures and macroeconomic statistics.

Conversely, other studies have suggested more flexible exchange rate regimes in order for oil exporting nations like the GCC economies to reduce the need for domestic prices to rise and fall along with the price of oil, to better pursue domestic goals of inflation and output through monetary policy independence, to easily absorb adverse real shock, and to dampen oil- related swings in government revenue. However, pure floating, and even managed floating, regimes are viewed as being not applicable or suitable at this stage to the economies of the GCC countries. This has been attributed to a number of factors including the lack of sensitivity of the market interest rates to the interest rate policy, issues regarding the choice of nominal anchor under floating exchange rate. Also, large oil swings under float may results into higher fluctuation in non-oil sectors and higher and more volatile inflation, and the absence of well-functioning financial markets purporting to facilitate hedging at low transaction costs so as to minimize the additional risks that economic agents in the GCC economies would face under a floating regime.

Furthermore, some studies, that viewed more flexibility as necessary given the recent economic development in the region, have stressed gradualism by suggesting an initial shift to a currency basket peg that would allow flexibility. The weight of the different currencies in the basket could reflect the currencies most often used in financial and commercial transactions. It could also reflect the country's direction of trade or the currency weight of the SDR. Commencing with a basket peg, although less transparent than a single peg, would be simple to manage and a useful way to introduce flexibility in the exchange rate in a gradual manner that would also allow economic agents to learn to manage and live with foreign exchange risks.

Under the basket peg, the local authority is allowed more space to use monetary policy for supporting fiscal policy to sustain internal stability and growth. Lower fluctuations in the effective nominal exchange rate under the basket peg are expected to support the diversification effort in the GCC economies and to result in a higher external trade and balance stability. Furthermore, it was also argued that with increasing international capital flow, the real shocks would be more efficiently addressed under the basket arrangement because of higher flexibility compared to the single peg, while reducing the level of foreign reserves needed to support the fixed exchange rate.

However, empirical studies, such as the one in this chapter on the feasibility of basket peg to the currencies of the GCC countries are very rare. Accordingly, in chapter seven an attempt was made to contribute by empirically assessing the applicability of a dollar-euro basket peg based on two tests drawn from the relevant literature. Furthermore, the choice of the euro and the US dollar for the basket peg has been based on the OCA theory that suggests adopting the anchor currency that minimizes the sum of the bilateral exchange rate fluctuations, weighted by the importance of each trading partner. Accordingly, basket of the euro and the US dollar was suggested, as these two currencies account for a large share of the GCC economies' international trade and non-trade financial transactions.

In the first tests a structured VAR model was used to investigate the influence of external shocks like the business cycles in the US and Europe on the economies of the GCC countries. In the second test the likelihood for a long-run business cycle synchronization between the economies of the GCC countries and the US and Europe was examined. The test included quarterly data spanning from Q1, 1991 to Q4, 2009. Moreover, the empirical work in this chapter included all six estate members of the Gulf Cooperation Council compared to the first three empirical works in chapters three, four, and five which were confined, due to data availability, to data from only four GCC countries.

With regard to the first test, the analysis of the results of the impulse response functions and the variance decompositions from the estimated structured VAR model indicated that output in the GCC countries is predominantly influenced by the terms of trade shocks, which reflect the large weight of the hydrocarbon exports in the GDP of the GCC countries. The results also showed that the GCC countries' output is significantly influenced by shocks from US and Europe. However, the changes in the output of Europe were found to have a higher impact on the GCC economies than the impact from changes in the output of the US. This reflects the growing trade link between the GCC countries and the European countries, and the geographic proximity between the GCC region and Europe as compared to US.

The tests for the synchronization of the business cycles presented some evidence for long-run association between economies of the GCC countries and those of the US and Europe. Real GDPs and inflation rates in the GCC countries were found to share some significant long-term trend with their counterparts in the US and Europe, indicating that the macro economies of the individual GCC countries and US and Europe are linked over the long-run, hence, lending further support to the proposition of using a dollar-euro basket peg for the currencies of the GCC countries.

5.5 Overview of chapter eight: Summery and Conclusions

Chapter eight summarises the work, results, and the implications of the empirical sections in chapters three, four, five, and seven. It also presents the author's conclusions and recommendations with respect to the exchange rate regime policies of the GCC countries. The final section of chapter eight discusses the limitations of the research and offers further areas for future research within the context of the GCC economies.

Chapter Two

Literature Review on the Causes of Inflation and the Pass-through of Exchange Rate

1. Introduction

This chapter is divided into two parts. In the first part it presents a brief survey of the main theories of inflation. This survey covers opinions on the inflationary process from various competing schools of thoughts within economics. It also includes an empirical survey on studies that have attempted to comprehensively analyze a great number of determinants of inflation that have been advanced in the theoretical literature[24].

In the second part the study focuses on understanding the link between inflation and movements in the exchange rate; the pass-through of exchange rate into domestic consumer price index. The survey in this part includes some theoretical background on the link between exchange rates and domestic prices, the discussion of a host of factors that influence the pass-through of exchange rate, a deeper focus on the transmission from exchange rate into domestic inflation consumer price index as well as some other related and recent issues in the relevant literature. Similar to part one, part two also includes some empirical surveys on the extent of pass-through from exchange rate into inflation. Furthermore, part two also attempts to identify some potential caveats in the literature for future research. A Summary and conclusions are provided independently at the end of each part.

[24] Note: this part is only focused to study the causes/determinants of inflation, so costs, solutions and other relevant topics (e.g. disinflation, core inflation, inflation variability, etc.) to inflation are not included.

2. **Causes of Inflation in Theories**

Inflation is generally defined as a persistent increase in the general price level, for goods and services in an economy, as expressed in a given price index (Lipsey and Chrystal, 2007). It has been a central concern for macroeconomists and policy makers for a considerable time due primarily to its economic and social costs[25]. Many theories have been advanced to explain the different causes of inflation. In most of those theories, the causes of inflation have been condensed into smaller number of determinants in order to better understand the inflation process. A brief write up on the opinion of the different theories on the dynamics of inflation is provided in the following subsections[26].

2.1 *Classical Approach*

The classical (*e.g.* Adam Smith, David Hume, David Ricardo, and John Stuart Mill) and the neoclassical schools (*e.g.* Alfrad Marshall, A. C. Pigou, Irving Fisher) state that inflation is a monetary phenomena (Snowdon and Vane, 2005). In other words, excess in the supply of money results, other things being equal, in a general price increase. Such a statement was confirmed more recently by the monetarists, particularly through the work of Milton Friedman (1968), one of the most influential economists in the last quarter of the twentieth century. Their proposition was based on two major elements; quantity equation of the quantity theory of money, and market clearing in the real sector. With regard to the latter element, the classical economists consider the real sector to (markets of goods and labors) operate competitively and efficiently so that supply and demand are clear in the long run to yield equilibrium in output and/or full-employment. As such, full employment was the normal state of the affairs according to the classical economists. Such an assumption of continuous market clearing implies a vertical aggregate supply curve.

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[25] Costs of inflation include, enter alia, shoe leather costs, menu costs, tax distortions, distortions to income and wealth distribution, distortions to the price mechanism, and increased uncertainty which lower investment and reduces economic growth (Fischer 1984, 1996). High Inflation is also found to be associated with less rapid growth of average income and lower equality (Romer and Romer, 1999).

[26] In order to be able to follow the development over time in explaining inflation I have tried to follow more or less a chronological order in comparing the opinions of the different theories of inflation instead of adopting other general criteria such as demand –pull theories vs. supply-pull theories, long-term vs. short-term theories, etc.

There were two highly influential versions of the quantity theory of money; the Cambridge cash-balance approach[27] and the income version of Fisher's equation of exchange. The identity of both versions is more or less identical and both lead to the same results in explaining the quantity theory approach on inflation process. Using Fisher's version (1911), the quantity identity is given by the following relationship:

$$MV = PY \tag{1}$$

Where M is the money stock and it is supplied by the authority, so it is exogenous. V is the velocity of money and represents the average number of times a unit of money is used to finance/conduct transactions. As the frequency of transactions carried out by agents is determined by institutional factors/arrangements that change slowly and in a predictable manner, the velocity V is assumed to be constant. P represents the general price level and Y is the real aggregate income in the economy. Furthermore, as Y is assumed to be predetermined at its full employment level by the equilibrium in the real sector market, and as V is constant, then we are left with the fundamental monetarist proposition that the quantity of money supplied determines the price level (P) in equation one is determined only by M). In other words, the price level (P) is an increasing function of money supply (M). The disequilibrium in the money market is restored by an increase or decrease in the price level. When there is an excess of money supply in the market, the individuals, firms and households, will try to remove undesired amounts of money by going to the market and increasing the demand of goods and services. As the supply of output is assumed to be fixed (vertical position of aggregate supply curve) sellers will try to meet the excess demand by increasing the price level. Hence, the general price level will rise in proportion to the initial increase in the money supply. Therefore, as per the classical school, money contraction policy should be used primarily as a tool to fight against inflation (Handa, 2000).

[27] Famous exponents of this version include among others Alfred Marshall, early writings of J. M. Keynes, and A. C. Pigou.

2.2 *Traditional Keynesian*

Keynes accepted the classical idea that money supply will result in 'true inflation', only in one case; when the aggregate volume of output corresponding to full employment is reached. In other words, when the aggregate supply curve is vertical. In his pamphlet 'How to Pay for the War' in 1940, Keynes developed a demand side model for the inflation process with temporarily rigid prices in the labor market. His initial concern was to provide space for the necessary increase in production during the war within already a fully employed economy. Keynes defined the inflation gab as " the amount of purchasing power which has to be withdrawn either by taxation or primary saving… in order that the remaining purchasing power should be equal to the available supplies on the market at the existing level of prices" (Skidelsky 2000, 84). Essentially, inflation gab is equivalent to unexpected increases in demand within an economy operating at full employment. Initially therefore, such a shock in demand will result in higher prices and in unanticipated profit for firms, due primarily to the assumption of rigidity in normal wages (Aykut, 2002). Firms' action to meet the excess demand will create pressure on the labor market, which is already operating at full capacity. This will cause a competition between firms for employed workers, which will bid up normal wages and subsequently the real wages, which in turn will induce a new demand in the goods market leading to another increase in prices. If normal wages continue to lag in response to any excess in demand, an inflation spiral is expected to occur. Keynes suggested fiscal restraint (forced saving) in the form of increased tax or cuts in government spending in order to eliminate the inflation gap. The upshot here is that, in contrast to the classical proponents, who emphasized the monetary, demand side approach to inflation, Keynes emphasized the non-monetary, demand side approach to inflation that was prevalent with the cost-push argument for inflation.

2.3 *Postwar Keynesians (The neo-Keynesians)*

The IS-LM model, which provided a very useful framework for analyzing short run aggregate supply curve of the neo-Keynesians (e.g., Hicks, Modigliani, Klein, Samuelson, and Hansen) dominated the majority of intellectual thinking during the 1950s and 1960s. With the so-called 'neoclassical synthesis', a consensus emerged that resulted in the General Theory being seen as "a special case of a more general classical theory (that is, the case where downward money wage rigidity prevents the classical automatic adjustment to full employment), while the need was recognized for Keynesian interventionist policies to ensure a more rapid return to full employment" (Snowdon and Vane 2005: 122-123).

Conversely, the neo-Keynesians believed that under the state of full employment, an increase in demand will lead to nominal response (wages/prices) and not to real response (output). In other word, as the economy becomes closer to full employment (resources are fully utilized) price increases would become more and more common. However, without an explicit relationship that could picture such links between demand and prices in the context of their existing framework of output and employment determination, the neo-Keynesians' analysis would still be incomplete. Accordingly, in their search for a complete macroeconomic model, the neo-Keynesians found the relationship between the change in the rate of money wages and unemployment, which was empirically tested by A.W. Phillips (1958) for the UK, to give a solid foundation for their approach to inflation or price determination.

Accordingly, the neo-Keynesians used the relationship between normal wage inflation and unemployment, as depicted by the Phillips curve, to establish their theory of wage and price inflation. It is worth noting at the onset that the contribution of A.W. Phillips was providing an empirical observation that there had been a significant and stable negative relationship between wage inflation and unemployment rate. Phillips did not aim to put forward a theory of inflation process or price determination. Phillips' approach used the normal wage inflation, but the neo-Keynesians were more interested in the price inflation. However, both approaches were considered largely interchangeable. Following Lipsey (1978), in a Phillips curve the relationship between normal wage and unemployment is as follows:

$$\omega = \alpha\mu \qquad (2)$$

Where ω represents the normal wage inflation, α represents a parameter that should be less than zero in order to reflect the negative correlation between wage inflation and unemployment, and μ represents the unemployment rate. By applying the mark-up pricing hypothesis that suggests that price inflation depends on money wage inflation minus productivity growth as follows:

$$\pi = \omega - \rho \qquad (3)$$

Where π represents the inflation rate and ρ represents the productivity growth per worker. Substituting equation (3) into (2) and producing the results in terms of inflation rate:

$$\pi = \rho - \alpha\mu \qquad (4)$$

Equation (4) relates the inflation rate to the unemployment rate, which measures demand pressure in the labor market and the product market. Following the contribution of Samuelson and Solow in the early 1960s, the neo-Keynesians viewed the relationship in the Phillips curve as implying a long run stable tradeoff between unemployment and inflation. In other word, Phillips' curve was seen to offer the policy makers a menu of possible unemployment-inflation combinations for policy choice

(Snowdon and Vane 2005). This meant that an expansionary policy would lead to lower unemployment and higher inflation rate, and vice versa. Moreover, a decrease in unemployment rate was viewed as an increasing demand for labor in the labor market and therefore a subsequent increase in the good market too. This suggested a real demand-side pull inflation, which was consistent with Keynes' view (1940) in his aforementioned pamphlet 'How to Pay for the War'. The experience of many countries during the 1950s and until at least the mid 1960s warranted the idea of a Phillips curve trade-off strong support. As a result, that gave the neo-Keynesian's framework of macroeconomics dominance in terms of both theorizing and policy prescriptions (Snowdon and Vane 2005).

2.4 *Monetarists' critique of the Neo-Keynesians' Phillips Curve Trade-Off and the Expectation-Augmented Phillips Curve*

In the late 1960s and throughout the 1970s, Phillips' relationship as interpreted by the neo-Keynesians failed to explain the stagflation and the recession experienced by many countries, particularly during the dramatic oil shocks by the OPEC cartel in the 1970s. The obvious and straightforward explanation for the inflation phenomenon, might have been that presented by the structuralists on the basis of cost push inflation, which is discussed below in section 2.9. At the same time, while many other economists were struggling with attempts to look for other influential variables which might have been missed in understanding the inflation process, some monetarists economists, including Milton Friedman and Edmund Phelps, were able to provide the economic world with a convincing argument for the 'Great Peacetime Inflation' of the 1970s (Aykut, 2002).

Friedman and Phelps denied the notion of a stable long trade-off between unemployment and inflation rates as proposed by the neo-Keynesians. According to Friedman, the Phillips curve was misspecified. Friedman had argued that the Phillips curve relationship should be modified to include the rate of change of real wages instead of nominal money wages. According to Friedman, the economic agents (firms and labors) who set prices are interested in the real, not money, wages. The negotiated real wages between the economic agents are assumed to be also affected by the inflation rate expected to prevail during the lifetime of the contract. In other words, the negotiations for price setting between the agents are influenced by two major factors; the supply and demand conditions in the markets as measured by the unemployment rate and the rate of inflation that the agents expect to exist throughout the period of the contract. Therefore, if more inflation is expected, the agents are likely to strike the contract at higher prices (nominal money wages) even if the supply and demand conditions in the market remain unchanged. Therefore, Friedman augmented the basic Phillips curve relationship by including the expected rate of inflation as another variable in determining the rate of change in money wages. Such addition resulted in a new form of Phillips curve model called the expectation-augmented Phillips curve:

$$\pi = \rho - \alpha\mu + \beta\pi^{e} \quad (5)$$

Where π^{e} represents the inflation expectations variable, and β is a parameter that measures the size of impact of expectations on inflation rate. For simplicity constant change in productivity ρ is assumed. Any value of β of less than one and greater than zero implies a long run tradeoff between inflation rate and unemployment rate. However, the long run tradeoff is assumed to be less favorable than in the short run due to the inflation expectations. When β takes the value of unity, then actual inflation will be equal to the anticipated inflation; $\pi = \pi^{e}$. Following this, there would be no long run trade-off between unemployment and inflation. This would mean that the agents were able to completely anticipate the actual rate of inflation and that labor is no longer suffering from money illusion (Handa 2000, Snowdon and Vane 2005). This is the case where the Phillips curve is vertical and the economy is operating at its natural level of unemployment. At this level, the rate of change in money wages will be exactly equal to the rate of change in prices.

In the expectation- augmented Phillips model, monetarists had argued that the impact on the real sector (reducing unemployment below its natural level) from monetary expansion is present only in the short run, when the inflation is unanticipated. However, in the long run, such an increase of inflation will be fully anticipated and incorporated in wage bargains and the unemployment will return to its natural rate (Aykut, 2002). According to the monetarists, the economic agents make errors in their expectations of inflation and hence allow the deviation of unemployment from its natural rate. The main reasons for these errors are because the economic agents form their expectations on the light of past actual inflation rates and not all information is available to them during their formations of price expectations. The lag in the adjustment from the expected inflation rate to the actual inflation rate permits the temporarily deviation of unemployment from its equilibrium. With the lagged or gradual adjustment of expectations of inflation, the economic agents are assumed to work with adaptive or error-learning expectations model (Aykut, 2002).

$$\pi_{t}^{e} = \lambda\pi_{t-1} + (1-\lambda)\pi_{t-1}^{e} \quad (6)$$

Equation (6) represents the mathematical form of the adaptive expectations or the so-called 'backward-looking' expectations. The parameter λ is the coefficient of adaptation, where $0 < \lambda < 1$. Equation (6) implies that expected inflation at time t is only a weighted average of actual inflation and expected inflation rates at time t-1(previous period)[28]. From equation (6), it can be seen that expectations respond quickly to the actual inflation rate when λ gets larger. As λ gets closer to unit, the more expected inflation at time t will depend on previous actual inflation rate and less on the previous expected inflation rate. Large values of λ also imply that expectations change/adjust very quickly to reduce the gap between the actual and expected inflation rates. This rapid adjustment can be used to explain the acceleration in the inflation rates in the 1970s. Furthermore, the adaptive model assumes that agents are less informed and do not have full access to the same information as the authority. The only information available that is used to formulate expectations of inflation is from the past, so there is no knowledge of current information that might have some influence on future inflation.

2.5 *New Classical Approach (Rational Expectation vs. Adaptive Expectations)*

The new classical school, which initially evolved out of the monetarists' macroeconomics and incorporated certain elements of their approach, formulated an alternative method of forming expectations. It was assumed that economic agents used rational expectation hypothesis (forward-looking approach) when setting prices. The rational expectation hypothesis was originally introduced in 1961 by John Muth and started to influence the macroeconomics in the seminal work of Robert Luca in the early 1970s (Snowdon and Vane 2005). Unlike the monetarists' assumption of imperfect information under the adaptive expectations, the new classical school argued that under rational expectations hypothesis the economic agents are assumed to have knowledge of all past and current relevant information as well as a full understanding on how the economy works. It follows that no systematic errors will occur in the process of forming inflation expectations as all known and systematic determinants will be taken into consideration when expectations are formed. Therefore, only nonsystematic errors or random shocks will affect the inflation rate and result in a gap between the actual and expected inflation rates. Accordingly, the Phillips curve is vertical in the short and the long run. The mathematical definition of the expected inflation rate as per the rational expectation hypothesis:

$$\pi_t^e = \pi_t + \eta \tag{7}$$

[28] By repeated substitution, adaptive expectations implies that expected inflation can be shown to be a weighted average of past actual inflation with greater weight assigned to more recent experience of inflation:

$$\pi_t^e = \alpha\pi_t + \alpha(1-\alpha)\pi_{t-1} + \alpha(1-\alpha)^2\pi_{t-2}....\alpha(1-\alpha)^n\pi_{t-n}$$

Where η represents a random error with an average of zero. Under the rational hypothesis, the adjustment parameter β in equation (5) should be equal to unity (full impact of expectation on inflation). Substituting equation (7) in equation (5) and producing the results in terms of unemployment rate:

$$\mu = (\rho + \eta)/\alpha = \mu^n + \eta/\alpha \qquad (8)$$

Equation (8) is the Phillips curve with rational expectation. Unemployment rate is equal to its natural/equilibrium rate (μ^n) plus a random error (η/α). There is no trade-off between unemployment and inflation either in the short run or the long run. In its extreme interpretation, equation (8) means that only random errors or unanticipated policy will lead to deviation of the inflation rate from its expected rate and hence the unemployment from its natural rate. Moreover, such a deviation will only last for the short term (current time) as the error/surprise will be in incorporated by the economic agents in the next period's information set. The assumption of a vertical Phillips curve in the short and long run means that the economy is always in an equilibrium status achieved through a continuous market clearing within a framework of competitive markets. According to Hoover (1992), the assumption of market clearing represents the classical elements in their thinking (new classical theorists). Moreover, the assumption that the inflation can only deviate from its expected rate by random shocks is often coupled with the quantity theory of money to imply that inflation is a monetary phenomenon in the short run as well as in the long run because rationality precludes any systematic difference between the two (Wachtel, 1989).

With respect to policy implication under rational expectations, the authority will not be able to affect output and unemployment unless it can find a way to create a surprise. As the macroeconomic framework of the authority is well known to the economic agents, any announced monetary stimulus will only lead to inflation and will not affect the real sector even in the short run as assumed by the monetarists. It therefore follows that for a policy to be effective it should be unanticipated, as the full knowledge of the economic agents of the economic structure makes it impossible to affect the real sector by an announced policy. This leads to the 'policy ineffectiveness proposition' of the new classical school under the hypothesis of rational expectations. As a result, the only way for the central bank to create an effect on the real sector is through a surprise to the public. Such a surprise or unanticipated policy will lead to a short term error in the inflation expectation and hence to a deviation of employment from its natural rate (Snowdon and Vane 2005).

Conversely, when the authority announces a disinflation policy or a low inflation target, according to the new classical school the success of such policy is subject to the time consistency and the credibility/reputation of the central bank. The dynamic inconsistency theories pioneered by Kydland and Prescott (1977) and developed by Barro and Gordon (1983) have explained that what appears initially to be an optimal policy can turn out to be suboptimal in subsequent periods if the government sees an incentive to renege/cheat on its previously announced optimal policy. Given such an anticipated action/surprise by the authority to reduce unemployment below its natural rate through monetary stimulus, the future announced policies will lack validation by the economic agents, who will continue to sign contracts for high wage increases. As a result, authority is ought to carefully consider the intertemporal trade-off between current gains from reneging (lower unemployment and higher output) and the future costs (lower credibility and higher inflation expectations).

Generally, the emphasis on credibility and reputation issues gained higher importance in the aftermath of the rational expectation revolution as rational economic agents know that, due to low credibility of the government, the announced/promised policy of low inflation, particularly during the election cycles, is time-inconsistent, in the sense that it will not be materialized after the election (King and Ma, 2001, Snowdon and Vane, 2005). Accordingly, based on the credibility and time inconsistency arguments, in order for the announced policies to be credible and time consistent, the policy makers or the governments need to establish a commitment device that will tie their hands around specific policy course (Drazen and Masson 1994, Velasco and Neut 2004, Carmignani et al., 2008). Some of the suggested arrangements include the independence of the central bank, fixed exchange rate regime, and receiving a seal of approval on the announced policy from an external institution like the IMF. With these kind of strategies, it is argued that governments will be able to address the credibility-deficit and dynamic inconsistency problems[29].

[29] For example, the Labor Party led by Toney Blair in the UK announced, during the 1997 election, to be counter inflation and to achieve lower unemployment rate at the same time. Such announcement was clearly time-inconsistent as the party was expected to follow the ideology of lower unemployment on the cost of higher inflation post to the election. However, in order to give credibility to its announcement of low inflation, the party immediately on winning the 1997 election granted operational independence to the Bank of England (Snowdon, 1997).

2.6 *New Keynesians*

The New Keynesians' economy (e.g. G. Mankiw, L. Summers, O. Blanchard, S. Fischer, E. Phelps, G. Akerlof, J. Stiglitz, and D. Romer) was developed in the aftermath of the theoretical crisis of the neo-Keynesians in the 1970s. Their work was primarily devoted toward developing rigorous and convincing microeconomics foundations to explain the phenomena of fixed wages and prices in the short run. In other words, to a great extent, their work was mainly to patch up the theoretical flaws of their 'cousins', the neo-Keynesians. Their models had incorporated propositions such as price-making monopolistic firms, a rational expectations-augmented Phillips curve, both supply and demand shocks as potential sources of instability, and imperfect competition and asymmetric information (Snowdon and Vane 2005).

Their critique on the new classical macroeconomic was strongly focused on the assumption of continuous market clearing, the absence of which represented the hallmark of the Keynesians' economics. Despite their agreement that in the long run inflation is a monetary phenomenon, the new Keynesians argued that within the context of their modified microfoundation, wage and price stickiness in the short run (failure of prices to change quickly to clear the markets) can be justified on grounds like staggered wage and price changes, and small menu costs. The staggering of the wages to quickly adjust, due to factors like long term contracts, may slow the process of general price changes and thus hurdle the process of market clearing. Moreover, the modified microfoundation of the normal price rigidity was one of the recognized contributions of the new Keynesians that was behind the idea of imperfect competition. In imperfectly competitive markets, the presence of small menu costs to price adjustment can generate potential aggregate nominal price rigidity. They are deemed to be barriers or frictions to price adjustments as firms (assumed to be profit maximizers), particularly those operating under low inflation environment, may consider it costly to reset their price continuously in response to each demand shock. On the contrary, under imperfect competition in high inflation conditions, wages and price rigidity as a cause of inertia generating mechanism is assumed to weaken as under such conditions the length of wage contracts significantly shrinks and menu costs do not matter. "Nonetheless, rigidity arguments related to factors such as the overlapping degree of wages contracts may contribute to understanding the short-run dynamics of inflation even in these type of economies, particularly taken together with the notions that expectations may be formed economy-wide, may be forward or backwards-looking, and may be accompanied by a lack of policy credibility" (Aykut K. 2002: P 55).

2.7 *Cost-Push vs. Demand-Pull Approaches to Inflation*

Costs-push theorists generally attribute inflation and disinflation to some nonmonetary, supply-side elements that influence the unit cost and profit markup component of the prices of individual goods (Humphrey, 1998). According to Humphrey (1998), cost-push theorists date back to the writings of Sir James Steuart (1767) in the eighteenth century, Thomas Tooke (of the Banking school in the mid nineteenth century (1844)), and Laurence Laughlin (1896), the first Chairman of the Economics Department of the University of Chicago in the first decade of the last century.

According to Humphrey (1998), Steuart's argument in the context of price level determinations was mainly threefold. Firstly, he suggested that the price level is a non-monetary phenomenon determined by the same forces that determine the individual prices of specific good. These forces are real, and include costs and competition. According to Steuart, increased competition forces firms to reduce their prices just as falling costs lower them. The second proposition of Steuart stated a dichotomy between movements in the money market and the general price level. Steuart had denied any role of money on the determination of the price level, which could mean that prices are real phenomena and totally independent of money balances. His third proposition, which clearly follows from his first two propositions, assumed a causation that runs from prices to money, which is the opposite of the monetarists' argument. With causation running in the opposite direction, Steuart meant to argue that the volume of money adjusts to accommodate/support the real activities at the existing prices. In other word, changes in the stock of money/coins are merely to validate the price changes produced by other means, hence money must be the consequence rather than the cause of these price changes.

David Ricardo, one of the very early classical economists, tried to defy Steuart's view as presented by the antibullionists, particularly when the Bank of England opted for the inconvertible paper currency after the Napoleonic War (Humphrey 1998). Ricardo argued on the grounds that cost-push argument for inflation is misleading as it creates confusion between relative and absolute prices. According to Ricardo's argument, with total output assumed to be fixed, an increase in the relative price of specific goods that requires workers to spend more on such goods would eventually leave them with fewer balances to spend on other goods, whose prices would accordingly fall. Hence, the rise in the relative price of particular goods would be offset by a decrease in the prices of other goods in the market, which in turn would leave the general price level unchanged.

Thomas Tooke, who was one of the prominent leaders of the Banking school in the nineteenth century, was a major advocate for cost-push inflation (Humphrey 1998). He believed in supply shocks and factor cost theories of price determinations. Examples of supply shocks in Tooke's list included harvest failures, changes in tariff rates, import cost variations, and cost reducing technological progress embodied in machines. Examples of cost factors included rents, salaries, wages, and profit. Tooke's theory on the causes of inflation is very much reminiscent of recent theories discussed below that attributed the high and low inflation in the 1970s and 1990s, respectively, to a number of non-monetary, supply-side elements. In his explanation of how cost factors derive product prices, Tooke focused on falling and rising interest rates. He simply argued that falling interest rates deflate prices by lowering capital costs and conversely, rising rates inflate prices by boosting business costs. Such an impact of interest rates on the prices through costs of production is assumed to be independent of the behavior of money. However, Tooke's theory on interest rate and inflation was countered- by Wicksell (1898) in the early decades of the twentieth century. Wicksell stated that by reducing interest rate, the cost of capital-intensive goods would fall and in turn more would be spent on other goods (non-intensive capital goods), the increasing demand of which would eventually produce a compensating rise in their prices leaving the general price level unchanged.

The list of supply shocks that was advanced by Tooke in explaining inflation has been reiterated by the theorists of the Real Business Cycle (RBC) in the early 1980s. The work of the modern new classical theorists (E. Prescott, F. Kydland, C. Plosser, J. Long, A. Stockman, R. Barro) was mainly focused on analyzing the effect of real supply shocks (e.g. productivity shocks, discovery of new source of raw materials, war and labor unrest, changes in the relative prices of food and energy, and natural disasters that could have adverse effects on agricultural output) on aggregate output and it was not explicitly directed to explain changes in the price level or inflation. However, their influential contribution – presenting supply shocks as the main source of aggregate instability - can be implicitly applied to explaining the inflation process. For example, a favorable supply shock in the form of technological progress will enhance productivity, thereby reducing inflationary pressures. By using such a propagation mechanism, one can easily argue that the RBC school gives an implicit support to the supply-side phenomena of inflation as advanced by some theorists of the costs-push school like Tooke.

The third-cited famous proponent of the cost-push inflation, Laurence Laughlin (1896), presented a similar version of his predecessors' ideas in explaining the link between the increase in the relative prices and change in the general price level with extra emphasis on structural factors like trade unions and cartels. Laughlin identified three mechanisms through which costs could raise relative prices and causes inflation. One mechanism was wage-push prices, where he emphasized the role of ratchet effects and unilateral wage-setting by trade unions. The second mechanism was monopoly-administrated pricing that aimed to control prices and prevent active competition. The third mechanism was supply shocks in the form of commodity shortage (e.g. raw materials and crop failures). He argued that commodity shortage can directly increase prices through lower supply and indirectly via their feedback into wage demand, where lower purchasing power because of increased food prices causes workers to demand higher pay, thus leading to higher production costs (Humphrey, 1998).

Laughlin's propositions came under attack in the first quarter of the twentieth century through the writings of Irving Fisher, who aimed to criticize costs-push theories in general. According to Humphrey (1998), Fisher criticized the costs-push theorists on four grounds. First, Fisher argued that these theories confuse changes in relative prices with changes in absolute prices, an argument similar to the one presented earlier by David Ricardo. Fisher’s second contention was based on the quantity identity, where he argued that effects on the price level must be through changes in money stock, velocity of money, or the physical volume of trade. If these variables remain constant in magnitude for a substantial length of time, the general price level will not change. In his third criticism, Fisher analysed the tendency of the costs-push theorists to refer to some 'ad hoc explanations' emphasizing random events and temporary shocks. According to Humphery (1998), Fisher termed such practice "the error of selecting special cases" as in his view those cases/events are short lived and their impact is confined to range of commodities, meaning that they are unable to create a sustained influence on the general price level. The fourth argument of Fisher revealed his reservation/opposition to the costs-push theories' proposed remedies to inflation, such as price and wage controls or income policies. In Fisher's view, a permanent solution to inflation cannot be delivered by income policies if there is an excessive growth of money stock.

Recently, great parts of the arguments of the cost-push theories were implicitly and explicitly cited in number of cases to explain the low and stable inflation during the 1990s. In its annual report of 2006, the Bank of International Settlement (BIS) suggested the direct and indirect effects of globalization as the main causes for the disinflation process during the 1990s. A number of mechanisms were presented by the BIS to explain how globalization lowered inflation. One such mechanism was that opening international markets in factor of productions, goods and services, cheap imports and larger cross-border investment has led to a reduction in the costs of taming inflation rates and keeping them in check, without necessitating contractionary polices and rising unemployment. Similarly, the IMF (World Economic Outlook, 2006) concurred with the view of the BIS by offering further explanation on the mechanism through which globalization could have led to low inflation. As per their view, globalization brought about higher incentives to enhance productivity through technology progress/innovation along with greater price and non-price competition that have resulted in an increase in world aggregate supply and hence reduced pressures on international prices. Another supporting argument for cost-push theories in the context of low inflation in the 1990s was further presented by Rogoff (2006). According to Rogoff, by increased competition, globalization has weakened the power of domestic monopolies and labor, hence 'flattening the long run Phillips curve'. Another further factor in the explanations list stressed the lower import costs stemming from the Asian Financial crisis in 1997-98 that was accompanied by the distress sale of Asian goods and the depreciation of Asian currencies.

As a matter of fact, those recently presented factors presented as causes of the low and stable inflation during the last decade of the twentieth century can be viewed to be an updating of Tooke's list of supply shocks factors mentioned above. However, for the theorists of modern quantity theory, those costs-push arguments can at best explain changes in relative prices; they cannot explain changes in the general price level unless they show how increased costs in one sector of the economy can induce material change in at least one of the determinants of the price level, such as the stock of money, its velocity, and aggregate income (Fisher, 1911). For modern monetarists, obvious explanations for the low inflation of the 1990s may include faster growth of output over lagging money stock and lower expectations of higher future rates of money growth and inflation by the public which in turn might be due to increased credibility of many central banks that had announced a solemn commitment to low inflation targets during the 1990s (Snowdon and Vane, 2005). For monetarists, causation always runs from money to inflation so the latter is 'always and everywhere' a monetary and demand-side phenomenon (Friedman, 1968).

2.8 *Some Variants of the Cost-Push Theories (Structuralists, Neo-Marxian, and Post-Keynesians)*

A major version of the cost-push theories is the structuralists' theory of inflation, which has competed with the monetarists' theory since 1940s. The structuralists essentially relate the inflation process to a special set of structural constraints faced by each economy/country (e.g. equal and unequal income distributions, the relative importance of certain sectors in the economy like the agriculture sector, and balance of payment disequilibrium). In their distributional mechanism, the structuralists assumed that changes in economic structure induce changes in relative prices, which in turn lead to changes in the general price level (Aykut, 2002). According to A. Canavese (1982), the structuralists' theory of inflation is based generally on three important factors: relative prices that change when economic structure changes, downward inflexibility of (some) money prices, and passive money supply. So with the presence of downward inflexibility of some money prices (e.g. wages) and a passive money environment, changes in the relative prices due to changes in the economic structure will result in an inflationary process.

Famous early studies of the structuralists' approach to inflation include those developed by P. Steeten (1962) and W. Baumol (1967) for industrialized economies, and J. Oliver (1964) for the Latin American countries. Moreover, studies have shown that despite similarities in their basic fundamentals and the propagation mechanism, the structuralists' schools in Europe and Latin America differed on the source of the structural change in the economy. While the former school restricts its analysis to structural changes coming from supply shifts, the latter considers structural changes stemming from both demand and supply shifts.

In their analysis of inflation in developing countries, particularly those in Latin America, the structuralists have maintained that certain aspects of the structures of these economies cause aggregate supply to lag chronically behind aggregate demand. For example, in their analysis of Latin American inflation, they argued that the agriculture sector, in which the supply is assumed to be fixed and not particularly price elastic, responds to the monetary and aggregate demand shocks with a lag. An increase on the demand for the nonagricultural (industrial) products will raise wages, thereby leading to an increased demand for agricultural outputs. Due to the rigidity of output (fixed supply or price inelasticity) in the agricultural sector, the incipient demand increase will be forced to increase prices in order to meet the excess demand. The increase in the relative prices of the agricultural sector will lead to higher wage demands in this sector. Increased wages will be passed along into higher prices for nonagricultural products and a cumulative inflationary process is set up. It was the inefficiency of the agricultural sector that originally sparked relative price changes in other sectors and eventually led to inflation (Taylor, 1983).

Another version of the cost-push theories includes that presented by some non-mainstream economists including Marxists, Post Keynesians, and neo-structuralists (Lavoie, 2009). Inflation theories of these groups are broadly based on a similar proposition, in which inflation is considered a supply side phenomena caused by conflicting claims in income distribution. As a result, they generally maintain a similar propagation mechanism that implies changes in relative prices, which in turn set off a persistent inflationary process.

2.9 *Fiscalists' Approach to Inflation*

The fiscalists' theory (*e.g.* M. Woodoford, C. Sims, J. Cochrane, and E. Leeper) of the determination of the general price level was developed during the 1990s. In their literature, they argued that the general price level is essentially a fiscal, rather than monetary phenomenon (McCallum 2003). They consider the sequences of the primary government deficits and surpluses to be the main determinant of the general price level. In their opinion, fiscal shocks affect aggregate demand through the intrusion of the former upon private sector budget constraints. Accordingly, they had viewed the commitment of the monetary authority (central bank) to conduct a rule-based monetary policy as insufficient to ensure a stable and low equilibrium rate of inflation.

According to Carlstrom and Fuerst (2000), the attack of the fiscal theory on the traditional approach (monetary approach) was divided into two forms; the weak-form fiscal theory and the strong-form fiscal theory. The weak-form was originally initiated by Sargent and Wallace (1981) in their celebrated study, '*Some Unpleased Monetarists Arithmetic*'. In this form the fiscal policy was assumed to dominate so that it moves first to independently set its budget and announce all current and future surpluses/deficits, thereby determining the amount of revenue that has to be raised mainly primarily through seignorage (creation of money) as the government is assumed to facing an upper limit constraint on the real stock of government bonds relative to the size of the economy. The monetary policy is then expected to move accordingly by maintaining the necessarily solvency solely through seignorage financing. Therefore, by being forced to create money to avoid any default by the government when any new bonds cannot be issued (and with no help from budget surplus), the monetary policy is left with no option but to tolerate additional inflation. However, although it is very obvious that inflation was tolerated to increase by the growth in money, fiscal policy is considered the ultimate driver for such growth. Hence, the weak form implies the exogenity of fiscal policy and the endogenity of money supply (Carlstrom and Fuerst, 2000). It also implies that commitment to an anti-inflationary monetary policy is sufficient to ensure price stability (Woodford 2001).

The weak form is assumed to be applicable to all non-Ricardian economies, in which the monetary policy is under the pressure of budget deficit and fiscal policy shocks. It is very common to see the presence of non-Ricardian scenario in less developed market compared with their developed counterparts, where it is less likely to obtain seigniorage revenues (Woodford 1998, Bildirici and Ersin, 2005)[30].

However, in developed economies with sophisticated financial markets and an independent central bank, which commit to a specific inflation path and need not accept seigniorage targets imposed by the treasury, the strong form of the fiscal policy is suggested as being the dominant form. The strong-form of the fiscal policy, for which the development is primarily attributed to the fiscalists of the 1990s, assumes the ability of the fiscal policy to induce changes in prices independently of monetary policy. In this form, both the fiscal policy and the monetary policy are assumed to be exogenous and that prices will have to adjust to a level satisfying the government's budget constraint, which link the real value of the debt to the present value of primary surpluses the government will run in the future. Proponents of the fiscal theory view this link as an equilibrium condition. It follows that any imbalance between the real value of the debt and the surpluses would trigger price adjustment in the form of increasing or reducing the nominal debt (Bassetto, 2002).

$$D + S(\pi) = B_0 / P_0 \tag{11}$$

[30] Ricardian regimes is basically those economies where fiscal budget constraint does not influence aggregate demand, and hence no impact on inflation (Woodford 1998).

Equation (11) represent a government budget constraint; where $S(\pi)$ represents the present value of seignorage, D is the present value of future primary budget surplus (deficits is represented with negative sign), B_0 is the accumulated government debt at time zero, and P_0 is the corresponding nominal price level[31]. By assuming fixed money growth (fixed money supply), there would be no future seignorage revenues (the monetary policy is committed to a seignorage path) and subsequently, equation (11) will be reduced to the form given by equation (12):

$$P_0 = B_0 / D \tag{12}$$

Equation (12) implies that the fiscal policy determines the current price level and the path of prices. A change in the fiscal policy (D) changes current prices (P) by changing the path of future inflation. For instance, a rise in the discounted value of future surpluses reduces current prices and future inflation, therefore, the strong-form of the fiscal theory, in which the fiscal policy can affect the price level and the path of inflation independent of any movement in the money stock. A major implication of the strong form is that anti-inflationary monetary policy rules with a low implicit inflation target are not sufficient to ensure price stability as disturbances from fiscal expectations, by the rational economic agents regarding government budget constraint, may prevent such stability from occurring. Accordingly, it is suggested that for the achievement of longer term price stability, monetary policy should be coordinated with fiscal policy (government budget constraint).

2.10 *The New Political Macroeconomic to Inflation*

In traditional economists' approaches, particularly the Keynesians, the policy maker who represents the government had been assumed to act to maximize social welfare. The government was thought, at least generally, to be the 'benevolent social planner', who would always try to pursue economic policies that were in the interests of society. In other words, the government was viewed as being exogenous to the economy, its only interest being steering the economy toward the best possible outcome (Snowdon and Vane, 2005). Killick (1976) clearly summarized in his paper "*The Possibilities of Development Planning*" such policy making processes of the traditional approach:

“Economists have adopted a rational actor model of politics. This would have us see governments as composed of publicly-spirited, knowledgeable, and role-oriented politicians: clear and united in their objectives; choosing those policies which will achieve optimal results for the national interest; willing and able to go beyond a short-term society point of view. Governments are stable, in largely

[31] Please note that I have purposely opted to use very simplified and non-technical analysis to bring very closely the idea of the strong form fiscal theory. However, more comprehensive and technical form can be found in Bassetto, (2002), Carlstrom and Fuerst (2000), McCallum (2003), or Woodford (2000).

undifferentiated societies; wielding a centralized concentration of power and a relatively unquestioned authority; generally capable of achieving the results they desire from a given policy decision.” (Killick, 1976, p: 171).

Further, as per the traditional approach, the relationship between the economist and the politician/policy maker was assumed to be such that the former is expected to offer economic advice based on well structured analysis to the latter, who is expected to follow the unbiased and well-informed advice provided by the former in maximizing societal welfare. However, in reality, studies (*e.g.* Alesina, 1988, Alesina and Roubini, 1997, Drazen, 2000) have shown that different roles are usually taken by the governing politician, particularly in societies that feature the presence of different classes, interest groups, political parties, and voters. In such heterogeneous societies, the policy maker is assumed to be mainly influenced by the forces of those different divisions and the unbiased insights, which should represent the public interest, of his economic advisor will be regarded as secondary. For example, the elected politician will try to take economic decisions that mainly pour into the current and future interests of his/her ruling party. Such an election's opportunity or partisan/ideology based-economic decisions are assumed to contribute toward economic instability through non-optimal use of monetary and fiscal policies (monetary growth, government spending, and taxes). For example, the incumbent government will try to exploit the short run Phillips curve (lowering unemployment on account of higher inflation) in order to win the election, thereby causing a potentially damaging distortion to the economy before and after the election period. Even in the case of a rationally behaving voter, who is assumed to evaluate based on observing outcomes as he lacks information on the competence of the politician, can be persuaded through intended signaling processes by the incumbent government. Another example of politically-generated instability is the attempts of incumbent governments to pursue short sighted policies as reputational considerations are no longer important due to the low probability of being re-elected.

Given these considerations, macroeconomic studies in the last quarter of the twentieth century were further developed to incorporate the influence of the political system into the economy thereby giving rise to the so called 'new political macroeconomics', which is based on some insights of the game theory and the theory of public choice[32]. Particular interests in those studies included, inter alia, understanding the impact of the interaction between the economic and political systems on macroeconomic variables such as inflation, unemployment, and output.

[32] Major contributions include studies by A. Alesina, A. Drazen, D. Hibbs, W. Nordhaus, K. Rogoff, F. Schneider, A. Shleifer, and B. Frey.

It is pertinent to discuss one final theoretical issue related to the causes of inflation; the role of non-economic, political and institutional factors in the creation or acceleration process of inflation. The new literature of political economy has advanced a number of factors in determining the inflation process including political instability, political cycles (e.g. election periods and performance of policy makers), budgetary politics, credibility and reputation, central bank independence, and inequality in income distribution.

It is generally argued that governments in countries with higher political instability (riots, repressions, coups, frequency in transfer of power, etc) tend to face highly inefficient tax systems and rely heavily on inflationary financing (seignorage and trade tax) as compared to democratic systems (Cukierman et al. 1992). Similarly, politically-induced economic cycles during the electoral competition may stimulate an inflationary process. According to the political business cycle model of W. Nordhaus (1975) the incumbent politician, who is concerned about his re-election prospect, will try to exploit the Phillips curve by manipulating monetary or fiscal policy, to create a favorable economic outcome around the election period. As a result, money growth and inflation will go up (lower unemployment and higher GDP growth) in the run up to the election and will come down (rising unemployment and lower GDP) after the election period in order to prepare for the next pre-election stimulation. Such an opportunistic behavioral cycle is assumed to be identical for different governments (the partisan's ideology does not matter), particularly when the chances of being re-elected are perceived to be low.

The political system can also affect the inflation process through fiscal disturbance. It is strongly argued that non-monetary expansionary policy in the form of government spending can also induce monetary ease under a number of circumstances. For example, indirect political pressure on the central bank to service government bonds that were issued to finance government expansionary policy (e.g. for pre-election economic boom), through monetization (printing of money). Increases in taxes to finance government spending can also induce indirect monetary ease by the central bank. Such increases in taxes are assumed to have a reallocation effect in resources between private and public sectors that will create pressure on the central bank to pursue a monetary expansion in order to reduce unemployment (Flemming, 1976).

In the new political economy theory, government and economic agents are seen to be engaged in a complicated dynamic game, under which any monetary or fiscal policy announcement for low inflation is subject to the credibility and reputation of the government (King and Ma, 2001, Snowdon and Vane, 2005). Such emphasis on credibility and reputation issues gained higher importance in the aftermath of the rational expectation revolution as rational economic agents know that, due to low credibility of the government, the announced/promised pre-election policy of low inflation is time-inconsistent, in the sense that it will not be materialized after the election. In the run-up to the election, all parties are assumed to consider it important to announce convergent policies that will appeal to the median voter. As a result, during such periods the party's ideology will be given secondary priority in order to maximize the election prospects. As there is no such mechanism for the voter to hold the elected party to its promises, the party will re-optimize by giving the ideological consideration predominance. Due to such time-inconsistent issues, the rational voter highly values the credibility and reputation of the candidate during the election process. Studies have advanced various courses of actions/arrangement in order to establish credibility or reputation among voters. Some of these arrangements include the independence of the central bank, fixed exchange rate regime, and receiving a seal of approval on the announced policy from an external institution like the IMF[33].

Central bank independence is consistent with the view that inflation is a monetary phenomenon. The presence of such institutional factors is assumed to restrain any inflationary attempts by politicians who are always tempted, if given discretion over monetary policy, to ease money for political ends (e.g. to win election tournament, budgetary payoff through extra tax revenue). Studies had showed that discretionary monetary authority has, in many instances, produced a higher then desirable inflation rate due to reasons such as political pressures to lower unemployment to influence the election process, the partisan effect and motivations related to the financing of deficits. Accordingly, an effective way to control inflation is the assignation of the monetary policy to an independent central bank with autonomous monetary authority that fully respects the value of money. Alesina (1988 and 1989) has found, in an empirical study for industrial countries, a negative relationship between average long term inflation rate and the degree of central bank independence. It should be noted, however, that the presence of an independent central bank does not render an equal influence on inflation across all countries. For example, central bank independence in countries with undeveloped financial markets and unsustainable budget deficits is unlikely to result in an effective counterweight to inflation (Mas 1995).

In recent years, inequality in income distribution had been suggested as being another political factor for inflation. There are a significant number of direct and indirect mechanisms through which inequalities in income distribution can affect inflation. Sachs (1989) attributed the economic situation in Latin American countries (LACs) to the inequality income distribution that creates political

[33] For example, the Labor Party led by Tonay Balir in the UK announced, during the 1997 election, to be counter inflation and to achieve lower unemployment rate at the same time. Such announcement was clearly time-inconsistent as the party was expected to follow the ideology of lower unemployment on the cost of higher inflation post to the election. However, in order to give credibility to its announcement of low inflation, the party immediately on winning the 1997 election granted operational independence to the Bank of England (Snowdon, 1997).

pressures on macroeconomic policies to increase the income of lower groups, thereby rendering weak economic performance due to poor policy decisions. In a similar mechanism, Beetsma and Ploeg (1996) used a median voter model to explain the link between inequality and inflation. They argued that when assets are unequally distributed in a democratic society, the public are more likely to elect a party that represents the interest of the poor people. Such a party is less likely to commit to policies of low inflation as they have more incentives to levy inflation taxes and erode the real value of debt services. Income inequality can also affect inflation through political instability. It is believed that inequality in income distribution can be a major factor for political instability (Alesina 1996), which in turn can lead to higher inflation as confirmed by empirical studies (discussed below).

2.11 *Summarizing Remarks*

Different hypotheses have been advanced by different theories over the last two centuries, as demonstrated above, concerning the creation and acceleration of inflation. Such tremendous efforts reflect how inflation has been a central concern to macroeconomists. However, despite this rich theoretical literature on inflation, the basic determinants of inflation continue to be disputed by economists of different schools.

From the brief survey of the various theories of inflation in the preceding sections, it can be inferred that the theoretical causes of inflation generally fall into four major groups; demand-side factors, supply-side factors (cost-push), inertial factors (built-in inflation), and political-side factors. The first three sources are close to Gordon’s theory (1997) of the 'triangle model of inflation'. The presence of these different factors in explaining the process of inflation lends support to those studies that view inflation as a macroeconomic and institutional phenomenon.

Demand sources of inflation may include nominal factors like money supply or real factors in the form of high demand on goods and low unemployment. These two sources of demand-pull inflation generally represent the view of the two mainstream groups ofeconomists, namely monetarists and Keynesians. Moreover, persisting government deficits have been commonly viewed, particularly among monetarists and new classical economists, as a major demand side cause for inflation. This fiscal view of inflation is more relevant in the context of developing countries, where less efficient tax systems, political instability, and limited access to external borrowing make it easier for government to rely on inflation tax (Cukierman et al. 1992).

Conversely, supply or real shock factors of inflation include inter alia, sudden increase in oil prices, crop failures, extraordinary weather changes, exchange rate movements, import cost variations, and negative productivity shocks. These supply side factors of inflation generally represent the cost-push theory of the non-mainstream economics. It should be noted, however, that both Keynesian and non-mainstream economists generally maintain a similar propagation mechanism, which implies changes in relative price levels that in turn induce continuous increases in the aggregate price level. The third source of inflation, the inertial factors, are induced by elements such as expectations, stickiness of wages, and indexations. These factors are often linked to the price/wage spiral that involves continuous attempts by labor to maintain their real income, followed by employers passing increases in wages to consumers into higher prices as part of a "vicious cycle".

Finally, politics can also, as explained above, be responsible at least in part for inflationary effects, particularly in countries where political institutions are granted discretionary power over the economic decision process. The inflationary process in a number of developing countries represents to great extent this case, where circumstances like inequality in income distribution, political instability, sustained government deficits, partisan politics, and the absence of an independent central bank are common.

3. Empirical Survey on Causes of Inflation

The empirical literature about the causes and dynamics of inflation is vast and rich. Some very important elements that have contributed considerably to the growing empirical field of inflation include the development in the mathematical methods (econometrics and time series techniques) since late 1970s, dramatic improvements in computing technology, and the availability of long data for most countries all over the world. In this section an attempt is made to survey the vast empirical literature on the determinants of inflation. However, the survey will not be focused on one or few determinants of inflation, but will try to selectively cite examples of the empirical studies that have collectively covered in their tests most of the theoretically identified factors of inflation. Moreover, given the nature of the institutional, political, and cultural factors of the developing countries, the survey will be divided into two subsections; the macroeconomic determinants and political and institutional determinants of inflation. Summarizing remarks will form the third subsection.

3.1 *Macroeconomic determinants of inflation*

Most studies have generally tested the effect of one or few explanatory variables of inflation, while only a few studies have examined the influence/effect of larger set of variables. Furthermore, among the theories that have been examined extensively, are the proposition of the modern quantity theory or the role of money in domestic price level.

For example, Darrat and Arize (1990) have used a money demand augmented model to empirically identify the determinants of inflation in 25 countries for the period 1950-1984. From the results of their statistical tests, the authors found that their model was powerful enough to explain the inflation process across all the examined countries. The inflation process was found to be significantly associated with changes in monetary base, real income growth, expected inflation, and expected rate of currency depreciation. From a policy perspective, Darrat and Arize have emphasized that a major implication of their results is a restrictive monetary policy, though facing some difficulties due to long lags, is an important ingredient in any anti-inflation policy. Other earlier cross country studies that have found dominant role for money in influencing domestic price level include McCandless and Weber (1995), Onafowora (1996), and Dwyer and Hafar (1999), among others[34].

Recently, Grauwe and Polan (2005) used cross section and panel analysis to test the propositions of the modern quantity theory of money in 116 countries over the period 1969-1999. They found a strong positive association between inflation and money growth in high inflation countries. However, such a relationship in low inflation countries was found to be weak. According to Grauwe and Polan, their finding implies the usefulness of money stock as a guide in steering policies for price stability in high inflation countries, although not in low-inflation countries. Similarly, Moroney (2002) tested the ability of the modern quantity theory to explain the differences in inflation among 81 countries. Moroney found the quantity theory to offer a complete explanation (coefficient of money is almost one) of inflation in high inflation countries. However, in low inflation nations, the money was reported to explain about only 70 percent of changes in inflation. These findings imply the usefulness of money stock as a guide in steering policies for price stability in high inflation countriesbut not in low inflation countries.

Other studies have found that money forms a secondary role in influencing the domestic price level, and that there are other factors dominating the inflationary process. For example, D. Dhakal and M. Kandil (1993) examined the major determinants of inflation in six developing Asian countries using a quarterly data for the period 1970-1988. They employed a monetarist model adjusted for some external factors, namely the foreign nominal interest rate and the import prices. The authors found that

[34] Much earlier studies that found strong positive association between inflation and money growth include Harberger (1963), Vogel (1974), and Hanson (1985). However, these three studies focused on Latin America Countries (LAC).

inflationary pressures in these countries do not stem primarily from the growth of money stock, as the empirical results showed zero impact of changes in the variable of monetary growth on inflation rate in half of the examined countries. Even the sum of the lagged impact of such variables was less than one in the other half of the sample, where the variable was significant.

Moreover, they found that during the examined period, various variables that influence the public's willingness to hold money were behind the inflationary pressures across the sampled countries. Among these were the foreign nominal interest rates and import prices that were found to have a significant, long-lasting impact on the inflation rates in some of the countries under examination. In their conclusion, they viewed that the kinds and effectiveness of the domestic anti-inflation policies will highly depend on the unique inflationary experience of each country. For example, they emphasized the implementation of effective development plans that expand real income growth in those countries, where real income growth was found to exert a significant dampening impact on inflation. In contrast, they emphasized the use of contractionary monetary policy in those countries, where the growth of money stock exerts a significant positive on inflation.

Furthermore, the role of external factors like import prices and exchange rates on influencing the domestic price level were also reported by many earlier, as well as recent, studies. For example, Hanson (1985) found the local cost of imports in LACs, which are highly dependent on imported inputs, to have significant affect on the inflation in these countries. Similarly, Agenor and Hoffmaister (1997), who used generalized vector techniques in an attempt to identify the inflationary impact of nominal wages in some middle-income countries for the period 1979-1995, found that shocks associated with exchange rate depreciation and money growth play a substantial role in explaining the inflationary pressures across the examined countries. Other studies that reported significant impact from exchange rate to inflation include Goldfajn and Werlang (2000), Mihaljek and Klau (2001), Choudhri and Hakura (2006), and Williams and Adedeji (2007).

In a recent study, Loungani and Swagel (2001) investigated the sources of inflation in 53 countries using the VAR technique with annual data from 1964 to 1998. The authors found that inertial factors play the major role in explaining inflation process in countries with fixed exchange rate regime. However, changes in money growth and exchange rate changes were found to dominate the inflationary process in countries with floating exchange rate regimes. From a policy perspective, Loungani and Swagel suggested that anti-inflationary policy in countries with fixed exchange rate regimes should focus on structural issues such as labor market rigidities and indexation schemes that affect the expectation relationship between past and future inflation. Similarly, countries with floating exchange rate regimes should give higher attention to fiscal imbalances that may lead to higher inflation by triggering higher money growth or a balance of payment crisis forcing exchange rate depreciation.

Very recently, Hassan and Alogeel (2008), based on an error correction method, found foreign prices to be the main factors that drive inflation in the long-run in the Gulf Cooperation Council (GCC) countries, which are highly import dependant, followed by changes in exchange rate. Excess in money supply in these economies was found to influence inflation only in the short–run, and tended to dissipate very quickly. In a contemporaneous study, Guerrieri et al (2008) estimated a structural Philips curve using data on US traded goods. The study's main finding was that the relative price of imports is an important determinant of inflation for traded goods. Specifically, they found that movements in relative import prices associated with changes in foreign competition accounted for over one third of the volatility of goods' price inflation over their sample period (1983-2006).

Relevant to the issue of traditional external factors is the global dimension of inflation. The idea of viewing global factors as significant determinants to domestic prices has developed recently in the literature[35]. In such studies, the inflation process has been found to be partly influenced by some global factors, the role of which is thought to have been increasing since early 1990.

Morimoto et al (2003), investigated the effect of global supply shock on the global disinflationary trend that prevailed since mid 1990s. The authors applied the structural VAR model for seven industrialized, as well as emerging, economies. They found that global supply shocks have put some significant downward pressures on domestic prices in major industrial economies since mid 1990s. According to the authors, global supply shocks were caused by expansion of supply capacity in emerging nations. Moreover, the authors have emphasized direct trade channels from emerging market countries to industrialized markets in explaining the global disinflationary pressure.

In another study by Borio and Filardo (2006), who estimated Phillips curve models for 16 advanced economies, global specific factors were found to be more relevant in explain domestic prices compared to other country specific measures. Specifically, the authors found proxies (*e.g.* global output gap) for global economic slack play very significant role in determining domestic inflation rates.

More recently, Ciccarelli and Mojan (2007) have attempted to show that historically inflation in industrialized economies is global phenomena. In their estimation for 22 OECD countries, they reported that inflation of 22 OECD economies have a common factor that alone accounts for about 70% of their variance. In contrast, very recently and based on a disaggregated study, Monacelli and

[35] Studies on this area are considered the counter part of a an already existing literature that deals with international synchronization of business cycles(*e.g.* Kose et al, 2003).

Sala (2009), found that one international common factor explains around 15% to 30% of the variance of the consumer product inflation rates.

Further, the literature also includes studies that have empirically attempted to investigate the influence of fiscal factors on domestic prices. For example, based on a panel of 133 countries by Fisher et al (2002) found short and long run positive associations between fiscal deficits and inflation in high inflation countries. Similarly, in an earlier study by Cottarelli et al (1998) in a sample of 47 industrial and transition economies during 1993-96, fiscal deficits were found to have significant effect on inflation, particularly in countries where the government securities market is not well developed.

Catao and Terrones (2005) investigated the inflation-deficit relationship using a dynamic panel data technique for 107 countries during the period 1960-2001. Unlike other studies, the authors had modeled inflation as non-linearly related to fiscal deficits, which they scaled using the narrow money rather than GDP. In their results, Catao and Terrones found a strong positive association between deficits and inflation among high inflation and developing countries, but not among low inflation or advanced economies. Their results, indeed, is in contrast with a previous study of Click (1998), who found insignificant role for government budget constraint in determining inflation tax while investigating the determinants of seigniorage in a cross-section study that included around 90 countries, including developing. Other studies that have reported significant fiscal effect on inflation include Alfaro (2005), Hammermann and Flanagan (2007), and Staehr (2008), among many others.

Finally, some evidence have been reported for the significant effect of structural changes on inflation. For example. Staehr (2008), in an attempt to investigate the main drivers of inflation in Central and Eastern Europe, found that capital deepening and high productivity growth in the traded sector formed partly significant drivers of inflation in these countries during 1998-2007. Other studies that have reported significant association between relative productivity differences in traded and non-traded sector and inflation include Lein-Rupprecht et al. (2007), Egert & Podpiera, (2008), and Belke et al. (2009).

3.2 *Political and Institutional determinants of Inflation*

Edwardo and Tabellini (1990) and Cukierman et al. (1992) have equally emphasized, in cross-section studies, the role of political instability and polarization in explaining inflation, particularly in developing counries. Both studies found that inflation tax have a significant positive long term relationship with political variables, and in particular to different measure of political instability. The main implication of these findings is that establishing political institutions that would reduce political instability and promote democracy should be at the forefront in the agenda of policy reform of the developing countries.

Recently, Aisen and Jose Veiga (2005) had confirmed the positive link between political instability and inflation . The authors have employed a modern estimation technique in the form of dynamic panel-data estimation on about 100 countries and over relatively a very long period, 1960-1999. Compared with previous studies, the authors have also introduced alternative and more direct measure of political instability affecting seigniorage and inflation as well as additional explanatory variables accounting for inflation inertia. From the estimated regressions, the authors found that higher degree of political instability generate higher inflation rates and seigniorage. In their conclusions, the authors have suggested that policy makers should be aware that it is essential to reform institutions and create viable mechanisms conducive to long-run price stability. They have also suggested that inflation-stabilization effort should be combined with serious fiscal and political reforms.

Further, other institutional arrangements like central bank independence, exchange rate regime and the degree of openness of the economy have been identified to be significant factors of domestic inflation. For example, Alesina and Summer (1993), found in sample of some developed countries that inflation variability is associated negatively with central bank independence[36]. More recently, Ghosh et al. (1997), in their study for the link between inflation and exchange rate regime, included a proxy for central bank independence in their model and found a significant negative coefficient for such variable. Thus, indicating that higher central bank independence should lead to lower inflation rate.

[36] Similar earlier studies that have found negative association between central bank independence and inflation include Bade and Parkin (1982), Grilli et al (1991), and Cukierman et al (1992).

Similarly, in a very recent study, Carmingnani et al (2008), in their study on the effect of the economic and socio-political environment on the de jure policies, reported very significant and negative association between inflation and central bank independence. Similar to Cukierman et al. (1992), the authors found two ways Granger causality between inflation and central bank independence as proxied by government's turnover. Lower central bank independence leads to higher inflation and at the same time higher inflation encourages processes that make it easier for the incumbent government to influence central bank policies resulting in a quicker central bank turnover.

However, Sturm and Haan (2001) found insignificant association between central bank independence and inflation when other various control variables are included. They also concluded that in those regressions, in which central bank independence is significant, the coefficient of the turnover rate becomes significant only after high inflation countries are added to the sample. Similar results was reported in an earlier study by Campillo and Miron (1996), who investigated the difference in inflation performance across 62 nations during 1973-1994 using OLS[37]. Instead, Campillo and Miron (1996) found more significant role for the degree of openness of an economy and political instability.

The degree of openness of an economy had been propagated in some earlier studies like Romer (1993). Romer (1993) tested the long run commitment of effect of openness on

[37] This finding is totally in contrast to that of Temple (1998). Temple had argued that the findings of earlier cross-section studies of CBI and inflation might have been influenced by limited number of observations in the sample. In a recursive estimation (adding high inflation countries in ascending order) using 49 country sample considered by Campillo and Miron (1998), Temple found the negative association between CBI and Inflation disappear and becomes unclear when high inflation countries are added to the sample. Temple had attributed such results to either bad measures of CBI, particularly those of developing world, or that the relationship between CBI and inflation is non-linear. The former reason had been confirmed recently in studies by Brumm (2002) and Brumm (2006), where a significant negative association between CBI and inflation had been found. Brumm (2002) had as well suggested that the proxies of CBI used by earlier studies (e.g. Campillo and Miron, 1997) might have been measured with error thereby rendering spurious results. Accordingly, Brumm (2002) used an alternative econometric method that took account of such error and found after applying it to the same sample of Campillo and Miron (1997) significant negative relationship between CBI and inflation. In Brumm (2006), Brumm had further tried to prove that such relationship also holds among developing countries. He used a sample of 24 developing countries that were originally used by Cukierman et al. (1992) over the period 1973-1994. By employing covariance structure analysis and using alternative proxies for CBI, Brumm found the theoretical proposition of negative association between CBI and inflation to strongly hold even in a sample confined to developing countries.

inflation using cross-section analyses for 114 countries over the period 1973-1990. He reported negative significant association between inflation and openness, suggesting that in the absence of pre-commitment in monetary policy more open economies will tend to have lower inflation. According to Romer (1993), monetary authority in open economies finds currency fluctuations caused by surprises more painful therefore pursue more restraint than its closed economy counterparts. In a later study, Arellano and Bover (1995), confirmed Romer's argument by reporting that causality runs from openness to lower inflation.
Similarly, in a recent study, Gruben and Mcleod (2004), based on cross country estimation for a panel of five-year averages for inflation and import share during 1971-2000, reported that economies more open to trade tend to have less variable inflation, albeit only in 1990. In contemporaneous study and based on micro data, Chen et al (2004) had further confirmed the link between the degree of trade openness and inflation. They showed, using disaggregated data for EU manufacturing during 1988-2000, that increased openness put downward pressures on sectoral prices by both lowering markups and raising productivity. Further similar results were reported by Lein-Rupprecht et. al (2007) for central and eastern Europe countries.

Very recently, Carmgnani et al. (2008), have reported based on cross country study the negative association between openness and inflation. However, in contrast to Romer's mechanism for restraining the discretionary of the authority, Carmgnani et al. (2008) argued that openness effect inflation through the exchange rate regime channel. Open economies that attempt to attract international capital flow use the pegged exchange regime in order to stabilize expectations.

Further, the effect of the choice of exchange rate regime on the inflation rate has been confirmed by number of other empirical works. For example, Ghosh et al. (1997), found a significant negative association between exchange rate regime in a panel of countries during 1960-1990. Similarly, in a recent study, Alfaro (2005) used a panel of 130 countries from 1973 to 1998 and found fixed exchange rate regime to play significant role in reducing inflation in the short-run. Alfaro (2005) found his finding robust even after controlling for other determinants of inflation and using a de facto exchange regime classification (*e.g.* Rogoff and Reinhart, 2004). Very recent, De Grauwe & Schnabl (2008) reported similar results in South-Eastern and Central European countries even after controlling for other determinants of inflation.Other studies that have reported significant link between the choice of exchange rate regime and inflation rate include Edwards and Magendzo (2003), Husain et al (2005), and Bleaney and Francisco (2007).

Furthermore, corruption has been identified by some studies to play a significant role in determining inflation rates. For example, in a cross section study on 41 from Asia and Latin America, Al-Marhubi (1999) found significant association between corruption and inflation, even when controlling for other institutional and political factors[38]. Al Marhubi used four proxies of corruption and they were all significant and bearing the expected sign, suggesting that, other things given, countries with highly corrupted systems experience high inflation. From a broad policy perspective, Al-Marhubi had concluded that a major implication of his finding is that reforming economic and political institutions to strengthen the rule of law and reduce corruption should be part of the agenda for any meaningful policy reform.

In a more recent study, Braun and Di Tella (2004) tested the link between inflation variability and corruption using yearly data of 75 countries over the period 1982-1994. They found positive significant link between inflation variability and corruption. In their analyses the authors had showed that higher inflation variability leads to higher corruption and lower investment. The authors had suggested indirect effect of inflation on growth through corruption. However, a full causality test between inflation variability and corruption was not part of the authors' work in this paper.

Desai, Olofsgard, and Yousef (2003) found that democracy affects inflation through inequality in income distribution. In a variety of panel-data estimation techniques with more than 100 countries (including developing) over the period 1960-1999, they found that democracy is associated with lower inflation in lower inequality countries but with higher inflation in higher inequality countries. From policy perspective, the authors had suggested that non inflationary redistributive programs (e.g.

[38] According to Al Marhubi (1999), there are number of mechanisms through which corruption may induce inflationary pressures. For example, in an environment with higher corruption, tax evasion and tax collection costs are more likely to rise thereby increasing government reliance on inflation tax. Corruption can also lead to higher inflation tax by encouraging businesses to go underground and by leading to capital flight, which reduces taxable assets and income of those most able to meet government revenue requirements.

progressive taxation) in democratic societies with high inequality should reduce political pressures on inflation.

Similarly, in an early study, Beetsma and Ploeg (1996) found in cross section analysis on 56 countries and over less number of period (1960-1985) similar positive links between inflation and inequality in democratic countries. But, they found such link to disappear in corresponding regressions for non-democratic countries. However, in similar study but with an updated period (1975-1995), Al Marhubi (2000) found that inequality matters for both democratic and non-democratic societies. In his cross section regressions, Al Marhubi included an interaction term of inequality and dummy variable for democratic countries. However, this variable turned out to be statistically insignificant, suggesting that the inequality-inflation link holds for democracies and non-democracies.

3.3 *Summarizing Remarks*

The empirical studies in the two preceding subsections have generally confirmed to some extent most of the determinants of inflation as proposed by the theoretical literature in section two of this chapter. More specifically, the results of the empirical studies had showed that inflation is generally influenced by a mixture of variables that stem from the four categories of inflation determinants identified in the theoretical literature[39]. Such results suggests that any study that attempts an empirical analyzes of the causes of inflation should consider to include variables that represent factors from the four categories of determinants of inflation in order for the estimated model to adequately represent the real inflation process[40]. Finally, the results of the empirical studies also suggest that in reality, the inflation process is dynamic and shocks to prices can be precipitated by different types of factors. In other word, inflation can be caused simultaneously by more than one factor stemming from the above identified four categories of determinants of inflation.

[39] The contrasting results between some of the empirical studies with the regard to the significance and direction of relationship between inflation and other macroeconomic, political, and institutional variables are primarily attributed to some econometric issues; e.g. choice of estimation method, specification of the independent variables in the model, the potential bias due to the joint endogeneity of some variables, etc (Staehr, 2008).

[40] Nonetheless, the selection of the independent variables should not be arbitrary. In other word, the independent variables from the four categories of inflation determinants should be based on the structure and economic conditions of the examined country/s.

4. Pass-through of exchange rate

Exchange rate pass through (hereafter ERPT) represents a link between exchange rates and internationally traded goods. It is defined as "the degree to which exchange rate changes are reflected in the destination currency prices of traded goods" (Menon, 1995, p: 197)[41][42]. The interests to study and measure the ERPT began to grow following the move from fixed to floating exchange rates. As a matter of fact, some early studies (Friedman, 1953 and Johnson, 1969) have argued that flexible exchange rate are useful for international price adjustments. In these studies, flexible exchange rates were assumed to have the ability to improve trade balances by simply delivering relative price adjustment between foreign and domestically produced goods. Accordingly, after the collapse of the Bretton Woods system, trading nations switched to the option of flexible exchange rates on the hope to bring their currencies back to equilibrium and to eventually improve their trade balances (Engel, 2002).

However, as trade balances in major trading nations began to show some resilience to changes in exchange rates, the initial confidence on flexible exchange rates for external adjustment started to decrease (Menon, 1995). Many studies started to take place in order to understand the adjustment puzzle. Great number of these studies looked at the slow or incomplete pass through from exchange rates to prices since it is believed that if there is no effect from exchange rates on prices that are paid by demanders of goods, then the use of any exchange rate based adjustments to improve the trade balance may be rendered less effective. In fact, the argument for flexible exchange rate is based on one very important premise that assumes a complete or substantial pass through of exchange rate to the buyers of the goods (Engel 2002, Bache 2006). So if ERPT is partial or incomplete then depreciation (appreciation) in the destination market currency would not imply much increase (decrease) in the prices of imported goods paid for by consumers. As a result, that would also imply a weak case for flexible exchange rate and a fixed exchange rate might be optimal (Devereux and Engel, 2003)[43].

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[41] Studies with comprehensive discussions in ERPT include Kahn (1987), Dornbusch (1987), Menon (1995), and Goldberg and Knetter (1996).

[42] Exchange rate pass-through is also generally used to refer to the effects of changes in exchange rate on import and export prices, consumer prices, investment, and trade volume. However, the primary focus in the literature has been on the effects on import and export prices because on one hand, this is a natural ground for studying the pricing practices of firms, and on the other, a reaction by import-export prices to change in exchange rate is normally a pre-requisite before there is any effects on consumer prices, investment, or trade volumes (Darvas, 2001).

[43] Devereux and Engel (2003) has provided a case for fixed exchange rates by exhibiting a model in which changes in nominal exchange rates do not, in the short run, have any effects in consumer prices (nominal or real).

The research in the pass-through relationship have been enhanced particularly after the muted response of the US import prises to the large swings in the US dollar during 1980s and the failure of inflation rates in industrial countries to accelerate after a major devaluation in the currencies of these countries in 1992 (Bache 2006, Frankel et al. 2005). More recently, the low response of inflation rates in many of the East Asian countries after the financial crises in 1997-98 and in other developing countries such as Mexico (1994) and Argentina (2001) have further led to additional contribution in the literature of pass-through[44]. In fact, the theoretical literature based on the small open economy models has predicted complete, or close to complete, pass-through of exchange rate on domestic prices of less developed countries. However, the low responses of consumer price indices of the developing countries that experienced large devaluations during the 1990s was a totally a surprise to most observers (Frankel et al, 2005). That has sparked number of studies, especially empirical ones, to shift part of the attention in the analysis of the pass-through relationship to less developed countries, as the great part of the earlier studies were focused on industrial countries.

Furthermore, early literature on the exchange rate pass-through was based on microeconomic foundation that evolved mainly during the 1980s (Bache, 2006). The large subset of the early literature have focused on the analyses of the ERPT at disaggregated micro level (industry level) as it is more appropriate to precisely isolate the effect of exchange rate on prices of the products (Ghosh and Rajan, 2007). Nonetheless, ERPT is also more often analysed at the aggregated macro level like analysing the effect of ERPT into consumer price index, which is more relevant to monetary policy makers. It is this later effect that is the focus of the following sections of this chapter.

4.1 Theoretical Background on the Link between Exchange Rates and Domestic Prices

The link between exchange rate and prices, more generally, is dated back to the studies of scholars of the Salamanca School in Spain in the fifteens and sixteenth centuries. However, in the first quarter of the last century, particularly after World War one, the relationship between exchange rates and relative price levels was resurrected and promoted by the influential writings of Gustav Cassel (1921,1922) in the form of the so called purchasing power parity (hereafter PPP) theory (Rogoff, (1996), Taylor (2003), Taylor and Taylor (2004)). Cassel had proposed the PPP as a guide for the industrial countries to reset their gold parity when the war ended[45].

[44]With regard the East Asian financial crises, an exceptional case was Indonesia, for which the inflation rate had showed relatively very significant response to the depreciation of its currency, the Rupiah (Ito et al. 2005).

[45] For historical as well as comprehensive literature survey: Dornbusch (1987), Rogoff (1996), A. Taylor and M. Taylor (2004), and MacDonald (2007).

In its simplest form, the PPP theory suggests that the nominal exchange rate between two different currencies will adjust to equate the aggregate price levels of the countries of these currencies. In another word, both the domestic and foreign currencies will have equal purchasing power when they are converted into one common currency. Expressed in mathematical form, the PPP theory is

$$P = SP^* \tag{13}$$

Where P is the domestic price level, S is the bilateral nominal exchange rate, and P^* is the foreign price level. Equation 13 represents the absolute form of the PPP theory that has its foundation from the law of one price (hereafter LOOP). Abstracting from any impediments to international trade such as transportation costs, taxes, and tariff, the LOOP states that the price of any particular homogenous good that is traded on world market should be the same, when converted at the market exchange rate (McDonald, 2007). The mechanism that forces the LOOP condition is the competitive arbitrage activities at individual level. A major implication of the absolute PPP theory is that the real exchange rate (hereafter RER)-the nominal exchange rate adjusted for the difference in the national price levels-should be constant, however, this not true for any real and nominal exchange rate comparison (McDonald, 2007)[46]. Furthermore, there is one very important condition, under which the law of one price generalize to yield the PPP between domestic and foreign currencies. The price indices of the domestic and foreign countries should include the same goods with the same weighting scheme so that a common market basket of goods is measured (Rogoff (1996), Pakko and Pollard 1996, McDonald 2007). Such condition is clearly restrictive as different countries may have different weighting schemes-due to difference in consumption-, and different base years. Furthermore, the LOOP assumes perfect competition, no capital flows, and no impediment to trade in the sense that there are costless transportation, distribution, and resale (Goldberg and Knetter 1996, McDonald, 2007). However, these conditions are clearly unlikely to hold in practice.

Given the difficulties to construct a common market basket as a measure of national price levels across countries and the other restricted assumptions of the LOOP, a weaker version of the PPP theory known as the relative PPP is often considered. The relative PPP theory states that differences in the national price levels, Inflation rates, between two countries will be adjusted by changes in exchanges rates. In other word, relative PPP states that changes in price levels will be related to changes in exchange rates (Pakko and Pollard, 1996). It can also be interpreted to indicate that economies with relatively higher

[46] In mathematical form, RER = $\dfrac{SP^*}{P}$. Accordingly, by assuming that that the absolute PPP theory holds, then RER = 1, or the log of RER should equal zero: The formula (McDonald, 2007).

inflation rates will experience a depreciating currency (McDonald, 2007). Expressed in mathematical form, the relative PPP theory is:

$$\%\Delta S = \%\Delta P - \%\Delta P^{*} \qquad (14)$$

Where Δ represents changes. From equation 14, it is clear that the relative PPP theory is less restrictive then the absolute version as it simply relates percentage changes in exchanges rate between two countries to the difference in their inflation rates. If for example, inflation in country A increased by 6% while inflation in country B increased by only 4%, then according to the relative PPP theory the currency of A will depreciate by 2% to offset the inflation differentials between the two countries. The primary requirement for the relative PPP theory to hold is that the spread/difference between the inflation differential and the changes in exchange rate should equal zero or at least tend to centre zero (Pakko and Pollard, 1996). In the context of ERPT, the validity of PPP means any changes in exchanges rates will translate into proportional movements in domestic price level. In other word, PPP theory assumes complete pass-through from changes in exchange rate to domestic price level. Accordingly, incomplete pass-through will reflect deviation from PPP. Nonetheless, complete pass-through can occur even though the LOOP fails. The failure of the LOOP need to invalidate only the absolute PPP, but incomplete pass-through will invalidate both variants (absolute and relative PPP) (Frankel et al, 2005).

5. Factors affecting the extent of ERPT into Domestic prices

5.1 *Microeconomic Determinants of ERPT*

A major body in the literature of exchange rate and prices have looked at the slow or incomplete pass-through of exchange rate to domestic prices. In reality, ERPT into domestic prices is found to be incomplete as in many cases prices were found not fully adjusting to changes in exchange rates or inflation rates were not showing similar movements in exchange rates. Early traditional analysis of exchange rate pass-through applied supply-demand analysis, and concluded that the impact of exchange rate change depend on elasticities of supply and demand of imports (Venables, 1990). The elasticities approach lies on the assumptions of perfectly competitive market and complete pass-through for small open economies and incomplete pass-through for large closed economies (Venables 1990, Menon 1995, Hahn 2003). However, since the modern industries are typically imperfectly competitive and given the profound recent evidences on less than 100 percent ERPT, the elasticities approach was proved to be incapable of addressing the pass-through relationship.

Subsequent development in the literature that was based on imperfect competition draws from the industrial organization literature and focuses on the link between the ERPT and industry characteristics such as market structure and the nature of competition. The applied models are partial in equilibrium as they focus on the reaction of prices to exogenous movement in the nominal exchange rate (Bache, 2006).

Under imperfect competition, firms will no longer be operating at marginal costs; instead they will be able to earn some margins above normal profits even in the long-run (Menon, 1995). The economic theory of price discrimination states that firms will be able to maximize their profits by varying their prices across markets in accordance with the elasticity of demand for a product (Pakko and Pollard, 1996). Firms can vary their prices or charge different prices by normally adjusting their margins; that is “pricing to market” (PTM). One way, in which firms PTM is by limiting the ERPT into domestic prices of their customers. In its attempt to maintain market share and avoid long run losses (due for example to an appreciation of its own currency), a firm will price to market by holding its prices constant and simply adjusting its mark-up to offset the changes in exchange rates[47].

By assuming imperfect competition and introducing the profit margin into the aggregate equation of the LOOP that had helped to explain the short run variations in the pass-through of exchange rate into import prices. Under the condition of imperfect competition, the augmented equation of the LOOP is:

$$P = S \times (C_f + M_f) \tag{15}$$

Where C_f and M_f represent the marginal cost and markup, respectively. In fact C_f and M_f together represent the foreign price (P^*) of the traded good. The markup M_f is assumed to be the key link between exchange rate and the price of the traded good (Mann, 1986). It is also often interpreted as an indicator of changes in the competitive positions facing foreign exporter in the destination market (Campa and Minguez, 2005). Equation (15) states that the domestic price of the traded good equal the marginal cost plus the profit margin/markup times the exchange rate. If the marginal cost is assumed constant, then the profit maximizing firm will react to changes in exchange rates by simply adjusting its markup and keeping prices unchanged.

[47] It is originally Krugman (1987) who dubbed the exchange rate induced mark-up adjustment as pricing to market.

The literature has advanced number of microeconomic factors that could affect the variations in mark-up over marginal cost in response to changes in exchange rates. These factors are primarily observed from market structures of the individual industries that deviate from perfect competition (Menon, 1995). They can be "viewed as forces that come into play to determine the price-setting power of firms and will affect the leverage available to them in responding to exchange rate changes" (Menon, 1995, p: 200). Dornbusch (1987) in his seminal contribution had identified number of factors including the degree of market integration or segmentation, the degree of substitutability between the domestic and imported goods (determined by the degree of product differentiation)[48], and the market structure.

For example, the lower the degree of market integration and the degree of substitutability the higher will be the market powers of firms that will enable them to set different mark-ups and accordingly different prices between markets for identical goods[49]. In explaining the effect of market structure and strategic interaction among suppliers, Dornbusch (1987) had considered the case of a Cournot industry of domestic and foreign firms that supply a homogenous product in the domestic market. He showed that the degree of ERPT will be less, the fewer foreign firms there are relative to domestic ones and the fewer firms there are in total (less competitive is the industry).

On the other hand, the 'hysteresis models' illustrates the importance of dynamic supply-side effects. Under these models, pass-through of exchange rate into import prices is assumed to be influenced by the irretrievable sunk costs associated with entry-exit decisions in the world markets. The presence of such kind of costs is assumed to introduce some frictions (making arbitrage costly) in the market and

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[48] Integrated market "is one in which geography and /or nationality do not have systematic effects on transaction prices for otherwise identical products"(Goldberg and Knetter, 1996, P: 3). In other world, if firms are unable to discriminate between countries (price-marginal costs is the same). On the other hand, segmented market is one, in which "the location of the buyers and sellers influences the terms of the transaction in a substantial way (e.g., by more than the marginal cost of physically moving the good from one location to another) (Goldberg and Knetter, 1996, P: 3-4). In segmented markets firms are charging different mark-ups, so they are price discriminating. Two commonly cited examples of integrated markets and segmented markets are the markets of Gold and Autos, respectively. In their extensive discussion of market integration and segmentation, Goldberg and Knetter (1996) have generally conclude that the pass through of exchange rate to domestic prices is lower in more segmented markets, as in such markets firms are more able to engage in third degree discrimination.

[49] Incomplete pass-through cannot always be adduced against market integration. For example, Kreinin (1977) had attributed incomplete pass-through to reasons like incomplete adjustments during the sample periods and the ability of the importer to influence the world price due to his size in the market. This was also confirmed earlier by Branson (1972).

accordingly may make small or temporary changes in exchange rate to have no effect on import prices. Moreover, ERPT is expected to be incomplete due to the 'hysteresis effect', whereby temporary exchange rate changes have permanent effects on import volumes (Venables, 1990). When appreciation causes new firms to enter the market, these new firms will not be able to exit the market easily when the appreciation is reserved. The sunk costs that have been invested by those new firms will deter them from leaving, thus resulting in a change in the market structure as there will be more firms, which in turn leads to higher volume of imports and eventually lower prices, assuming aggregate demand did not change (Lafleche, 1996).

Menon (1996) emphasized some other institutional factors that are assumed to affect the pass-through relationship. These include the effects of intra-firm pricing policies by multinational corporations (MNCs) and the effects of non-tariff barriers (NTB) (Menon, 1995). MNCs actively employ intra-firm pricing policies in order to offset the full transmission of exchange rate changes to selling prices in individual markets. Such practice can help the subsidiaries of MNCs to maintain their market share following large exchange rate depreciation in domestic markets. Furthermore, non-tariff barriers in the form of quantity restrictions are assumed to play an important role in preventing a full pass through to feed into domestic prices. Bhagwati (1988) and Branson (1989) have argued that the increase in NTB in the presence of a depreciating currency can limit the pass-through from changes in exchange rates to import prices. According to Branson (1989), the premium on restricted imported goods would fall first as the currency depreciates, thus leaving less effect into prices.

Furthermore, the above advanced factors are assumed to affect the pass-through relationship mainly on the long run. Menon (1994) had presented other factors to help explain the short-run variations in the pass-through relationship observed in the macroeconomic data. These factors include menu costs, costs of changing supply, the dynamics of demand response to price changes, payment lags, hedging techniques, and currency denomination of trade contracts.

Pricing decisions by firms are generally influenced by costs associated with changing prices[50]. Given such costs, firms are expected to absorb any transitory variations in exchange rate in their margins and respond to variations that are perceived more permanent. Similarly, costs associated with changing supply in the foreign market influence firms' decision to lower prices and consequently alter their supply patterns. Prices are also more likely to fall gradually in response to a currency appreciation as it takes time for firms to expand its supply capacity. As such, due to the presence of these supply-side factors, movements of exchange rates perceived as being transitory will be ignored (Menon, 1994).

[50] These costs include collection and processing of new information, the associated costs with changing posted prices and menu costs. The influence of menu costs were also emphasized by Giovannini (1988).

Generally, customers are more likely to respond with some lags to changes in the competitive situations (lower prices). This is due to many factors such as slow diffusion of information about prices, low reliability on new sellers, loyalty to traditional suppliers, and costs associated with switching suppliers. Similarly, lags also exist in the payment process. Due to the lead time involved during the order-payment period, prices may not reflect the current exchange rates but those that prevailed in the past. Accordingly, delayed customers reaction to price changes and payment lags are assumed to affect the pass-through relationship in the short run (Menon, 1994).

Firms also enter into hedging contracts (forward exchange rate cover) in order to eliminate any potential losses from fluctuations in exchange rates. In such case, payment by importers will not reflect current exchange rate, but those that prevailed in the past. As such, to the extent that hedging contracts are made, the pass-through relationship in the short-run is going to be affected. Moreover, the currency in which import contracts are dominated is also assumed to play a significant role in affecting the pass-through in the short-run. If contracts are dominated in the importer's currency, they will not be affected by changes in exchange rates as importers will not have to exchange a currency to make payment. Consequently, there will be some lags in the reaction of prices to movements in exchange rates as prices will not change until the next contract is negotiated (Menon, 1994). Hence, ERPT into import prices will be incomplete[51][52].

5.2 *Macroeconomic Determinants of the ERPT*

Generally, the question of whether macroeconomic factors can influence pass-through from exchange rate to domestic prices is relatively recent. This development is drawn from the new open economy macroeconomic models (NOEM) that introduced the nominal rigidities and market imperfections into dynamic general-equilibrium, open economy model with well specified microfoundations (Bailliu and Fujii, 2004).

According to the NOEM literature that is based on studies like Obstfeld and Rogoff (1995), Betts and Devereux (1996), and Devereux *et al*. (2003), the extent of pass-through depends on the pricing strategies used by firms. Under producer currency pricing (PCP), where domestic nominal prices are fixed in producers' currencies, consumers' prices would be expected to show a one to one change with

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[51] The ability for greater hedging of foreign currency and to set prices in importer's currency can as well imply a smaller long-run pass-through of exchange rate changes to import.

[52] According to Hegji (2003) the pass-through from exchange rate to consumer prices can also be low if the production of goods takes several stages in different countries, cross-border production. In such case, the final goods would constitute costs in different currencies that may not move together and hence can result in low pass-through.

changes in exchange rates (this case is in line with the traditional open-economy macromodels such as Mundell-Fleming and with the recent Keynesian small open economy models). However, under local currency pricing (LCP), where domestic nominal prices are set in advance in consumers' currencies, changes in exchange rates are not expected to exert any effect on consumer prices in the short run.

In other related models (e.g. Bacchetta and Van Wincoop, 2005), the economy is assumed to be characterized with different pricing strategies; foreign exporters follow PCP and domestic firms follow LCP (due for example to competition from other local producers). Under such mix of pricing strategies the aggregate degree of pass-through is assumed to be partial in the short-run, thus lending further support to some existing evidence that suggest that the pass-through differs by industry.

In another related approach by Obstfeld (2001), exchange rate changes are assumed to results in 'expenditure switching effect'[53], whereby substitution between imported and locally produced products is expected to take place at the level of local producers only. As the exchange rate changes (depreciation), local producers are expected to switch from imported intermediate goods to locally produced alternative[54]. In this model, intermediate imported goods are priced in foreign currencies and final consumers' goods are priced in consumers' domestic currencies. Accordingly, complete pass through is assumed at the level of intermediate goods producers, but zero pass through to consumer prices. However, a major objective of this kind of models is to show that despite the zero response in consumer prices, the economy is not completely shield from changes in exchange rate as such changes have influenced an expenditure switching effect at the level of local producers (Engel, 2002).

Generally, there are number of factors that condition the choice of optimal price-setting currency such as the domestic monetary policy (Devereux and Engel, 2002), the exporting firm's market share in the foreign market (Bacchetta and Van Wincoop, 2005) and the degree of substitutability between foreign and domestic goods (Goldberg and Tille, 2005). Furthermore, in order to allow for limited but non-zero pass-through, subsequent studies have assumed that import prices are sticky in local currencies. In another word, import prices are not completely predetermined but take time to adjust (Bailliu and Bouakez, 2004). Such sluggishness in price adjustment had been explained on account of factors like explicit costs of changing prices as discussed earlier.

[53] Refer to the change in the composition of demand resulting from movement in relative international prices induced by changes in exchange rates (Bailliu and Bouakez, 2004).

[54] In this model, consumers cannot differentiate between local and imported sources of inputs.

Further, the NOEM literature has also emphasized a link between the pass-through and the inflationary environment in a country. This link is based on the seminal contribution of Taylor (2000), who emphasizes the importance of monetary environment on determining the extent of ERPT. Taylor (2000) explained the relationship between inflation and pass-through in a microeconomic model with staggered price setting and monopolistic competition. According to Taylor (2000), firms, which normally set prices in advance for several periods, react to changes in costs (either as a results of depreciation or some other costs) only if these changes are perceived to be of persistent nature. Countries with high average inflation tend to have more persistent costs. As a result, the extent of pass-through tends to increase in high inflation environment. Therefore, a more stable regime with low inflation is going to be characterised with a relatively lower rate of pass-through, while the high inflation regime would tend to reverse the effects.

Taylor’s study has sparked a further theoretical and empirical studies to show how a low inflation environment can lead to lower degree of pass-through. Emphasized mechanisms in this regard include a decline in the expected persistence of cost and price changes (*e.g.*Choudhri and Hakura, 2006), a fall in the frequency of price changes (*e.g.* Devereux and Yetman, 2002), and an increase in the prevalence of LCP (*e.g.* Devereux et al, 2003).

Other macroeconomic factors that may affect firms' pricing strategy and the corresponding ERPT include the uncertainty about the nature of depreciation (duration) of exchange rate fluctuations, the volatility of exchange rate and aggregate demand, and the business cycles (Mann, 1986). ERPT tends to be higher when changes in exchange rates are perceived to be more of persistent nature as firms are more likely to change prices than adjust profit margins. In contrast, ERPT is assumed to be low under greater volatility of exchange rates and aggregate demand as in such circumstance firms are expected to be more wary of changing prices and more willing to adjust profit margins (McCarthy, 2000). According to Froot and Klemperer (1989), Krugman (1989), and Taylor (2000), firms are less likely to pass a given exchange rate change to import prices in an environment where such changes are common and transitory. Business cycles are also assumed to affect the extent of ERPT. For example firms are expected to be more willing to change prices rather than adjusting profit margin during a demand boom. In contrast, in case of excess supply in the economy, it is less likely for firms to increase their prices under such an environment (Bailliu and Bouakez, 2004). Moreover, in a multiple shock scenario like currency depreciation and a simultaneous demand boom, the pass-through is expected to be smaller (Mann 1986).

The extent of ERPT is also assumed to be influenced by the degree of openness of an economy. According to Romer (1991) the degree of openness of a country is assumed to have a negative impact on its inflation as openness can ensure the availability of goods and services at internationally competitive prices. However, the impact from openness to pass-through is hypothesised to be positive. In fact there should be no contradiction between the two hypotheses as the later hypothesis means in other word that the impact on inflation from depreciation of exchange rate is stronger in a more open economy (Amitrano et al 1997).

Furthermore, the degree of trade integration and changes in relative productivities across countries had been suggested by Gust et al (2010) to pose significant influence on the extent of pass-through. According to their model, the firm's pricing decision depends not only on its marginal cost but also the prices of its competitors. As a result, firms do not want their prices to deviate much from their competitors, and because of that they find it optimal to vary its mark-up more and their prices less in response to an exchange rate movement. Lower trade costs due to increasing trade integration and higher productivity induce domestic producer to lower their mark-ups in response to the decline in the prices of foreign exporters, thus leading to fall in the average mark-up across all producers, and eventually lower pass-through. In summary, the proposition of Gust et al (2010) is that higher trade integration lowers the market power of firms, thus squeezing their profit margins and resulting in lower pass-through.

Generally, the presence of various factors, as suggested by the theoretical and empirical literatures, indicate that there is no consensus on the determinants of ERPT, and that the micro as well as the macroeconomic sides in an economy are important in influencing the extent of the pass-through and its behaviour over time.

6. Asymmetry in ERPT

The existing literature suggests that the extent of pass-through is asymmetric and depends on the direction of the change (depreciation or appreciation) as well as on the size of the change. The economic theories have identified various circumstances that could generate asymmetric exchange rate pass-through.

Capacity constraints: According to Knetter (1994), if the foreign exporter is facing binding quantity constraints in distribution net works, then an appreciation of the importing nation's currency may lead to lower pass-through than depreciation. As the capacity constraint limits expansion of sales, they discourage the lowering of export price that an appreciation of the importing market's currency might normally induce. On the other hand, capacity constraint does not have an effect on the increase of import price that depreciation would normally induce. The import price in the destination market could still rise even if the foreign exporter attempted to absorb the impact of depreciation by adjusting its profit margin. Thus, the extent of pass-through is higher for depreciation than appreciation.

Market share: If the foreign exporter has some market share objective, then an appreciation in the currency of the destination market might cause higher pass-through than depreciation. Depreciation in the currency of the importing country will cause the foreign exporter to offset the potential price increase, by reducing their mark-up, to keep the importing nation's import price stable. However, in the case of appreciation, exports in the destination nation will become cheaper and will create incentive for the exporting firms to either maintain their prices or to reduce them in order to increase their market, hence, resulting in higher ERPT (Pollard and Coughlin, 2003).

Production Switching: Input switching by the foreign exporter provides another asymmetry in pass-through. An appreciation in the importing country's currency will cause the foreign exporter to use domestic inputs, and the pass-through will depend solely on the elasticity of the mark-up. In the case of depreciation, foreign exporter uses inputs from currency depreciating currency, and the pass-through is zero (Webber, 2000).

Menu costs: Foreign exporter also show asymmetric response to the size of the change in the exchange rate due to conditions like the presence of menu costs and the type of price invoicing followed. Given the fact that menu costs are like fixed costs, firms are expected to adjust prices only if the change in exchange rate is above a threshold. When the invoice currency is the foreign exporter's currency, a small change in exchange rate does not make it worthwhile for the exporter to alter the price of its product in its own currency due to the menu costs. Hence, a small change in exchange rate does not impact the invoice price of imports in foreign currency, leading to a change in import prices in the domestic market of the importing country to the extent of the change in exchange rate. However, if there is a large change in the exchange rate, given the menu costs, it becomes worthwhile for the foreign exporter to change the invoice price in its own currency. By doing so, the foreign exporter absorbs part of the change in the domestic price of the importing market that resulted from large change in exchange rate. Therefore, when the invoice currency is the foreign exporter's currency, the pass-through is higher when exchange rate changes are small (Pollard and Coughlin, 2003).

Furthermore, if the invoice currency is the importing country's currency, a small exchange rate change will also have little effect on the invoice price due to the menu costs. Thus, there will be little or zero pass-through in the invoice price of the importing country's currency. However, the price received by the exporter in its own currency will vary to the extent of the change in exchange rate. In the case of a large exchange rate change, the foreign exporter will alter the invoice price in the importing country's currency in order to maintain their profit, thus leading to higher pass-through (Pollard and Coughlin, 2003).

Number of empirical studies has confirmed the presence of asymmetry in the impact of exchange rate changes in domestic prices. For example, Mann(1986) who examined the pass-through in US using aggregate data, have reported higher pass-through during the dollar's appreciation than during the dollar's depreciation, though the difference was statistically insignificant[55]. Likewise, Khundrakpam (2007), in his pass-through study for India, has found higher pass-through for appreciation than depreciation. In contrary, in another aggregate data-based study for seven Asian countries, Webber (2000) found higher pass-through during depreciation than the period of appreciation. Higher pass-through during depreciation was also found by Dobrynskaya and Levando (2005) in their study for Russia.

Studies at the industry level like Goldberg (1995) for the US automobile industry, Kadiyali (1997) for the US imports of photographic films, and Olivei (2002) for 34 US import industry, have reported higher pass-through for depreciation than appreciation. In another study for US industries, Pollard and Coughlin (2004) found asymmetry in pass-through in half of the 30 industries considered, with the direction of the asymmetry varies across industries[56]. In a range of industries across a sample of European countries, Gil-Pareja (2000) found that the degree and direction of asymmetry varied across industries and countries.

Studies with respect to asymmetry based on the size of change in exchange rate include Ohno (1989) who found the Japanese export prices to vary more with large exchange rate changes than small. In their study for 30 US industries, Pollard and Coughlin (2004) have found that most of the firms adjust their prices when there are large exchange rate changes. In contrast, Khundrakpam (2007) found higher pass-through for small than large exchange rate changes in India.

7. Exchange Rate and Inflation Rate

Apart from its implication for external sector, financial stability, and the functioning of foreign exchange markets, exchange rate fluctuations have as well some implications for welfare of the society. To the extent that changes in exchange rate are passed on to domestic prices, changes in exchange rates are expected to affect inflation rate. The assumed link between changes in exchange rates and inflation rate, under the PPP theory, implies that the devaluation comes with important costs

[55] However, in their studies of the US, Lawrence (1990) and Marazzi et al (2005) have found no such asymmetry.

[56] Marazzi et al (2005), however, found symmetrical effect with respect to the size of the change in exchange rate.

that necessarily must be factored into the monetary policy. These costs normally come in the form of higher inflationary pressures as depreciating exchange rates would tend to raise prices, regardless of the stance of the macroeconomic policy (Kahn, 1987)[57]. Accordingly, the exchange rate could be potentially important under any policy regime that to some extent concerns about inflation, but it is likely to be of particular relevance when monetary policy is focused on controlling inflation (Lafleche 1996, Ho McCauley 2003).

7.1 Direct Effect on Inflation

Changes in exchange rates can generally affect inflation rate directly and indirectly (figure 1). The importance of both of these channels is assumed to increase with an increase in the openness of the economy (Hufner and Schroder, 2002). The direct channel operates through the external sector, specifically through the relative share of imports in the consumer basket (Lafleche, 1996). Exchange rate depreciation will raise the prices of imported final goods. As producers and importers raise their prices in line with the increase in imports, the depreciation will eventually get translated into producers and consumers prices, which in turn may lead into higher inflation.

7.2 Indirect Effect on Inflation

On the other hand, the indirect effect of ERPT can operates through different channels like changes in the composition of demand or in the level of aggregate demand and wages, and inflation expectations (Lafleche 1996, Taylor 2000, Ho McCauley 2003). The channel through inflation expectations is originally suggested, as explained earlier in section 5.2, in the hypothesis of Taylor (2000), according to which the pass-through is highest when changes in exchange rate are perceived to be of persistent nature and prices adjust because of the expectations of the public.

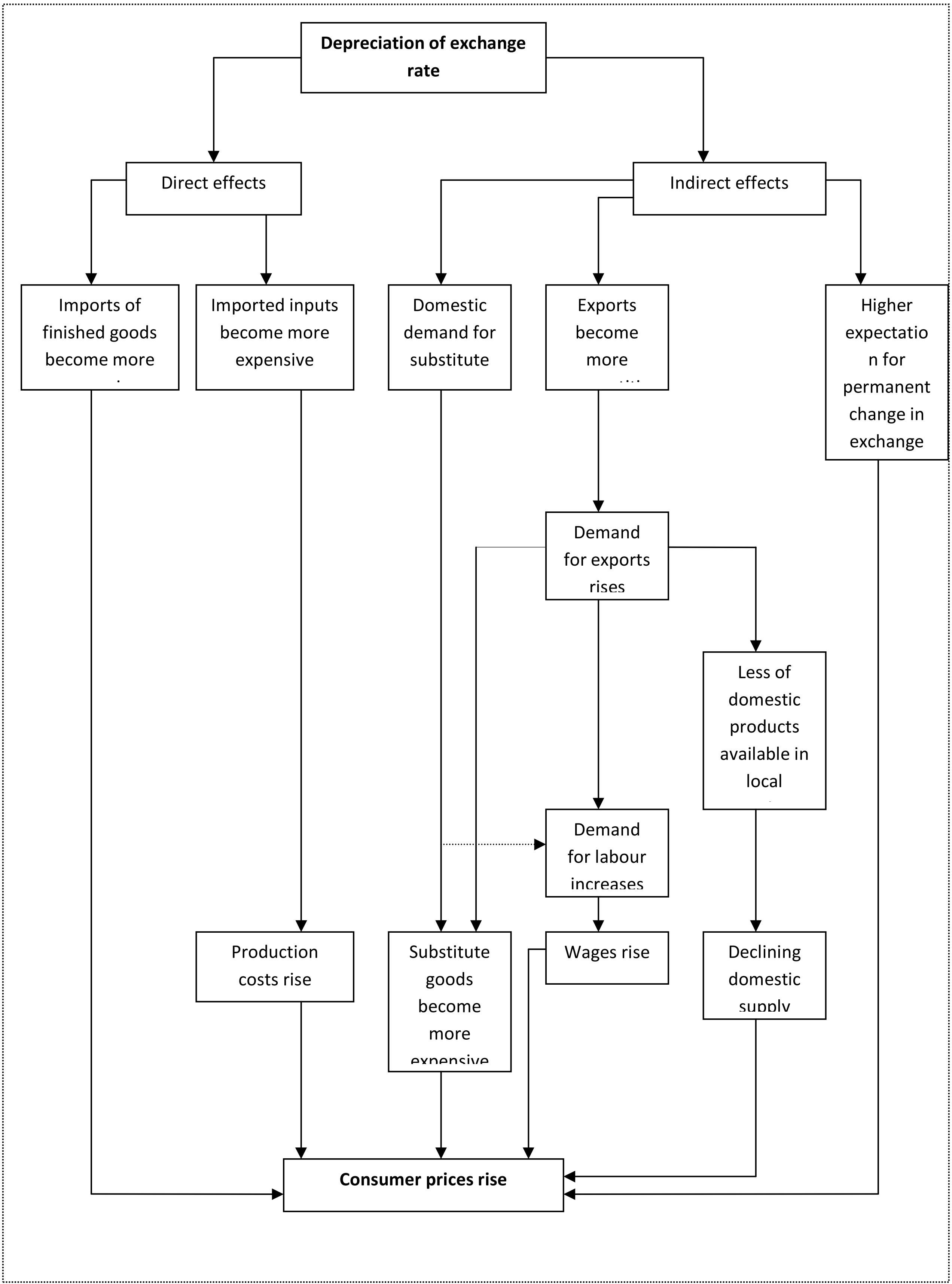
Another channel is through the pressure of increased aggregate demand on domestically produced goods. As the exchange rate depreciates, domestic goods become relatively cheaper in international markets, as a results exports and aggregate demand for domestic goods will rise. In the short run, such an increase in the aggregate demand will induce an increase in the price level and output, however, in the long-run as real wages rises to their initial equilibrium output will decrease and prices will remain at their new level (Kahn, 1987).

[57] Depreciation of exchange rates may be an indication of the underlying macroeconomic policy that is inflationary.

Similarly, the indirect effect can also manifestate through the pressure on the supply of goods. For example, assuming supply rigidity, if exchange rate depreciates and as a result exports increased, the supply of the same commodities for meeting domestic demand may appear short. Consequently, that will put higher pressures on prices. Stated differently, with unchanged domestic demand, if domestic supply declines due to higher exports, that may lead to higher inflation (Al Raisi and Pattanaik, 2005).

Figure 1:

The pass-through from an exchange rate depreciation to consumer prices.


Depreciation of exchange rate
Direct effects
Indirect effects
Imports of finished goods become more
Imported inputs become more expensive
Domestic demand for substitute
Exports become more
Higher expectation for permanent change in exchange
Demand for exports rises
Less of domestic products available in local
Demand for labour increases
Production costs rise
Substitute goods become more expensive
Wages rise
Declining domestic supply
Consumer prices rise

Further, according to Al Raisi and Pattanaik (2005), under some special conditions, the direct channel may dominate the indirect channel. For example, when the import-intensity of exports is high for an economy and when the direct channel can results into faster adjustment in wages and prices in the domestic economy. In contrast, the direct channel may prove to be weak, particularly in more diversified economies, if depreciation can enhance domestic production of local substitutes, and if higher prices of imported goods gave rise to some reduction in demand. Accordingly, the direct channel is stronger in small and less diversified economies relative to large and more diversified economies.

7.3 The importance of analysing ERPT into Inflation Rate

There are quite number of reasons to justify the importance of analysing the degree of ERPT into inflation rate or generally including information content from exchange rate, as an external element, in analysing and forecasting inflation.

The extent of pass-through to consumer prices is assumed to influence central bankers' forecasts of the future path of inflation, a key element in the conduct of monetary policy (Bailliu and Bouakez, 2004). Successful implementation of monetary policy indicates that the central bank has good understanding of inflation dynamics and also relatively good at predicting the future path of inflation. In an economy, where inflation forecasts are based on estimates of ERPT, regular assessment of the effect of movement of exchange rate on consumer prices is therefore considered very important. If for some reason such assessment was bypassed or neglected, that could lead to an error in inflation forecasts. For example, if due to some reasons (higher degree of market segmentation) the extent of pass-through declined and such decline was not taken into account while carrying inflation forecasts, these forecasts could be overestimating the effect of movements in the exchange rate on inflation.

Further, despite the fact that the exchange rate regime is no longer the nominal anchor for many of the emerging countries in the wake of the financial crises in the 1990s, the variability/fluctuations of the exchange rate continue to pose an important implications for many other macroeconomic variables including inflation Ito et al. (2005). In their study on the role of exchange rate on inflation targeting regimes, McCauley and HO (2003) found the emerging markets to be relatively more exposed to exchange rate fluctuations than industrial economies. The authors also reported that even under inflation targeting regimes, the exchange rate considerations/management can be expected to play a more prominent role in emerging markets economies, given the considerable influence of the exchange rate on inflation in these economies. Furthermore, the authors have concluded that the costs of exchange rate movements and policy attention thereto are not only relevant to emerging markets, given the recent experience of some of the industrial economies like Australia, Sweden, Switzerland, and the G3.

The continuation and importance of exchange rate management in reality even under a pure floating regimes or regimes with inflation targeting have also been evidenced by other studies like Levi Yeyati and Sturzenegger (1999) and Hausmann et al (2000). These studies have found that number of countries, including industrial as well as emerging and developing, which are officially classified as floating regimes are in fact intervening irregularly to limit the movements of exchange rate either through foreign reserves or domestic interest rates. The high level of ERPT and the existence of important currency mismatches in the economy are viewed among the primary factors that may lead the Central Bank to limit exchange rate volatility (Hausmann et al, 2000). Furthermore, Ball (1998), in his study of optimal monetary policy rule under open economy, has theoretically argued that in an open economy framework, purely inflation targeting is dangerous due to the effects of changes in exchange rate on inflation through imports. Ball (1998) had suggested, as an optimal policy rule, to replace inflation on the right hand side of Taylor rule with long term inflation that takes into account the transitory effects of exchange rate fluctuations. In practice, Edwards (2006) have found some evidence for exchange rate management, when conducting monetary policy, in inflation targeting countries that are characterized with an unstable inflation.

The importance of exchange rate on inflation had also been emphasized implicitly and explicitly in many official report and studies that tried to explain the low inflation rates in many countries during the 1990s. External factors such as the disinflationary effect of exchange rate depreciation and lower import prices that were in part induced by the financial crises in East Asia during 1997-98, have been among the most cited reasons. That clearly reflects the importance of the extent of impact from exchange rate and import prices on domestic inflation (McCarthy, 2000). Such importance has been explicitly cited in number of official reports of central banks like the Bank of England (BOE) and the European Central Bank (ECB). For example, in its Inflation Report dated May 2000, the BOE has stated

"The sterling prices of imported manufactures have continued to decline, reflecting the appreciation of the exchange rate over the past year" (p. 33).

Furthermore, the ECB has cited in many instances in its monetary policy monthly report dated May 2000 their concern of the inflationary impacts of the depreciation of the euro exchange rate on the Harmonized Index of Consumer Prices (HICP). In fact, the depreciation of the nominal effective exchange rate of the euro was partly behind raising the short-run interest rate (tightening monetary policy) in that time[58]. Also the annual reports for the year 2007 of the central banks of the GCC countries have blamed the depreciation of their nominal effective exchange rate among other external sources that participated in the recent rising inflation rate in these economies. Moreover, in its inflation report for 2006, the Bank of Israel has blamed the depreciation of exchange rate for the deviation of the annual inflation from its target (Eckstein and Soffer, 2008).

According to Ito et al. (2005) the degree of ERPT is assumed to influence the recovery process of the country from a financial crisis. Higher degree of pass through following currency depreciation may results in the loss of competitiveness through inflation, with sustained level of depreciated nominal exchange rate, thus, making economic recovery relatively slow. Furthermore, any increase in domestic inflation following currency depreciation may lead to financial instability that may lead to out-flow of international capital, or a sudden change of investors' sentiment, which in turn may result into collapse of monetary regimes (e.g. financial crises of South East Asian countries during 1997-98). As a result, whether there is a high ERPT to inflation or not has significant implication to the course of economic recovery.

Furthermore, an important theoretical result that has recently emerged in the NOEM literature is that analyzing the degree of ERPT into inflation is considered essential in evaluating the relevance and feasibility of the exchange rate regime of a country. From the degree of ERPT, one could infer the relevant and optimal monetary policy of the economy. For example, according to Devereux and Engel (2003), lower degree of ERPT indicates the presence of LCP and accordingly fixed exchange rates are preferred because flexible exchange rates cannot achieve the optimal relative price adjustment. On the other hand, significant degree of ERPT indicates the presence of PCP, in which case flexible exchange rate is an optimal monetary policy (Obstfeld and Rogoff, 1995). Moreover, in case of a conventional peg, whereby a country has to follow the monetary policy of the country to which its currency is pegged, say the US. Accordingly, the interest and inflation rates have to be similar to that in the US. If for instance, after a depreciation of the US dollar in front of the currencies of the trading partners of the pegging country, the country failed to maintain a moderate inflation rate (due primarily to high ERPT), then it would risk its export competitiveness in the medium run (Ito et al. 2005).

Also the majority of the available studies of ERPT on the developing countries emphasize the role of macroeconomic conditions due to the common view that in smaller and more open economies with relatively high share of traded goods, high import, and limited local substitutes, the effect of ERPT into

[58] The behaviour and the effect of the exchange rate on inflation had been the concern of monetary authority not only recently but also in the past. For example, the behaviour of the dollar during the 1980s was part of the monetary policy discussion of the Federal Open market Committee's report dated 1988.

aggregate domestic prices is expected to be greater (Ghosh and Rajan, 2007). Accordingly, as the majority of the developing counties are highly trade dependant, they are potentially susceptible to ERPT into domestic consumer prices.

Finally, very recent hypothesis of Taylor 2000 and the subsequent relevant empirical studies (Baqueiro et al 2003, Gagnon and Ihrig 2004, Frankel et al. 2005, Choudri and Hakura 2006, Mwase 2006, Edwards 2006)) on the link between the ERPT and the monetary policy of the central bank further emphasize the importance of analyzing the macroeconomic relationship of the ERPT. According to this strand of the literature, stable inflation and macroeconomic conditions should lead to lower implications of monetary expansion including devaluation of exchange rate.

In view of the above advanced arguments, assessing the extent of the ERPT into inflation rate is important, given potential policy implications such as its effects on central bankers' inflation forecasts, the recovery process of the economy, and optimal choice of exchange rate regime and monetary policy regime.

7.4 Why Inflation Rate might Exhibit Lower Response than Import Prices to Changes in Exchanges Rates?

It is generally acknowledged that Inflation rate, as measured by the CPI (consumer price index), reacts lower than import prices to changes in exchange rates. In other word, ERPT into CPI is normally less than ERPT into import prices. Furthermore, in some case, the reaction of the CPI is lower than the share of imports in the consumption basket (Cunningham and Haldane, 2002, Bailliu and Bouakez, 2004). The previously explained determinants of exchange rate pass-through into domestic prices may also be applied to explain the incomplete ERPT into inflation rate. However, other factors can be stitched from the theoretical literature to further understand the lower response of consumer prices as compared to imports and producer prices to changes in exchange rate. Generally, these reasons are primarily related to some microeconomic factors like the composition of the CPI basket, distribution costs of the tradable goods, availability of domestic substitutes (Burstein et al, 2002, Corsetti and Dedola, 2005).

The CPI of a country is generally a weighted average of its consumed tradable and non-tradable goods and services[59]. Non-tradable goods and services are normally produced locally and priced in domestic currency, hence such items are assumed not be influenced by changes in exchange rates. As a result, the presence of non-tradable items in the CPI basket lower the response of the inflation rate to changes

[59] Mathematically, CPI = $P_t = \alpha^T P_t^T + (1-\alpha^T)P_t^{NT}$, where α^T represents the fixed weight associate with tradable goods in the CPI. P^{NT} represents the price of non-tradable goods.

in exchange rates. The larger the weight of non-tradable items compared to tradable items in the CPI basket, the lower the reaction of inflation rate is expected to be (Burstein et al (2002), Ho McCauley (2003)).

Furthermore, constructing the CPI involves using consumer prices (retail) that normally include distribution costs (transportation, wholesaling, and retailing). Specifically, the price of tradable goods includes costs for some distributional services[60]. The presence of distribution costs is hypothesised to lower the response of tradable good prices at the consumer level to changes in exchange rates as the cost of distribution services are large and may dominate the cost of physical tradable goods. Accordingly, changes in exchange rates will have smaller impact on the consumer price index (Burstein et al, 2002, Engel (2003), Corsetti and Dedola, 2005).

Additionally, some of the locally produced goods are produced as inferior substitutes for imported commodities[61]. Since the producer price of these kinds of tradable goods depends mainly on local economic conditions, they are assumed not to adjust proportionally to changes in exchange rate (Burstein et al, 2002). However, that does not entirely role out the response of domestically produced goods from movements in exchange rate, a fact that further explains why the rate of pass-through to consumer prices need not to be equal to the share of import prices in the consumption basket even if the pass-through to import prices is complete (Bailliu and Bouakez, 2004). Furthermore, it is worth emphasizing that the reaction of prices of locally produced goods to movement in exchange rate is a function to factors like substitutability with imports, adjustment costs of domestic prices, and nominal wage stickiness (Bailliu and Bouakez, 2004).

A related argument is also brought by Hahn (2003), who measured the pass-through of exchange rate along the distribution chain (from import prices, producer prices, and consumer prices). Hahn explained the decline in the size of pass-through along the distribution chain on the basis of two main factors namely the fraction of traded goods in the different stages of the distribution chain and the accumulation over larger number of incomplete pass-through stages. As the fraction of traded goods,

[60] In this case, the retail price of tradable goods, $P_t^T = S_t + \gamma P_t^{NT}$, where γ stands for the weight of distributions services in the value of the retail traded goods.

[61] According to Burstein et al, 2002, consumers are expected in the event of declining real GDP to exhibit some shifts in the consumption pattern by substituting away from high quality imported goods toward locally produced similar but inferior goods. Such kind of substitution is viewed as a "flight from quality" since the locally produced products are generally cheaper and not branded. Nonetheless, some studies have showed that significant differences in quality between replaced products can have substantial impact on the measured rate of inflation.

which are more likely to be affected by exchange rate shocks, tend to decrease along the distribution chain, the response of the consumer prices to exchange rate changes would be expected to be lower than that of pervious stages (importer and producer prices), where the share of traded goods is assumed to be higher. Also, the accumulation of incomplete pass-through over the different stages would basically imply a decline in the pass-through along the distribution chain. Moreover, the adjustment speed/lags in consumer prices to exchange rate changes can generally be attributed to the issue of price stickiness which is assumed to results in the accumulation of adjustment lags at different stages in the distribution chain (Hahn, 2003).

Furthermore, inflation is normally, defined as the persistent increase in the general price level of goods and services. This pragmatic definition of inflation clearly illustrates that inflation occurs as a results of price increases that persist over an extended period of time. So once and for all increase in the price level should not lead to inflation[62]. On the other hand, persistent increase in prices can occur only if aggregate demand continuous to grow faster than supply. Since it is generally known/evidenced that money supply is the main determinant of growth in aggregate demand, according to the monetary theory of inflation depreciation in exchange rate will only lead to inflation if the demand for higher nominal money balances, due to lower real money because of higher prices in goods and services on the account of depreciation, has been accommodated (Hafer,1989). Otherwise, depreciation will only results in changes in relative prices but not the general price level (CPI). The point to be made is that CPI unresponsiveness is not because of incomplete ERPT into the tradable. Rather, it is because central banks are so good at containing price pressures that they take actions that immediately isolate aggregate prices from exchange rate induced pressures (Campa and Minguez, 2005).

Furthermore, relevant to the proceeding argument is the degree of slack in the economy as another potential determinant of pass-through from exchange rate to consumer prices (Takhtamanova, 2010). As mentioned previously, during booms episodes firms are more likely to change prices rather than adjusting profit margin, hence leading to higher consumer prices and eventually to higher CPI inflation.

Finally, institutional actions in the form of price regulations of essential products and foreign exchange controls may distort the pass-through into consumer prices (Choudhri and khan, 2002). Since under such policies, the measured values would not reflect the accurate market values, the corresponding ERPT at the consumer level would be distorted. Furthermore, the pass-through into inflation can also be lowered through some institutional factors that can enhance global competition and reduce

[62] For example sudden increase in oil prices is hypothesized to only produce sizable but transitory increases in the inflation rate.

producers' pricing power. For example, in their study on the Euro Area, Campa and Minguez (2005) have argued that the creation and expansion of the European Union and the common market has led to more competition and lowered pass-through.

8. Empirical Literature on the Pass-through of Exchange Rate to Consumer price inflation

8.1 *Cross-country evidence from developed countries*

Due to its policy implications, the issue of ERPT has been the focus of a burgeoning number of empirical studies. The majority of the studies of ERPT have primarily focused on traded good prices such as import or export prices and there are only a few papers available which deal with the analysis of pass-through into consumer prices (Darvas, 2001, Takhtamanova, 2010). However, as the economists have realized the importance of exchange rate fluctuations on inflation and economic activities, many recent studies have started to incorporate in their estimation of ERPT the aggregate consumer prices as it is more relevant for monetary policy.

However, most of the analytical frameworks that underlie the empirical estimation of the influence of exchange rate changes on aggregate consumer prices were based on microeconomic foundations. The common standard specification found in the literature is basically based on the pricing behaviour of exporting firms. Drawing from the literature (*e.g.* Bailliu and Fujii, 2004), a profit maximizing problem for an exporting firm is:

$$\max \pi = s^{-1}PQ - C(Q) \qquad (16)$$

Where π denotes profits in the exporting firm's currency, S is the exchange rate of domestic currency per unit of foreign currency, P is price in domestic currency, C is the cost function in foreign currency (exporting firm's currency), and Q is the quantity demanded. The first order condition for equation (16) is:

$$P = sC_q\mu \qquad (17)$$

Where C_q represents marginal cost of production and μ is the mark-up of price over marginal cost. Equation (17) states that the domestic price of imported good depends on the exchange rate, marginal cost, and mark-up of the exporting firm. Furthermore, changes in marginal cost is mainly subject to changes in the cost of local input (in the exporting country), whereas changes in the mark-up are assumed to be mainly affected by the demand pressure in the importing country. Accordingly, it is necessary to take into account the movements in other determinants of the price when measuring the pass-through in order to properly isolate the effects of exchange rate on prices. Thus, a reduced from for the price equation can be drawn as follows:

$$P_t = \alpha_0 + \alpha_1 S_t + \alpha_2 P_t^* + \beta_3 Y_t + \varepsilon_t \qquad (18)$$

Where P^* represents the marginal costs of the foreign firm and Y represents the demand conditions in the importing country. Equation 18 defines the exchange rate pass-through as the partial elasticity of domestic price with respect to the exchange rate. According to Goldberg and Knetter (1996) and Bache (2007), variants of equation (18) are widely applied to estimate the pass-through.

Menon (1995) made an extensive survey for around 46 empirical studies on the pass-through of exchange rate. The first major finding in Menon' survey is that the majority of the studies have concluded incomplete pass-through[63]. Even in those studies (around 6) which reported a complete or close to complete pass-through, Menon mentioned that the results of these studies were associated with longer lags in the transmission of exchange rate changes to prices. Second major finding in Menon Survey was that the majority of the studies were focused on large economies namely the US, Japan, and Germany, with fewer studies on small open economies. This was also reported by Goldberg and Knetter, 1996.

Other major findings include different degree of pass-through across countries and products and similarly across studies for a given country. Two main factors were generally used to justify the diversity in the degree of the pass-through across countries and they are the openness and size of a country. Furthermore, Menon has attributed the difference in the results across studies for a country to be mainly from differences in methodology, model specification and variable selection. Menon has also found from his survey that the pass-through relationships have remained stable over time. However, this last result has recently been challenged as we will see here later[64]. Subsequent studies to Menon have tried to overcome some of the drawbacks in previous studies (e.g. expanding the analysis to include other industrial and non-industrial countries, introducing system techniques such as VARs in the estimation of ERPT as well as employing panel analysis).

[63] This was also confirmed by the survey of Goldberg and Knetter (1996), who reported a range of around 60% pass-through from various studies.

[64] Menon had also found that the majority of the studies of his survey have used OLS techniques without taking into account the time series properties of the data. As a result of that, the estimation of these studies is under doubt due to biasedness because of using trended data (non-stationary data).

Amirtano et al (1997) have used quarterly data during the period from 1966 to 1993 to measure the effects of exchange rate changes on consumer price inflation in seven industrial countries (France, Sweden, Italy, UK, Spain, Japan, and Australia) using cross-country regression. The authors found very significant effect for exchange rate depreciation on both consumer and wholesale price indices. However, the extent of pass-through, albeit less than 100 percent for both indices, was about 4-5 times higher in the later index. The degree of pass-through of depreciations of nominal exchange rate on consumer price inflation and wholesale price index were 0.2 and 0.8, respectively. Amirtano et al (1997) found the restrictive demand policies (monetary and fiscal policies), and policy of wage moderation, that followed the exchange rate depreciation, as the main factors for low affect of the large depreciation on inflation in Europe during 1992-93.

The effect of the restrictive demand policies was also confirmed in the study of De Grauwe and Tullio (1994), who have focused as well on the inflationary effect of the depreciations of 1992-93. De Grauwe and Tullio (1994) have concluded that the low acceleration of inflation after the large depreciations was mainly influenced by the high real interest rate. However, the estimated degree of pass-through in this study was relatively higher; it was on average between 0.3-0.4. Amirtano et al (1997) have attributed the difference in the coefficients of pass-through between the two studies to a longer transmission lag (two years) in the estimation of De Grauw and Tullio (1994) compared to the one in their study (less than one year). Other studies that offered evidence for the influence of demand policies on the extent of pass-through include Murgasova (1996), Gordon (1999), Parsley and Popper (1998) and Dobrynskaya and Levando (2008).

In a very recent study, Takhtamanova (2010) used an open economy Philips curve model to estimate the short and long term pass-through from exchange rate to inflation in 14 OECD countries during two periods; 1980-1989 and 1990-2007. In the first period the author found an average pass-through of about 0.1% in the short run and 0.45% in the long run following a 1% appreciation in the exchange rate. In the second period the pass-through coefficients were insignificants in both the short run as well as the long run. According to Takhtamanova, the weak link between changes in exchange rates and CPI inflation is caused in part by the low inflation environment, particularly in the second period of the estimation. The low inflation environment is assumed to encourage less update of prices by firms in the economy, and that in turn results in low pass-through to domestic prices.

Further, from methodical prospective, most of the earlier studies used single equation technique that dominated the estimation of pass-through in the past two decades. In pass-through regression a price index (import price index, consumer price index, or producer price index) is regressed against the exchange rate plus other hypothesised determinants of prices (*e.g.* equation 18). The estimated coefficient of the exchange rate variable represents the exchange rate pass-through, which in other word defined as the elasticity of prices to changes in exchange rate.

However, an alternative technique, which is getting increasingly popular, is the system approach (Mwase, 2006, Bache, 2007)). The major difference in structural vector autoregressions (VARs) is that they do not a priori assume any exogenous variable and treats each variable as endogenous. Accordingly, each endogenous variable becomes a function of all lagged endogenous and exogenous variables in the system. Most the VARs used to estimate the pass-through typically include a nominal exchange rate variables, one or several set of price indices (typically, import prices, producer prices, and consumer prices), plus some other additional variables like oil prices, output gap, money and interest rates. The impulse responses analyses from VAR provide the degree and speed of pass-through from shocks to price indices. VAR is also used to analyse the importance of different macroeconomic shocks on domestic prices.

For example, McCarthy (2000) used a VAR model to estimate the pass-through of exchange rate fluctuations along the distribution chain (import price, producer price, and consumer price) for nine industrial countries during the period 1976-1998. McCarthy found the response of consumer price to changes in exchange rate to be modest in most of analysed countries. The impulse response of import price to changes in exchange rate was higher than that of producer price and consumer price. McCarthy had also used a variance decomposition analysis to investigate the importance of exchange rate shocks in explaining price variances in the examined countries. The variance decomposition indicated that the role of exchange rate shocks in explaining inflation fluctuation is relatively modest. Furthermore, McCarthy (2000), found the extent of pass-through to be positively related to the import share of domestic demand and the persistence of exchange rate changes and negatively with the exchange rate volatility.

More recently, Hufner and Schroder (2002) applied co-integration analysis and vector error correction model (VEC) to estimate the pass-through into consumer prices in some European industrial countries for the period 1981-2001[65]. Their estimation also included other stages of the distribution chain (Import and producer prices). The authors found positive significant response from consumer prices to changes in exchange rate, with the extent and speed of such response to differ across the analysed countries. The estimated pass-through from exchange rate to consumer prices ranges between 0.07-0.12 after one year and 0.08-0.18 after two years. Similar to McCarthy (2000), the authors also observed that the degree of pass-through from exchange rate changes declines along the distribution chain with the

[65] VEC is in fact a restricted variant of VAR. However, unlike in VAR, analysing the impulse responses in VEC requires first to establish the presence of co-integration relationship between the variables.

largest effect on import prices. From their variance decomposition analysis, the authors found that external shocks from exchange rate explain large variation in import prices, while this impact declines along the distribution chain with the lowest impact on consumer prices[66].

More recent study on the euro area was carried out by Faruqee (2006), who used VAR approach to investigate exchange rate pass-through in a set of prices along the pricing chain, during the period 1990-2002. Similar to McCarthy (2000) and Hufner and Schroder (2002), Faruqee found very low response by consumer prices (around zero in the short-run and 0.02 in the long-run) to shocks in exchange rate, and the extent of pass-through is higher in producer and trading prices, with the highest degree of pass-through is reflected in the euro area import prices (near unity). The author has attributed the difference in the extent of pass-through in import prices and consumer prices to factors like nominal rigidity, invoicing currency by firms, pricing to market behaviour, and the presence of local distribution costs.

8.2 *ERPT in Developing countries*

Generally, the analysis of pass-through of exchange rate in small open economies, specially developing ones, have had a fewer share compared to the large and more developed countries (Frankel, 2005). Indeed, hundreds of theoretical and empirical studies analyzing the pass-through issue have been published in developed countries but far fewer in developing countries (Darvas, 2001). Increasing attention, albeit relatively steadily, to developing countries was rekindled recently. Particularly, in the wake of the large devaluations in South East Asia, Latin America, and other emerging countries between 1994 and 2001, number of studies were undertaken to investigate why large depreciations did not materialize into significant price increases although the traditional view states that the pass-through is relatively rapid and complete in small or less developed economies (Frankel, et al, 2005). However, studies on developing countries have focused on episodes of sudden large devaluations (e.g. currency crises) with less attention to analyse the pass-through in economies that are generally stable but are experiencing a sustained depreciation. Furthermore, available studies on small and less developed countries are relatively small in number (compared to the developed-countries-based studies) so to

[66] Hufner and Schroder (2002) have also tried to derive an estimate of the pass-through effects for the whole euro area by using Harmonized Index of Consumer Prices (HICP). They found that on average 10 percent depreciation in the effective euro exchange rate leads to an increase of 0.4 percentage points in the euro area inflation, as measured by the HICP, after one year. The total impact converges to around 8 percent after three years. Nonetheless, in similar study of the effect of changes in the effective exchange rate of the Euro on the HICP, Hahn (2003) reported twice as large as the above reported by Hufner and Schroder (2002). He found, using a VAR model, that one percent appreciation in the Euro effective exchange rate is passed on HICP by 0.08 after one year, and to double that amount of around 0.16 after three years.

draw a conclusion on the extent and behaviour of pass-through in each of these countries, or for the developing economies in general. Also, large part of the studies was focused on particular regions like South East Asia and Latin America. Studies on other important economic regions like Africa and the Middle East are rare. For example, the countries of the Gulf Cooperation Council have recently experienced a significant decline in the exchange rate of their currencies that are pegged to the US dollar, which in turn has depreciated over 40 percent, since 2002, against the currencies of major trading partners of the GCC countries[67]. The depreciation of the currencies of the GCC members is likely to feed into higher inflation through higher cost of imports, which constitute very significant share in the GDP of each of these economies**.** As a result, analysing the pass-through from exchange rate to inflation is of particular interest to the monetary policy of the central banks of the GCC countries. However, to my best knowledge to date, there is only one study (Al Raisi and Pattanaik, 2005) that have analysed the pass-through of exchange rate into inflation rate in the region and it was solely on Oman.

Studies that have focused on developing countries include Mihaljek and Klau (2001) who applied ordinary least squares procedure to 13 countries. Their estimates of exchange rate pass-through ranged from 0.1 to 0.84. Their major finding is that changes in exchange rate are more strongly and contemporaneously correlated with inflation than are changes in import prices[68]. This finding is considered in conflict with other studies (e.g. McCarthy, 2000) that emphasized the importance of exchange rate to import prices. The authors have as well reported a decline in the extent of pass-through during the 1990s and they have attributed such decline to the more stable macroeconomic conditions and structural reforms implemented in emerging economies.

In a contemporaneous study but with only four European Union candidate countries[69] Darvas (2001) analysed ERPT into consumer prices over the period 1993-2000. Darvas had reported that in an exchange rate targeting environment a change in the exchange rate might be regarded as more permanent than in a floating regime, implying higher pass-through. He has also identified a negative link between volatility of exchange rate and the extent of pass-through, which suggests that floating regimes with lower volatility can yield a higher exchange rate pass-through. The authors have concluded that his findings are neither new nor surprising, but important as present thinking among many international economists tend to disregard the possible role of the exchange rate in curbing inflation in small open economies.

[67] The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates.

[68] According to Mihaljek and Klau (2001), currency substitution and indexation of wages and debt contracts are the main explanation for higher exchange rate pass-through relative to import price pass-through.

[69] They are Czech Republic, Hungary, Poland and Slovenia.

In a broader and with diversified sample of countries, Goldfajn and Werlang (2000) analyzed the effect from depreciation to inflation using panel data framework. Their study covered the period from 1980 to 1998 and included 71 countries from different major regions namely America, Africa, Europe, Asia, and Oceania. The pass-through coefficient on inflation was found to be significant and increasing over time, with its peak at 12 months. However, the magnitude of the pass-through was smaller than one and it ranged between about 0.2 and 0.7. When the authors divided the sample geographically and extended the period up to 18 months, they found the highest pass-through in Latin America (1.2) and Asia (0.8) the lowest in Oceania (0.2) and Europe (0.5). The authors have also estimated the extent of the pass-through after dividing the countries according to their social economic conditions. The pass-through was found to be almost complete (0.9) in emerging market after 12 months, while it was only around 0.6 and 0.5 in developed and other developing countries, respectively. Final classification by the authors was based on OECD members and non-members. This later classification had in fact confirmed the estimation results of the authors in their earlier classification as the pass-through, in 12 months, was much lower for OECD members (0.2) than non-members (0.8)[70].

Further, Goldfajn and Werlang (2000) have found the extent of misalignment of real exchange rate (RER), initial inflation, trade openness, and the cyclical component of output (GDP deviation) to be the main determinants of pass-through. Nonetheless, misalignment in real exchange rate was found to be particularly important for the pass-through coefficient in the American region (mainly developing) and the initial inflation was particularly important for European countries (industrial). The importance of factors like misalignment of RER, initial inflation, and GDP deviation were also reported as main determinants of the extent of ERPT in the study of Borensztein and De Gregorio (1999).

In a relatively more recent study that emphasizes the importance of exchange rate management under inflation targeting framework, particularly in emerging economies, Ho and McCauley (2003) argue that lower-income economies are expected to show a stronger linkage between the exchange rates and

[70]Choudhri and Hakura (2006) have as well estimated the pass-through coefficients for the same sample of countries (71) in Goldfajn and Werlang (2000) but with different classification over the period 1979-2000. They classified the countries into three groups namely low, moderate, and high inflation, based on average inflation rate. The authors found positive significant relationship between exchange rate and inflation and the magnitude of such relation, albeit less then unity, increases over time for all the three groups. The estimated average degree of pass-through coefficient for the group of countries classified as low inflation countries (mainly industrial countries) is 0.08, 0.14, and 0.16 after the first, fourth, and twentieth quarters, respectively. For the set of countries that are classified as moderate inflation countries the average pass-through elasticity is 0.19, 0.33, and 0.35 after the first, fourth, and twentieth quarters. Finally, for the high inflation countries the results are 0.32, 0.5, and 0.56 after the first, fourth, and twentieth quarters.

domestic prices and that a history of high inflation accentuates linkage. In contrast to other studies, Ho and McCauley (2003) do not find a significant link between the extent of pass-through and the degree of openness. They have explained that by putting forward the argument that the overall degree of openness is by no means a full reflection of the share of the imported goods in consumer price index. Accordingly, large and relatively close countries may have large ERPT if their imports are final consumer goods. The authors also highlight the role of past currency crisis as another factor for the relatively high ERPT in emerging countries. They argue that episode of rapid and large devaluation in the history of emerging markets could raise the salience of the local price of foreign exchange in domestic prices and wages, and could lead to the use of foreign currency in transaction and financial deals, all of which could further contribute to increasing sensitivity of domestic prices to changes in exchange rates.

Kang and Wang (2003) employed VAR technique to study the extent of pass-through into aggregate prices for four East Asian countries (Japan, Singapore, Korea, and Thailand) during the period 1991-2001. The authors found the import prices respond higher to changes in exchange rate than consumer prices, which conforms to above discussed results for developed countries. The authors have as well conducted variance decomposition analysis and observed that shocks to exchange rate are in general more important to import prices than the corresponding consumer prices. Moreover, the authors have split the horizon of the analysis into two periods; pre-crisis period (1991-1997) and post-crisis-period (1998-2001). Comparing the results between the periods, the authors observed that the extent of pass-through in both aggregate prices is higher during post crisis periods in crisis-hit countries (Korea and Thailand) compared to pre-crisis period. Similarly, the variance decomposition have showed that exchange rate shocks explain higher variations in both import prices and consumer prices during post-crisis for crisis-hit countries. The authors have attributed the significant difference in the extent of pass-through between the countries that were severely hit by the crisis and those that were less impacted during the post-crisis period to the adoption of a floating regime by the crisis-hit countries. The adoption of the floating exchange rate regime by and the subsequent temporary fluctuations in the crisis-hit countries are assumed to have increased the response of both aggregate prices to the depreciation in the exchange rates.

More recent similar study on the East Asian crisis-hit countries was made by Ito et al. (2005) over the period 1986-2004. The authors have basically employed two methods in their analysis; a conventional pass-through method based micro-foundations of the exporter's pricing behaviour and a VAR method. The results from the conventional method have revealed different degrees of pass-through elasticities from exchange rate into consumer prices among the analysed countries with a minimum pass-through of 0.13 and a maximum of 0.57. However, the pass-through elasticity into import prices were found relatively higher then consumer prices. As far the VAR method, the results of impulse response analysis have indicated lower pass-through along the distribution chain as the highest response to exchange rate shocks was by import prices, followed by producer prices and then consumer prices. Moreover, the variance decomposition analysis have showed that shocks from exchange rate account for around 40 percent in explaining the variations in consumer prices in only two countries and less than 20 percent in three countries. Furthermore, the authors have observed during the first ten months of the currency crisis (1997-1998) that hit these analysed economies that the monetary shocks explains large amount of consumer prices in Indonesia compared to the rest of the sample. This finding has led the authors to attribute the relatively higher pass-through (0.57) in the consumer prices of Indonesia to the accommodative monetary shocks that followed the depreciation of the exchange rate.

Further, several other studies have used the VAR approach in their evaluation of ERPT on individual basis (e.g. Leigh and Rossi (2002) for Turkey, Bhundia (2002) for South Africa, Billmeier and Bonato (2002) for Croatia, Belaisch (2003) for Brazil, and Al Raisi and Pattanaik (2005) for Oman, Mwase (2006) for Tanzania). Their main finding is lower pass-through along the distribution chain.

9. The stability of ERPT

A recognized fact from the empirical literature is the general decline in the extent of ERPT since the end of 1980s in both the industrial and developing countries. The empirical studies in this regard were originally motivated by number of events during the 1990s. For example, the surprisingly low inflation in countries like Sweden and Italy after the their currencies fell out of the European exchange rate mechanism in 1992, the low inflation after large devaluations in East Asia (1997-1998) and Latin America (Mexico (1994), Brazil (1999), and Argentina (2001).

The most often cited and tested hypothesis for the decline in pass-through is that of Taylor (2000), discussed above. As per Taylor's view, the recent attenuation in pass-through is primarily due to the low inflation environment that has been achieved in many countries. Taylor's study has in fact sparked handful theoretical and empirical studies to test, in addition to the influence of monetary environment on the extent of pass-through, the stability of the pass-through relationship. For example, Choudhri and Hakura (2001) had emphasized a channel similar to Taylor (2000) in the context of a more elaborate dynamic general equilibrium model (DGE) with imperfect competition and staggered contracts. In their model, a low inflation environment decreases the extent of pass-through because the later reflects the expected impact of monetary shocks on current and future costs, which in turn are reduced by a stable inflation environment.

Furthermore, Choudhri and Hakura (2001) have tested their theoretical argument on a cross-sectional study using a sample of 71 countries including developing ones during the period 1979-2000. They found the average inflation rate to have positive and strong relation with the pass-through of exchange rate across all the analysed countries. They also found the inflation rate to dominate other macroeconomic factors in explaining the pass-through across the countries and periods. The authors have concluded that the dependency of ERPT on the inflation regime should be taken into account when designing the monetary policy rules.

Devereux and Yetman (2002) tested Taylor hypothesis by presenting a theoretical argument to show that the low pass-through during the 1990s is in part a macroeconomic phenomenon. The authors have developed a simple model of small open economy, in which the extent of pass-through is determined by the frequency of price changes that in turn depends on the monetary policy role of the central bank. The monetary policy of the central bank determines the average rate of inflation and the volatility of the nominal exchange rate. The authors show that companies will choose higher frequency of price changes the higher is the average rate of inflation and the more volatile is the nominal exchange rate. The higher is the frequency of price adjustments, the greater is the pass-through of exchange rate into consumer prices. The authors have tested their model empirically on data set of 122 countries and found aggregate pass-through is very high (close to unity in many cases) in countries with very high inflation rates[71][72].

Gagnon and Ihrig (2004) had extended Taylor's claim to a sample of 20 industrial countries industrial countries. They found, after splitting their sample to control for the shift in the monetary policy behaviour that the pass-through has generally declined in many countries after the beginning of 1990s[73]. They found positive significant link between the pass-through and inflation variability. Furthermore, they have attributed the decline of pass-through in some of their sample of countries to the strong shift towards stabilizing inflation in these countries. However, the authors could not

[71] The authors have also reported a non-liner relation between average inflation and estimated pass-through coefficients; as inflation rises, pass-through rises but at a declining rate.

[72] Other theoretical argument was also presented by Devereux and Engle (2001), who have related the extent of pass-through into domestic prices to the monetary policy regime. In their theoretical model, which emphasizes the role of LCP versus PCP, the authors have argued that firms normally wish to set prices in the currency of the country with the most stable monetary policy. With this argument, the authors endogenize the choice of currency, on which to set prices, to the monetary stability. That as well means that the ERPT into domestic prices in local currency terms will be low in countries with low monetary and nominal exchange rate variability.

[73] Similarly, McCarthy (2000) have found a decline in the ERPT into inflation during the period 1983-1998 relative to the period 1976-1982 in entire sample of his study.

establish a systematic link between the exchange rate pass-through and the behaviour of the monetary policy. Other recent empirical studies that offered evidence for declining pass-through in developed and less developed nations include Baqeiro et al (2003), Ho McCauley (2003), Bailliu and Fujii (2004), Frankel et. al (2005), Mwase (2006), and Takhtamanova (2010).

Along somewhat different line, Campa and Goldberg (2005) have argued that the microeconomic factors related to the composition of a nation's imports may dominate the macro factors in influencing the extent of pass-through elasticity and the pass-through relationship over time. The authors have reported that changes in the composition of imports by moving away from raw materials and energy imports towards manufacturing sectors (where more differentiated goods are produced and thus where PTM is likely to be more prevalent) has been the primarily factor behind the recent pass-through changes into domestic prices among the OECD countries. This has also been confirmed by Otani et al. (2003) for Japan, Khundrakpam (2007) for India, and Marazzi et al. (2005) in the case of the US[74].

Other micro-based theory include Burstein et al (2002) who analysed the reaction of inflation rates to devaluations during the 1990s for nine industrial and developing nations. Burstein et al (2002) have attributed the recent declining trend in pass-through from exchange rate to CPI to the disappearance from consumption of newly expensive import goods, and their replacement in the indices by inferior local substitutes, a phenomena that they dubbed as 'fright from quality'. Additional microeconomic factors were also argued for by Bailliu and Bouakez (2004), who explained the decline in the exchange rate pass-through to the higher degree of market segmentation because of (i) more firms are engaging in PTM behaviour and/or (ii) a larger proportion of goods are subjected to price discrimination across international markets.

Some other studies that focused on analysing the low pass-through in emerging and developing economies have further cited some other additional factors in addition to the above. For example, studies like Mihaljek and Klau (2001), Baqueiro (2003), Mwase (2006), and Khundrakpam (2007) have in part emphasized recent structural reforms (e.g. domestic deregulation, foreign trade and investment liberalisation, improved external accounts, and larger global integration in the production of goods and services) in the emerging and developing countries have contributed toward the low pass-through from changes in exchange rate.

[74] Marazzi et al. (2005) have presented additional explanations that include the increasing market shares of Chinese imports and changes in the pricing behaviours of firms in East Asia following the currency crises in 1997-98.

Furthermore, Frankel et al (2005) have also suggested the rising costs of non-traded services due perhaps to Baumol and Balassa-Samuelson effect, in which rich countries are assumed to have higher prices then poor countries once all price levels are expressed in a common currency at the prevailing nominal exchange rate. Such differences in price levels have been attributed primarily to the differences in productivity across countries and sectors. High income countries are assumed to have higher productivity in traded sector than poor countries. Since non-traded good sectors are more labour intensive, then due to increased productivity in traded sectors prices in non-tradable goods increases and eventually such increase translates into higher price levels in high income countries. As a result of that, currencies of higher income countries will be overvalued relative to poor countries. Generally, the HBS hypothesis is found to be more useful in explaining differences in price levels (deviations from PPP) between developed and developing countries than between countries of similar productivity/per capita income (Balassa (1964), Pakko and Pollard (1996), Rogoff (1996), Taylor and Taylor (2004)).

Further, recent strand in the literature of inflation have emphasized the role of globalization as a major factor for the declining role of exchange rate on the inflation process. For example, according to Borio and Filardo (2006), in a cross-section globalization means that price differentials for identical goods is expected to narrow, arbitrage opportunities increase and location matters less for the production of certain products and services as production is delocalised. On the other hand, changes in exchange rates over time may tend to reflect more real and financial factors and less nominal influences, such as persistent and large inflation differentials. As a result, under such conditions, changes in exchange rates will be viewed temporary (reversible) and hence may have a smaller effect on the corresponding prices, at least in the short-run.

Another mechanism, through which globalization weaken the role of exchange rate on domestic prices is by enhancing global economic integration. This mechanism is clearly articulated in the above-cited study of Gust et al (2010), who stated that increasing trade integration and higher productivity results in lower costs that in turn induce domestic producers to lower their mark-ups in response to the decline in the prices of foreign exporters, thus leading to fall in the average mark-up across all producers, and eventually lower pass-through.

10. Summery and conclusion

This part of the chapter has attempted to survey the theoretical as well as the empirical literature of ERPT into aggregate domestic prices, with particular reference to ERPT into inflation rate as measured by the consumer price index. The main findings of the survey are summarized as following:

Pass-through relationship draws its theoretical underpinning from the PPP theory that assumes full impact from changes in exchange rate to domestic prices. However, earlier and recent studies on the ERPT have extensively documented incomplete pass-through to prices and even in those cases where a complete or close to complete pass-through is reported they are often associated with lags in the transmission/adjustment process from exchange rate to prices. Such finding is apparently at odd with the case of Friedman (1953) who assumed complete pass-through from exchange rate to consumer prices in his argument for flexible exchange rate.

Various micro as well as macroeconomic causes has been proposed by the literature to explain the incomplete pass-through from exchange rate to domestic prices. The most often offered microeconomic explanation is the strategy of PTM by imperfectly competitive firms. Other suggested microeconomic causes include trade distortions (e.g. tariff, non-trade barriers), transportation costs, domestic content in the distribution of traded products, and price stickiness in the local currency. On the other hand, macroeconomic causes include persistence of changes in inflation and exchange rates, volatility of inflation and exchange rate, and the business cycle.

The extent of pass-through is asymmetric and depends on the direction of the change (depreciation or appreciation) as well as on the size of the change. The economic theories have identified various circumstances that could generate asymmetric exchange rate pass-through such as capacity constraint, market share, production switching, and menu costs.

The majority of ERPT have primarily focused on traded good prices such as import or export prices and there are only a few papers available which deal with the analysis of pass-through into consumer prices. Given the theoretically as well as empirically identified link between the pass-through from exchange rate and inflation rate and the importance of such link for a proper assessment of the monetary policy transmission on prices as well as for inflation forecasts, many several recent studies have examined the impact of macroeconomic pass-through from exchange rate to inflation rate.

Exchange rate can influence inflation directly and indirectly. The direct channel is basically through the prices of traded final goods, and the prices of imported intermediate goods. The indirect channel is through the competitiveness of goods in the international markets and inflation expectations. Both channels become more with an increase in the degree of openness in the economy.

Most of the analytical frameworks that underlie the empirical estimation of the influence of exchange rate on aggregate consumer prices were generally based on microeconomic foundations. The reduced form for the pass-through equation defines the price level as a function of exchange rate plus other hypothesised determinants of prices: $P = f(S_t, P^*, Y)$

where P_t is the domestic CPI, S_t is the exchange rate, P_t^* is the trading partner CPI, and Y is the output gap. Furthermore, the most two common estimation techniques for the ERPT are the single equation method and the structural vector auto regressions (VARs).

As per the empirical findings, the pass-through from exchange rate to inflation rate is incomplete even in the long run, and the exchange rate elasticity of inflation is less than the exchange rate elasticity of import prices. Generally, the size and the speed of adjustments decline along the different price stages; the impact of exchange rate changes is highest on import prices, then producer prices, and the lowest is on consumer prices.

The literature has advanced number of factors that could account for the lower response of inflation rate relative to other prices in the distribution chain with respect to changes in exchange rate. The majority of these factors are primarily microeconomic-based such as the composition of the CPI basket, distribution costs of tradable goods, availability of domestic substitutes, and the optimal pricing strategies of firms. Other factors include demand policies (monetary and fiscal policies) and institutional factors; like price regulations, foreign exchange rate controls, and enhanced global competition.

There is a declining trend in the extent of pass-through from exchange rate to inflation rate. This decline has been a characteristic of both developed and less developed economies. Several plausible explanations have been presented for this potential decline in the literature including changes in monetary environment (shift to a low-inflation regime), changes in the composition of import goods towards sectors that have lower rates of exchange rate pass-through, substitution between goods (from high-end selection of imports to lower quality substitutes), the increasing importance of non-traded goods in consumption and structural reforms (particularly in developing countries). Nonetheless, there is no consensus in the literature and the debate is still going on regarding the causes of the changed behaviour of the pass-through relation.

Further, the extent of ERPT to inflation rate is generally larger in developing countries relative to more developed ones. Such difference is more often attributed to factors like Baumol and Balassa-Samuelson effect, high share of traded goods, high import content, and limited domestic substitutes, which generally reflect the characteristics of small and more open economies. From policy perspective, given the relatively high ERPT into inflation rate in developing countries implies that the monetary authorities in these countries should take into account the underlying relationship between exchange rate and inflation rate and the factors determining such relationship while designing the monetary and exchange rate policies for their economies.

The analysis of ERPT in general and at the aggregate level, in particular, for small open economies, specially developing ones, have had fewer share compared to the large and more developed countries. Studies on developing economies were spurred recently in the wake of large devaluations in South East Asia, Latin America, and other emerging countries between 1994 and 2001. Nonetheless, the majority of these studies have focused on episodes of sudden large devaluations (e.g. currency crises) with less attention to analyse the pass-through relation in economies that generally stable but are experiencing a sustained depreciation. Furthermore, studies of pass-through on developing economies have concentrated on particular regions like South East Asia and Latin America, however other economic region like Africa and the Middle East were mostly neglected. Accordingly, future studies of ERPT could further contribute to the literature by trying to redress the imbalance in country study coverage within the context of developing countries. Future studies on developing countries can also contribute by giving more attention to episodes of sustained depreciation over time in addition to the analysed episodes of sudden large devolutions. Moreover, the diversity of the exchange rate regimes among the developing countries relative to the developed countries also offers other fertile grounds for empirical research to analyse effect of exchange rate regimes on the pass-through relationship.

Chapter Three

Exchange Rate Pass-Through into Inflation Rate: A Case Study on the GCC Countries Using Single Equation Technique

1. Introduction

This chapter attempts to empirically estimate the extent of exchange rate pass-through into the domestic consumer price indices of the GCC countries using the single equation method. It begins by briefly highlighting the primary motivation behind the study as well as the objectives and the general contribution of the study.

Recently some inflationary pressures have emerged in the Gulf Cooperation Council countries (GCC) in the wake of recent high oil prices, the ensuing buoyant economic growth and rising import[75]. As of 2008, inflation rates ranged between a single digit figure of around 5% (Bahrain) to a double digit figure of around 15% (Qatar), with an average of around 11% (table 5). Among the common factors for the recent inflationary pressures of the GCC countries are domestic absorption of high and rising oil revenues, bottleneck in factors of production like labour and raw materials, caused mainly by economic boom, and rising import prices.

Furthermore, the recent rise in import prices of the GCC countries has coincided with significant depreciation in the US dollar, to which the currencies of the GCC countries are pegged[76]. The sustained depreciation of the US dollar has been blamed as major factor behind the accelerating inflation rates. While the dollar-peg stabilizes the exchange rate between the GCC currencies and the US dollar, depreciation in bilateral exchange rates, relative to non-dollarized trading partners (e.g. euro and pound

[75] The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates (UAE).

[76] The US dollar has been the de facto anchor for all of the GCC countries' currencies, with the exception of the Kuwaiti Dinar, for over two decades. Except for a short period when it was exclusively pegged to the US dollar (May 2003-May 2007) pursuant to an agreement in the context of the GCC's monetary integration process, the Kuwaiti Dinar has been linked to a weighted basket of currencies, in which the US dollar forms the major part given that most of the Kuwaiti's exports (oil) are priced in US dollars and limited fluctuation occurred vis-à-vis the US dollar, and subsequently the fluctuations vis-à-vis GCC countries' currencies (Sturm and Siegfried, 2005).

sterling), is likely to magnify the increase in the price of imports and eventually inflation. The recent abandonment of the dollar peg by the Kuwaiti authority in May 2007 toward a weighted basket of currencies formed a vivid evidence for the inflationary pressure felt from the depreciation of the US dollar[77]. Accordingly, recently there has been some increasing public demands in the rest of the GCC countries for an up-ward valuation, or even de-pegging the currencies of these countries from the existing US dollar, and a shift towards an exchange rate regime that should bring about higher price stability and enhance the foreign exchange value of the GCC countries' currencies.

However, with the exception of one single limited study (Al Raisi and Pattanaik, 2005) on Oman, no empirical studies have been carried out to thoroughly estimate the impact from exchange rate changes on inflation rates in the GCC countries. In other word, the pass-through from exchange rate into domestic prices, including domestic CPI inflation of the GCC countries. The link between exchange rate and inflation in the GCC region was touched as part of general studies[78], albeit few, for analysing the inflationary process in the region.

Against this background, we intended in this chapter to present an estimate for the underlying pass-through relationship between exchange rate and inflation in the GCC countries. From the study we attempt to achieve a number of objectives. The first objective is to assess the risk to the domestic CPI inflation of the GCC countries arising from the fluctuations of the US dollar against the currencies of the major trading partners of the GCC countries. Given the fact that one of the major objectives of the central banks in the GCC countries is to ensure price stability, the results from this paper should be useful for these economies' central banks in forecasting domestic inflation and determining the appropriate policies and actions.

A second major objective is to draw some conclusions, based on the observed associations between changes in exchange rate and domestic CPI inflation, and some policy implications for the existing exchange rate policies of the individual GCC countries. The choice of exchange rate regime by the GCC nations and the subsequent economic implications are critical topics that necessitate further examination, particularly given the potential ramification to the incipient GCC monetary union.

[77] According to the Kuwaiti authority, the depreciation of the dollar has resulted in a weaker dinar (Kuwaiti's currency), which raised the local currency cost of imports not dominated in US dollars.

[78] E.g. Al Mutairy (1995), Darrat and Al-Yousif (1998), and Hasan and Alogeel (2008).

Furthermore, this study further enriches latest discussions on whether the individual members of the GCC need to consider their fixed exchange rate regimes, particularly, in the wake of the latest regional and global economic developments. Accordingly, analyzing exchange rate pass-through into the regional member countries inflation rates, as in this study, would undoubtedly add value to the body of studies on the regional block as a whole.

Further, with this study we also attempt to cover some of the caveats in the literature of exchange rate pass-through (ERPT). For example, by focusing our analysis on the GCC countries, which are small and less developed countries, we are redressing the imbalance in country study coverage (Menon, 1995). Furthermore, given the inconclusive evidence on the prediction of full pass-through from exchange rate to domestic prices of small less developed economies, the paper tries to further test such hypothesis in the context of the GCC countries. Also unlike most earlier available studies that focused on episodes of large sudden depreciations (De Grauwe and Tullio 1994, Amirtano et al 1997, Goldfajn and Werlang 2000) the focus of our study is on economies that have experienced sustained depreciations in their currencies over a period of time. Moreover, we further contribute to the literature by employing monthly macrodata as compared to most other studies that were faced with data availability and have to use lower frequency data, like quarterly times series. According to Choudhri et al. (2005) and MacCarthy (2007) using monthly frequency is considered preferable in studying the pass-through.

The outline of the remainder of this chapter is organized as follows. Section two will present a theoretical background on the link between exchange rates and inflation rates. Section three includes an overview on the pass-through relationship in the context of the GCC countries. Sections four and five present the estimation framework and the data description. An overview of the trade pattern in the GCC economies is given in section six. Section seven presents an analysis of the composition of the CPI baskets of the GCC countries. Preliminary data analysis, unit root tests, and some correlation analysis are presented in sections eight, nine, and ten, respectively. Finally, the estimation and analysis of the results is given in section eleven.

2. Theory in the link between exchange rate and inflation rate

The estimation framework of the study is primarily motivated by the following brief on the link between the movement in exchange rate and domestic prices based on the Purchasing Power Parity (PPP) theory, and some relevant economic facts about the GCC countries:

In its simplest form, the PPP theory suggests that the nominal exchange rate between two different currencies will adjust to equate the aggregate price levels of the countries of these currencies. In other words, both the domestic and foreign currencies will have equal purchasing power when they are converted into one common currency. Expressed in mathematical form, the PPP theory is:

$$P = SP^{*} \qquad (1)$$

Where P is the domestic price level, S is the bilateral nominal exchange rate, and P^{*} is the foreign price level. Equation 1 represents the absolute form of the PPP theory that has its foundation from the law of one price (hereafter LOOP). Abstracting from any impediments to international trade such as transportation costs, taxes, and tariff, the LOOP states that the price of any particular homogenous good that is traded on world market should be the same, when converted at the market exchange rate (McDonald, 2007). The mechanism that forces the LOOP condition is the competitive arbitrage activities at individual level. A major implication of the absolute PPP theory is that the real exchange rate (hereafter RER)-the nominal exchange rate adjusted for the difference in the national price levels-should be constant, however, this not true for any real and nominal exchange rate comparison (McDonald, 2007)[79]. Furthermore, there is one very important condition, under which the law of one price generalizes to yield the PPP between domestic and foreign currencies. The price indices of the domestic and foreign countries should include the same goods with the same weighting scheme, so that a common market basket of goods is measured (Rogoff,1996, Pakko and Pollard, 1996, McDonald, 2007). Such a condition is clearly restrictive as different countries may have different weighting schemes, due to difference in consumption, and different base years. Furthermore, the LOOP assumes perfect competition, no capital flows, and no impediment to trade in the sense that there is costless transportation, distribution, and resale (Goldberg and Knetter, 1996, McDonald, 2007). However, these conditions are clearly unlikely to hold in practice.

[79] In mathematical form, RER = $\frac{SP^{*}}{P}$. Accordingly, by assuming that that the absolute PPP theory holds, then RER = 1, or the log of RER should equal zero.

Given the difficulties to construct a common market basket as a measure of national price levels across countries and the other restricted assumptions of the LOOP, a weaker version of the PPP theory known as the relative PPP is often considered. The relative PPP theory states that differences in the national price levels, inflation rates, between two countries will be adjusted by changes in exchange rates. In other words, relative PPP states that changes in price levels will be related to changes in exchange rates (Pakko and Pollard, 1996). It can also be interpreted to indicate that economies with relatively higher inflation rates will experience a depreciating currency (McDonald, 2007). Expressed in mathematical form, the relative PPP theory is:

$$\%\Delta S = \%\Delta P - \%\Delta P^{*} \qquad (2)$$

Where Δ represents changes. From equation 2, it is clear that the relative PPP theory is less restrictive than the absolute version, as it simply relates percentage changes in exchange rates between two countries to the difference in their inflation rates. If, for example, inflation in country A increased by 6% while inflation in country B increased by only 4%, then according to the relative PPP theory the currency of A will depreciate by 2% to offset the inflation differentials between the two countries. The primary requirement for the relative PPP theory to hold is that the spread/difference between the inflation differential and the changes in exchange rate should equal zero or at least tend to centre zero (Pakko and Pollard, 1996). In the context of ERPT, the validity of PPP means any changes in exchanges rates will translate into proportional movements in domestic price level. In other words, PPP theory assumes complete pass-through from changes in exchange rate to domestic price level. Accordingly, incomplete pass-through will reflect deviation from PPP. Nonetheless, complete pass-through can occur even though the LOOP fails. The failure of the LOOP need to invalidate only the absolute PPP, but incomplete pass-through will invalidate both variants (absolute and relative PPP) (Frankel et al, 2005).

Generally, movements in exchange rates affect domestic price level (inflation rate) directly and indirectly (figure 1). The importance of both of these channels is assumed to increase with an increase in the openness of the economy (Hufner and Schroder, 2002). The former channel operates through the external sector, specifically through the relative share of imports in the consumer basket (Lafleche, 1996). Exchange rates The depreciation of exchange rates will raise the prices of imported final goods as well as intermediate goods. As importers and producers raise their prises in line with the increase in imports, the depreciation will eventually get translated into producers and consumer prices, which in turn may lead to higher inflation.

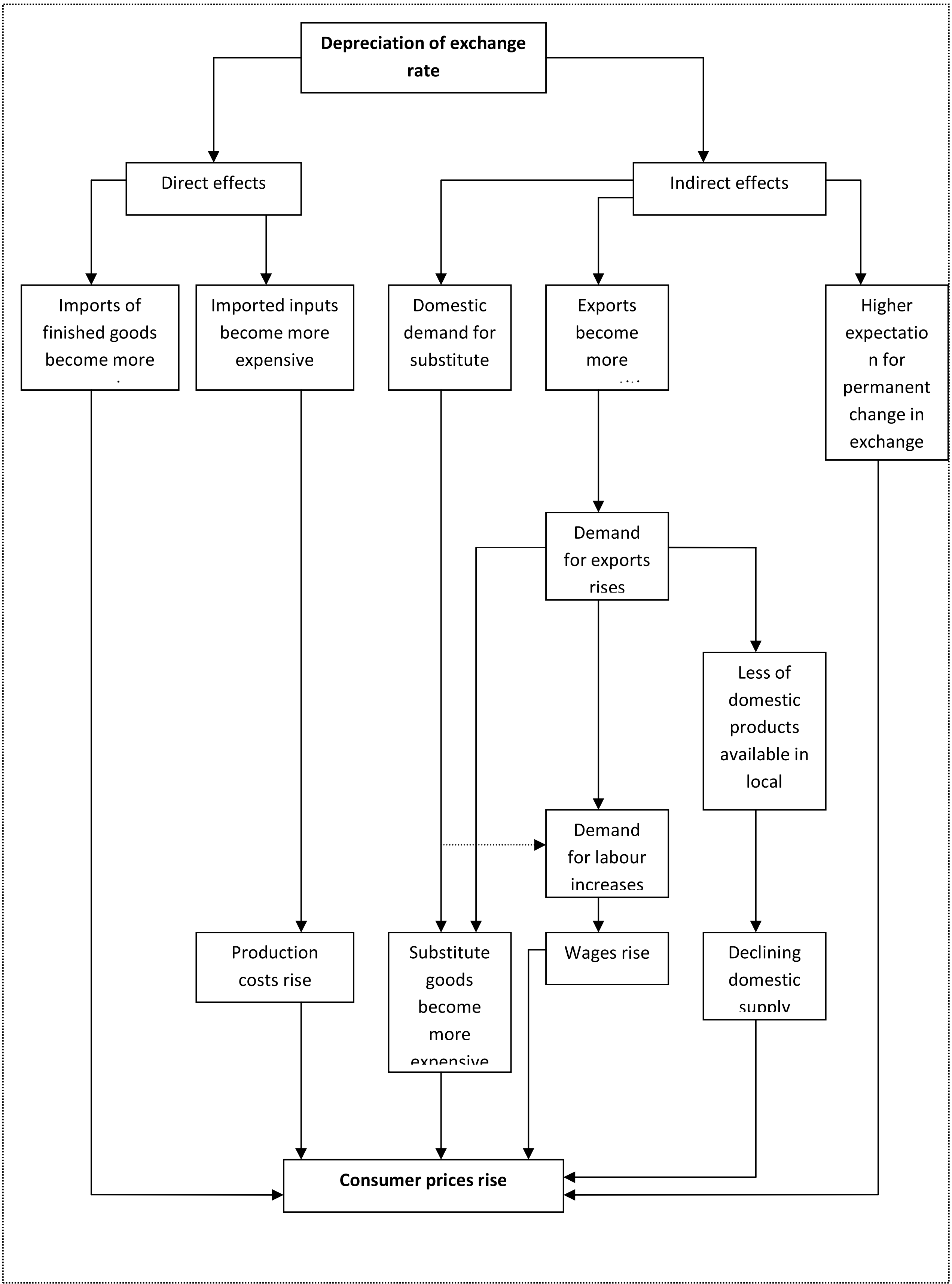
On the other hand, the indirect effect of ERPT can operate through different channels, like changes in the composition of demand or in the level of aggregate demand and wages, supply of goods, and inflation expectations (Lafleche,1996, Taylor, 2000, Ho McCauley, 2003). The channel through inflation expectations is originally suggested in the hypothesis of Taylor (2000), according to which the pass-through is highest when changes in the exchange rate are perceived to be of a persistent nature and prices adjust because of the expectations of the public.

Another channel is through the pressure of increased aggregate demand on domestically produced goods. As the exchange rate depreciates, domestic goods become relatively cheaper in international markets; as a result exports and aggregate demand for domestic goods will rise. In the short run, such an increase in the aggregate demand will induce an increase in the price level and output, however, in the long-run, as real wages rise to their initial equilibrium, output will decrease and prices will remain at their new level (Kahn, 1987).

Similarly, the indirect effect can also manifest through the pressure on the supply of goods. For example, assuming supply rigidity, if exchange rate depreciates and as a result exports increase, the supply of the same commodities for meeting domestic demand may appear short. Consequently, that will put higher pressures on prices. Stated differently, with unchanged domestic demand, if domestic supply declines due to higher exports, that may lead to higher inflation (Al Raisi and Pattanaik, 2005).

Further, according to Al Raisi and Pattanaik (2005), under some special conditions, the direct channel may dominate the indirect channel. For example, when the import-intensity of exports is high for an economy and when the direct channel can result in faster adjustment in wages and prices in the domestic economy. In contrast, the direct channel may prove to be weak, particularly in more diversified economies, if depreciation can enhance domestic production of local substitutes, and if higher prices of imported goods gave rise to some reduction in demand. Accordingly, the direct channel is stronger in small and less diversified economies relative to large and more diversified economies.

Figure 1: The pass-through from an exchange rate depreciation to consumer prices


Depreciation of exchange rate
Direct effects
Indirect effects
Imports of finished goods become more
Imported inputs become more expensive
Domestic demand for substitute
Exports become more
Higher expectation for permanent change in exchange
Demand for exports rises
Less of domestic products available in local
Demand for labour increases
Production costs rise
Substitute goods become more expensive
Wages rise
Declining domestic supply
Consumer prices rise

3. Pass-through relationship in the context of the GCC countries

Further, given the nature of the GCC economies, this paper can be considered to form a general test on the validity of the PPP theory regarding the extent of ERPT in small, open and less developed economies. According to the existing relevant literature, the pass-through from movements in exchange rate to domestic prices is generally greater in small open economies with a relatively high share of traded goods, high import, and limited local substitutes. Since such characteristics highly fit the nature of GCC economies, one would expect a relatively high degree of ERPT (detailed analysis of the GCC region trade pattern is presented in section 6).

The common view that pricing to market strategy (PTM) is less likely by importers in developing economies, further stresses the plausibility of a relatively large degree of ERPT in the GCC countries. Under such a view, consumers in developing countries are viewed as price takers, as foreign suppliers set their prices at a constant mark-up over costs. Local importers, on the other hand, in an attempt to protect their profit, adjust consumer prices to completely offset any changes in exchange rates[80]. Accordingly, the transmission process between movements in exchange rates and consumer prices will be greatly influenced by the conditions of the economy (Frankel et al, 2005)[81].

In addition to the above characteristics, the presence of a pegged exchange rate regime to the US dollar is expected to accentuate the degree of ERPT in these economies[82]. If the US dollar depreciated against the major trading partners of the GCC countries, there would be a corresponding depreciation in the

[80] As a matter of fact, the mark-up set by the foreign producer depends primarily on the prices of domestic competing goods. However, given the fact that the production of import competing goods in the GCC economies constitutes a relatively marginal share in the GDP of each of these countries, it is assumed that the prices of competing domestic goods cannot influence domestic prices. Therefore, foreign prices are expected to be influenced mainly by foreign production costs and exchange rates (Ghars El-Din and Mohammed, 2005).

[81] The low PTM strategy in the developing countries explains why the majority of the studies in developing countries have emphasized the role of macroeconomic factors in influencing the pass-through.

[82] In contrast, others view fixed exchange regime as a monetary discipline that should lead to lower inflation by basically preventing the active use of monetary policy for achieving real sector objectives.

currencies of the GCC countries against other non-US dollar currencies. The depreciation in the exchange rates of the GCC currencies will get transmitted into higher prices of imported goods and services that will eventually lead to an increase in the general price levels given the weight of such commodities in the consumer price indices of the GCC countries. High ERPT would indicate that the economies of GCC countries have high dependence on external shocks in the world market and that the domestic prices in these economies are highly volatile, due to changes in the exchange rate (Dobrynskaya and Levando, 2008).

Furthermore, the high dependency of the GCC economies on foreign workers (from neighbouring countries like India, Pakistan, Indonesia, Egypt, *etc.*) has further accentuated the inflationary effect of the dollar peg (Willett et al, 2009). The recent economic growth in the area, following high revenues from a hike in oil prices, has led to economic development that resulted in higher demand for foreign labour in the GCC countries, given the low level of unemployment and the fact that most of the national labourers are being absorbed by the public sector. Given the supply bottlenecks, on account of limited agricultural production and manufacturing, recent higher migration of labourers into the GCC countries fuelled demand for various consumer goods (*e.g.* food stuffs) that are mainly imported, thus, magnifying supply constraints and eventually enhancing the increase in domestic prices (Marzovilla et al. 2010).

Moreover, another influence of higher dependency on foreign labour on domestic prices of the GCC countries is believed to have been transmitted through demand for higher wages (Gulf Talent, 2007). The depreciation of the US dollar has lowered the value of wages, and as results the purchasing power of the foreign workers' remittance decreased. That has made it difficult to attract/retain staff, particularly skilled and highly qualified workers, in the GCC countries, thus resulting in a price-wage spiral (Ghars El-Din and Mohammed, 2005).

Based on the monetary theory, the decline in the exchange rates can lead to an increase in the domestic prices only if it is being accommodated by the monetary authority, which lowered interest rates and increased aggregate demand and output (Hafer, 1989). In fact, by considering the current scenario of the GCC economies, we can see that the monetary stance in the GCC countries has been accommodative to the decline in the effective exchange rates of these countries' currencies vis-à-vis the currencies of their other non-US trading partners. As the Federal Reserve Bank started to decrease its short term rate in a precautionary step to avoid any recessionary tendencies in the economy, in the aftermath of the 11th of September 2001 and the sub-prime market crisis in September 2007, the exchange rate of the US dollar has generally declined (compared to its level prior to the attack) against other major currencies in the world[83]. As a result, the exchange rates of the GCC countries' currencies have exhibited a corresponding decline in relation to other non-US currencies (figure 9). Moreover, given the fixed regimes with the US dollar, the monetary authorities in the GCC countries have been tracking the monetary changes in the US by similarly lowering their short term interest rates, thus accommodating the demand for higher nominal money balances due to lower real money because of the depreciation[84].

Further, relevant to the pegged exchange rate of the GCC countries' currencies is also the current scenario of buoyant economic growth following high revenues from the increase in the demand and prices of oil (MacDonald, 2010). The recent development in the region, in the form of rapid economic growth due to massive revenues because of a hike in oil prices, has necessitated the use of stringent monetary policy, in order to contain inflationary responses to the expansion of monetary circulation. However, given the peg with US dollar, the GCC countries were forced to align their interest rate with that of the US, in order to resist any appreciation due to speculation in the form of capital inflow. That, in turn, has motivated further borrowing and credit expansion and further fuelled the inflationary pressure of the oil surpluses recorded by the GCC countries. Given the policy constraint under the peg system, there were fewer incentives for the GCC economies to depend on monetary policy to curb inflation. Such a situation reflects a divergence in the business cycles of the GCC countries and the US and suggests a fundamental role on inflation rates of these economies from changes in the exchange rate of their domestic currencies (Marzovilla et al. 2010).

Based on the above explained link between exchange rate and domestic price level and the given facts about the conditions of the GCC economies, we would infer that the inflation rates in these economies are significantly influenced by the changes in the exchange rates of these countries' currencies. Accordingly, in this paper we would like to formally test the validity of such a hypothesis in the

[83] Particularly, since 2002 the US dollar has lost around 40 percent of its value vis-à-vis a basket of major currencies, weighted by their countries' trade with the US.

[84] Ito et al (2005) have empirically found the accommodating monetary policy in Indonesia following the Asian crisis during 1997-98 to be a significant factor on the high domestic inflation, relative to other Asian countries that were affected by the crisis.

context of the GCC economies. Our null hypothesis is that there is high pass-through (almost complete, at least in the long-run) from changes in exchange rate to inflation rate in the GCC economies.

4. Estimation Model

Generally, the econometric methods that have been used to estimate the pass-through from exchange rate to inflation can be broadly divided into four categories: single equation models, VAR models, structural macroeconomic models, and open-economy dynamic stochastic general equilibrium (DSGE) models (Mwase, 2006). Furthermore, single equation econometric methods are the most widely used in the literature (Goldberg and Knetter, 1996, Amato et. al, 2005, Bache, 2007). In pass-through regression a price index (import price index, consumer price index, or producer price index) is regressed against the exchange rate plus other hypothesised determinants of prices. However, according to Menon (1995), who carried out a comprehensive survey on the relevant empirical literature, the earlier studies have suffered from some deficiencies in the econometric part, which shed some doubt on their results. According to Menon (1995), most of the earlier studies on ERPT used traditional single equation methods that did not properly take into account the time series properties of the variables, e.g. the non stationary nature of the data. Specifically, the variables used in a great number of the 46 studies that were surveyed by Menon (1995) were non-stationary, so the regression estimates of the studies may have been spurious.

However, an alternative technique, which is becoming increasingly popular, is the system approach (Mwase, 2006, Bache, 2007). The major difference in structural vector auto regressions (VARs) is that they do not a priori assume any exogenous variable and treat each variable as endogenous. Accordingly, each endogenous variable becomes a function of all lagged endogenous and exogenous variables in the system. Most of the VARs used to estimate the pass-through typically include a nominal exchange rate variable, one or several sets of price indices (typically, import prices, producer prices, and consumer prices), plus some other additional variables like oil prices, output gap, money and interest rates. The impulse responses analyses from VAR provide the degree and speed of pass-through from shocks to price indices. VAR is also used to analyse the importance of different macroeconomic shocks on domestic prices.

Accordingly, given the popularity of both the single equation technique and the VAR method in measuring the ERPT and given the deficiencies in many previous studies, we will use an Ordinary Least Square model (OLS) and a Vector Error Correction Model (VECM) to analyse the pass-through relationship between exchange rate and inflation rate within the context of the GCC countries. However, in this chapter we will only focus on measuring the extent of ERPT using the OLS technique. In the next chapter, chapter four, we will re-estimate the extent of ERPT using a VECM. The policy implications, summary and conclusions from the analysis of the ERPT in the GCC countries will be presented at the end of chapter four.

Further, the popularity of the single equation specifications makes such techniques amenable to comparison with other recent empirical analysis of pass-through to domestic prices (*e.g.* Mihaljek and Klau 2001, Campa and Goldberg 2005, Choudhri and Hakura 2006, Khundrakpam 2007, Ceglowski 2010, Takhtamanova 2010) since most have been based on the estimates of single equation models. In our model we basically follow the literature and use the following pass-through relation[85]:

$$\log P_t = \alpha_0 + \alpha_1 \log P_{t-1} + \alpha_2 \log S_t + \alpha_3 \log P_t^* + \alpha_4 \log P_t^{oil} + \varepsilon_t \qquad (3)$$

Where P_t is the domestic CPI, S_t is the nominal effective exchange rate, P_t^* is the trading partner CPI, P_t^{oil} is the oil price, and ε_t is the error term. The lagged price variable of home index indicates an adaptive inflation expectation approach and it allows us to distinguish between short term and long term pass-through. The short term exchange rate pass-through is given by α_2 and the long run by $\alpha_2/(1-\alpha_1)$. Taking into account the lagged effect of the independent variables and using small letters to indicate logs the following inflation equation is produced:

$$p_t = \alpha_0 + \sum_{k=1}^{L} \alpha_{1,k} p_{t-k} + \sum_{k=0}^{L} \alpha_{2,k} s_{t-k} + \sum_{k=0}^{L} \alpha_{3,k} p_{t-k}^* + \sum_{k=0}^{L} \alpha_{4,k} p_{t-k}^{oil} + \varepsilon_t \qquad (4)$$

[85] Our reduced form equation for the pass-through relationship follow generally the literature that modelled inflation as a function of current and lagged changes in exchanges rate and other control variables, suggested by the economic theory, that capture changes in unit cost of exporting firm as well as changes in the level of economic activity in the importing country.

Equation (4) will be estimated for each country. Different information criterion will be used to determine the optimal lag order for each variable in the equation (4). From a comparison point of view, we will replicate the estimation of the equation (4) using aggregate import price index and producer price index. Testing our hypothesis will take the following form:

1) Short-run ERPT:

$H_{0:}$ $\sum \alpha_{2i}$ = 0 (No Pass-through)

$H_{1:}$ $\sum \alpha_{2i}$ $\neq$ 0 (Pass-through exists)

2) Long-run ERPT:

H_0: $\sum \alpha_{2k} /(1-\sum \alpha_1)$ = -1 (Complete ERPT)

$H_{1:}$ $\sum \alpha_{2i} /(1-\sum \alpha_1)$ < -1 (Incomplete ERPT)

5. Data Description

It is necessary to note at the outset that similar to many other developing countries, the GCC countries suffer from a data availability problem. In particular, high frequency time series are mainly available only from the beginning of the current decade onwards. All our data are time series with monthly frequency for the period January 2000 to December 2008. The rationale for such a period is primarily because the US dollar, to which the currencies of the GCC countries are pegged , have showed some significant persistent fluctuations during that period, thus providing fertile atmosphere to test the extent of ERPT in the economies of these countries. The main sources of the data are the International Financial Statistics (IFS), IFS Direction of Trade Statistics, and the central banks of the examined countries. Due to lack of data for Qatar and UAE, the test will be confined to four GCC members; Bahrain, Kuwait, Oman, and Saudi Arabia. However, given the similarity in the structure and conditions of the economies of the GCC state members-large share of oil production in total, dependency on oil exports, highly import-dependent, and similar trading partners' weights, the inferred implications from the estimated results of the examined country members can be applied to the entire GCC area.

Further, consistent with the IMF, we define NEER as the foreign currency price per local currency, so an increase in it would indicate an appreciation. Moreover, since we intend to capture the total effect of exchange rate changes in countries with diversified trading partners, NEER is considered the appropriate measure instead of the bilateral exchange rate vis-à-vis the US dollar, which is used in many other studies Ito et al. (2005). For the trading partner CPI, we used World CPI. We followed other studies (*e.g.* Campa and Gonzalez, 2005) that have assumed, based on the integration of international markets, that there exists a single market for each product, regardless of its origin, destination or currency of domination[86]. We will also try to include some dummy variables to account for some events like the Iraqi war (2003).

Furthermore, we used oil prices as a proxy for output gap or the status of the business cycle in the GCC economies. One reason behind that is primarily the lack of consistent monthly data for real activity measures (*e.g.* real GDP, industrial production, etc.) for the countries of our sample. Second reason is that due to the pro-cyclicality of the aggregate economic activity of the GCC countries to changes in oil prices, we think that oil prices can be used as a good representative for short-run changes in the business cycle of these economies[87]. The use of oil prices can also serve to control for supply shocks.

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[86] Furthermore, other reason for using the World CPI as a proxy for foreign CPI includes the relatively large and diverse trading partners of the GCC countries.

[87] Also using a direct measure for excess capacity like output gap is not recommended in the case of our sample for number of reasons. First, it is generally known that information on excess capacity is not very reliable in several countries, particularly developing, and is difficult to find. Second, Output gap, which is the difference between actual out and potential output where the latter is unobservable variable that reflects the maximum output an economy can sustain without inducing inflation (Mwase, 2006), has a measurement issue in the context of our sample. It is generally debatable whether lower income economies and relatively smaller and more open ones, like the case of our sample, have reached their potential level or display unused long run capacity. According to Hasan and Alogeel (2008) the large contribution of oil in the GDP of the GCC countries may affect the accuracy of measuring the GDP gap due to the fact that if changes in real GDP because of changes in the production of oil are not reflected into higher government expenditure, it would not affect local demand and thus would not results into higher inflationary pressures.

6. Trade Pattern of the GCC Economies

Analysing the trade pattern of the GCC economies is viewed necessary to further understand the nature of the pass-through relationship in the economies of the GCC countries. In particular, from analysing the international trade of these economies we are able to visualise the expected results from formal tests, in terms of significance.

In the wake of large revenues from the prolonged rise in oil prices during the period of our review, trade by the GCC economies has increased substantially. From 2000 to 2008, exports in most of the the six GCC countries more than tripled, as can be seen from figure (2). In absolute terms, Saudi Arabia and UAE registered the highest exports among the block as of 2008, with total exports of around USD 313.5 billion and USD 231.6 billion, respectively. Collectively, the total export of goods of the GCC region rose dramatically from USD 175 billion in 2000, and grew to USD 752 billion in 2008. However, around 70% of these exports are dominated by hydrocarbon products. As a share of nominal GDP, total exports for the individual GCC countries stood at average of around 70 percent as of 2008, with annual growth of around 6.5 percent between 2000 and 2008, notwithstanding the significant expansion in theses economies' GDP (figure 3 and 4). That reflects the importance of exports on domestic production.

Similarly, imports have been buoyant in all the GCC countries, with a recorded growth of more than 200 percent in most of them between 2000 and 2008 (figure 5). Collectively, total imports of the region have jumped from around USD 85 billion in 2000 to around 361 billion in 2008, with Saudi Arabia and UAE accounting for the majority of increases over the period. As a share of nominal GDP in 2008, total imports in each of the GCC economies formed, on average, around 40 percent, with an average yearly growth of around 3 percent between 2000 and 2008, notwithstanding the increases in these economies GDP (figure 6). This signifies the importance of imports in meeting the domestic consumption and investment demand in the economies of the GCC nations.

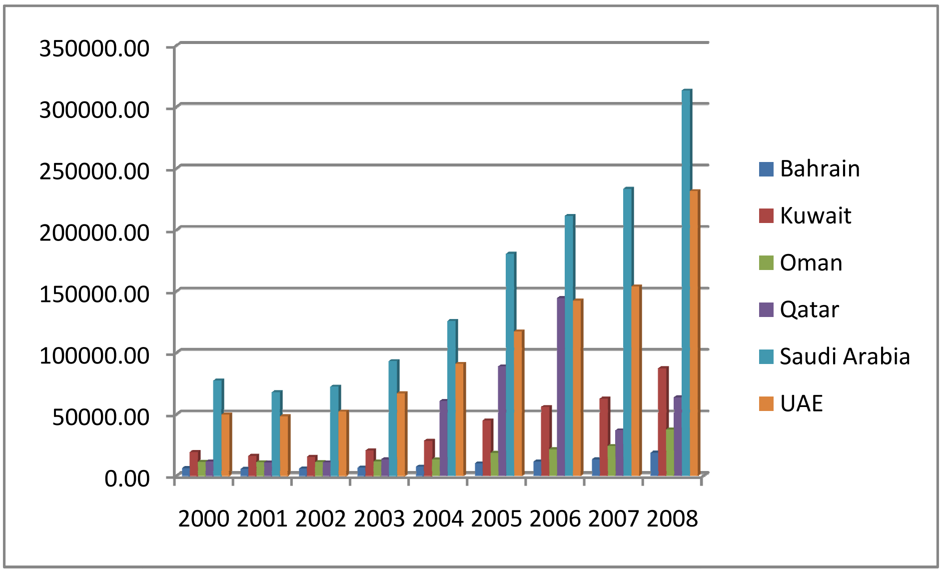
However, there is a very clear difference between exports and imports with respect to structure of goods traded and the geographical pattern of trade. The bulk of the GCC exports consist of hydrocarbon goods (oil and oil derivatives), which are mainly oriented towards Japan and emerging Asia (table 1). For example, in 2008, exports to Asian countries constituted around 60% of GCC countries' aggregate exports. Japan alone accounted for about 20% of the GCC economies' total exports. However, imports to the GCC countries are predominated by two regions, Asia and Europe, with around 40% and 30% shares from total GCC imports in 2008, respectively (table 2)[88]. Furthermore, the European markets are among the main beneficiaries from the increases in oil revenue of the GCC economies. The European area is the only region that maintains a trade surplus with the GCC block (figure 7). Machinery and mechanical appliances, vehicles and parts, electrical machinery and equipment formed the main imports to the GCC economies as of 2008[89]. Intraregional trade between the GCC countries is very limited and formed around only 7% of total trade in 2008. The limited intra-GCC trade is primarily attributed to the dominance of hydrocarbon products in the external balance of these economies and to low diversification in their economic structure.

Based on the GCC trade pattern and given the pegged exchange rate system that fixes the parities between the GCC countries' currencies and the US dollar as well as the persistent depreciation of the US dollar over the past five years against the major currencies in the world, one would expect some significant link, during the period of our sample (2000-2008), between changes in the nominal effective exchange rates of the currencies of the GCC countries and the domestic prices of these economies.

[88] In Asia, China is emerging as a major trading partner with the GCC countries, with respect to exports as well as imports (table 2 and 3).

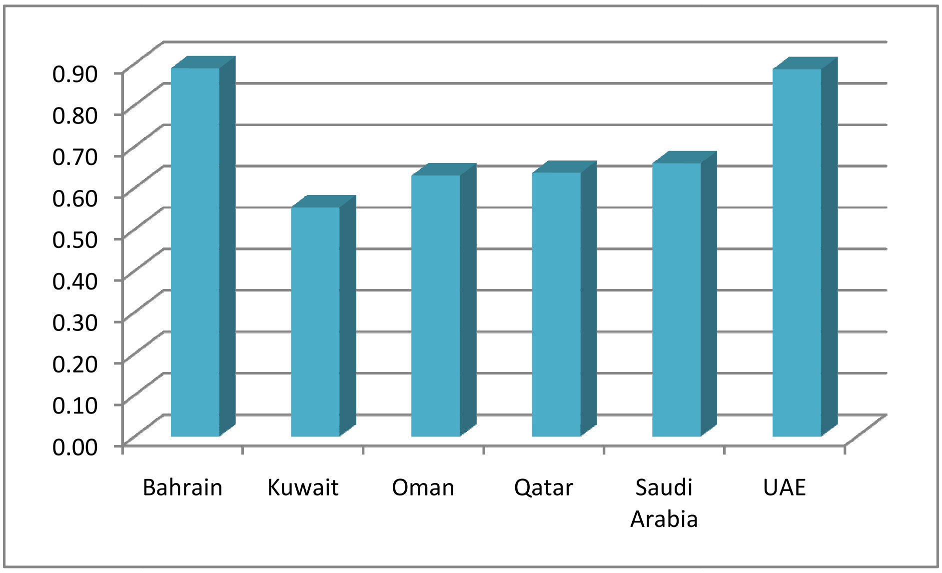
[89] Based on GCC central Banks annual reports of 2008.

Figure: 2 (GCC countries' exports)



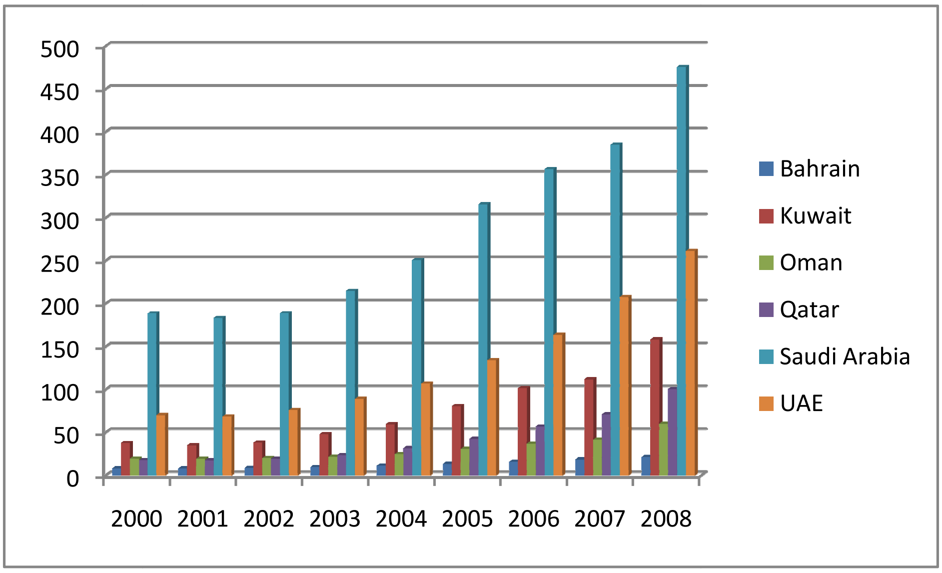
Source: International Financial Statistics, IMF

Figure: 3 (Ratio of GCC countries' exports over GDP as of 2008)



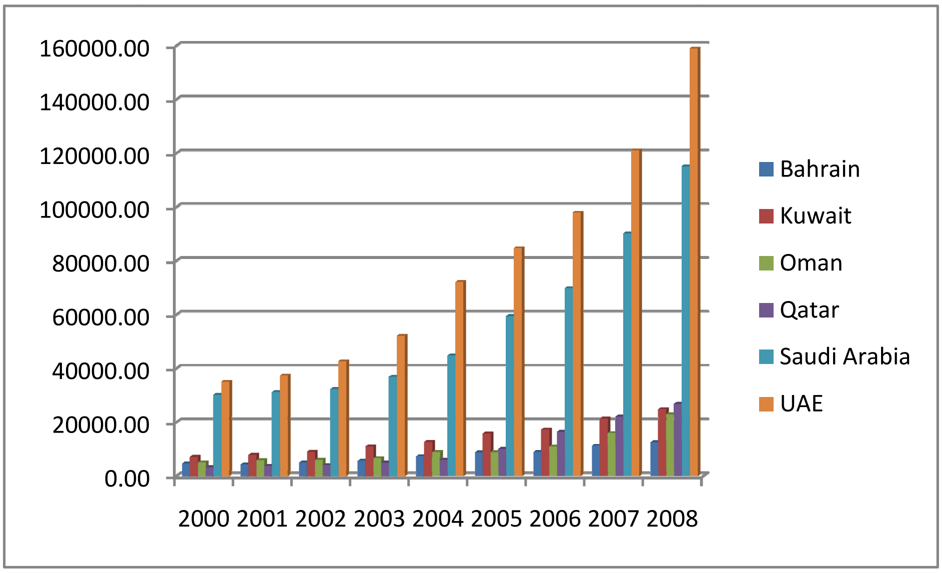
Source: International Financial Statistics, IMF

Figure: 4 (Nominal GDP of the GCC countries)



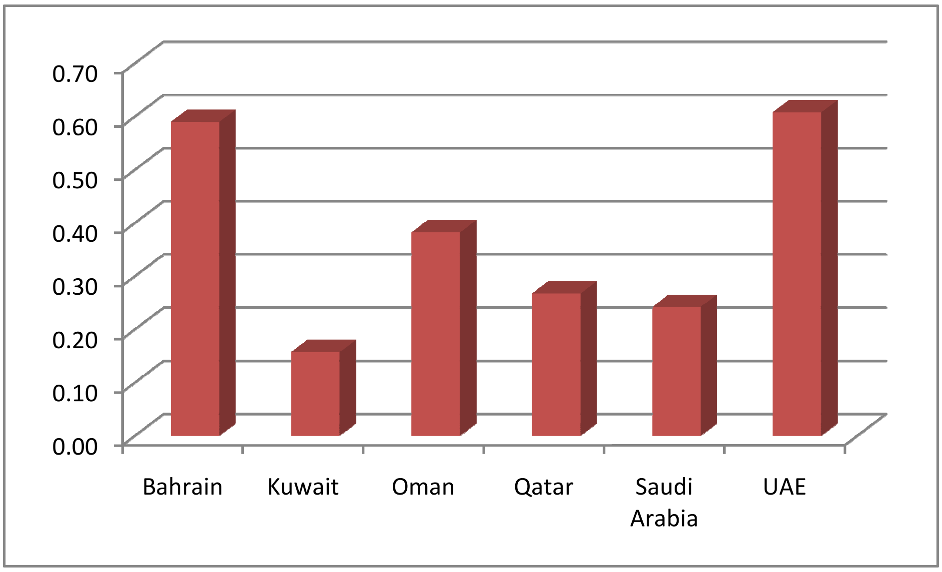
Source: International Financial Statistics, IMF

Figure: 5 (GCC countries' imports)



Source: International Financial Statistics, IMF

Figure: 6 (Ratio of GCC imports over GDP as of 2008)



Source: International Financial Statistics, IMF

Table: 1 (Direction of GCC countries' exports as of 2008)

	USA	Europe	GCC	China	Japan	Others
Bahrain	3%	6%	12%	1%	2%	76%

Kuwait	8%	6%	2%	5%	16%	63%
Oman	2%	1.00%	13%	29%	11%	44%
Qatar	1%	6%	5%	2%	38%	48%
Saudi Arabia	17%	11%	7%	9%	15%	41%
UAE	1%	3%	5%	2%	19%	70%

Source: Annual reports of the GCC countries' central banks.

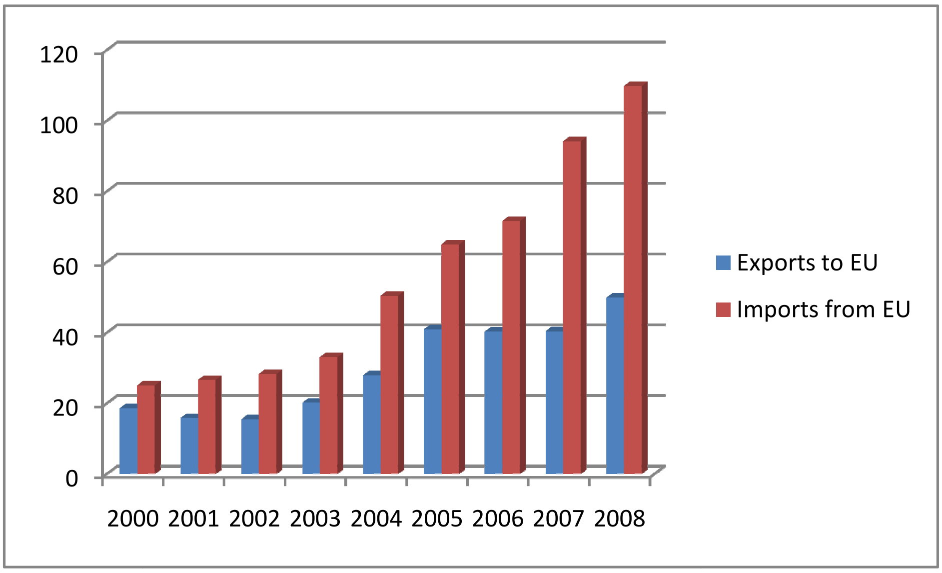
Table: 2 (Direction of GCC countries' imports as of 2008)

	USA	Europe	GCC	China	Japan	Others
Bahrain	7%	14%	29%	6%	8%	36%
Kuwait	11%	30%	9%	15%	10%	25%

Oman	6.00%	13%	31%	5%	16%	29%
Qatar	9%	36%	14%	7%	10%	24%
Saudi Arabia	14%	30%	4%	11%	9%	32%
UAE	10%	34%	5.00%	16%	8%	27%

Source: Annual reports of the GCC countries' central banks.

Figure: 7 (Trade between GCC and Europe)



Source: DOTS, IMF.

7. The Composition of CPI Baskets in the GCC Countries

We can also get an initial glance at the expected magnitude of the estimated pass-through from our formal test in the subsequent sections by attempting to decompose and analyse the commodities that make up the CPI indices in the GCC countries. The major items in the GCC economies' CPI baskets are food stuffs and beverages, rents and housing, and transport and communication. Each of these items constitutes not less than 15 to 20 percent in each of the GCC countries CPI baskets (table 3). Furthermore, food stuffs and rent and housing were behind most of the inflationary trends in the GCC countries over the past three years (table 4).

A number of factors have contributed to the acceleration in the indices of food stuffs and rent and housing in the GCC countries during the period of our sample. For example, the recent inadequate global supply of food items was one reason behind the significant rise in the indices of these items, as most of the consumed products and goods in the GCC economies are imported. The sustained depreciation of the US dollar against the major trading partners of the GCC countries, during the period of our sample, represented a second major reason for the rise in the domestic prices of food and any other imported commodity prices. A further pressure was created on the domestic prices of food stuff through rapid economic growth, due to high revenue from oil prices, that led to an unprecedented demand for additional expatriate work force[90], who in turn increased their share from imported goods and services. The large influx in expatriate labour due to the economic boom, has also been the primarily factor for the significant increases in the rent and housing indices in the GCC countries, particularly in Qatar and UAE (Sturm et al., 2008).

However, it is believed that the inflationary pressures experienced by the GCC economies during the period of our sample may not be completely reflected in the headline CPI of these countries. The reason for that has been the number of anti-inflationary measures introduced by the GCC countries in order to contain inflationary pressures. Given the limited role of their monetary policies due to the existing pegged systems, the GCC countries have resorted to some alternative tools to keep inflation in check. For example, imposing some administrated prices like announcing certain caps on permitted increases in house rents[91], introduction of further subsidies in consumption of certain essential commodities (e.g. water, energy, and food), lifting bans on certain importable items, and lowering or cancelling tariffs on certain imports, like steel. Further, the central banks in the GCC economies have further introduced additional measures like hikes in reserve requirement, tightening the lending ratio so to rein in fast credit growth, and increase in the volume of absorption of surplus liquidity through open market operations.

[90] Basically, labour markets in the GCC economies are fragmented between nationals and expatriates. Expatriates represent the lion share in the private sector, which is highly flexible, and form a large share in the total population. On the other hand, the majority of the nationals are employed in the public sector, which is highly rigid (Sturm et al. 2008, Willett et al. 2009).

[91] For example a maximum annual increase of 15% in Oman, 10% in Qatar, and 7% in UAE.

The above anti-inflationary measures that were imposed during the period of our sample suggest that the expected estimated pass-through from changes in the nominal exchange rates of the GCC countries to the inflation rates of these countries is likely to be limited and incomplete.

Table: 3 (Major items of the CPI baskets of the GCC countries)

	Kuwait	**Oman**	**Qatar**	**Saudi Arabia**	**UAE**
Food and beverage	19%	31%	18%	26%	15%
Rents and Housing	27%	22%	21%	18%	36%
Transport and Communication	16%	22%	23.4%	16%	15%

Source: Annual reports of the GCC countries' central banks

Table: 4 (Contribution in Inflation by major items of CPI baskets in the GCC countries)

	Food and beverage			**Rents and Housing**		
	2006	2007	2008	2006	2007	2008
Kuwait	24%	16%	20%	23%	37%	33%
Oman	51%	45%	53%	9%	28%	20%
Qatar	11%	10%	24%	45%	44%	28%
Saudi Arabia	64%	49%	39%	12%	51%	34%
UAE	9%	8%	15%	59%	56%	39%

Source: Annual reports of the GCC countries' central banks

8. Preliminary Data Analysis

During the period of our sample (2000-2008), the foreign exchange values of the currencies of the GCC countries have shown some persistent depreciation against the currencies of the major trading partners of these countries. According to figure (8), the NEERs of the GCC countries have declined considerably from the last quarter of year 2001 onwards. The primary reason for the decline is the pegging system of the GCC countries' currencies to the US dollar, which has weakened significantly during the period of our sample as depicted in figure (9)[92]. As of December 2008, cumulative depreciation in NEER, based on the average annual price index, over December 2001, stood at 20.89, 8.98, 16.64, 21.10, 20.11, and 17.98 for Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE, respectively[93]. Furthermore, figure (8) also reveals that the depreciations of the NEERs were associated with increasing inflation rates, as measured by the changes in the consumer price index, in the GCC economies. The 2008 year-end inflation rates, based on average annual consumer price indices, ranged from a single digit of 3.53 (Bahrain) to a double digit of 15.05 (Qatar) as compared to -1.22 (Bahrain) and 2.47 (UAE) over 2001 year-end (Table 5).

Further, another aspect that deserves mention from figure (8) is that inflation rates and the depreciations of NEERs have generally moved in opposite directions during the period of our sample, which confirms the hypothesis of the economic theory and provides further evidence for the link

[92] The persistent depreciation of the US dollar during the period of our sample is primarily attributed to a number of factors, including the continued narrowing of interest rate spreads between the US and other major trading partners of the US, and the greater uncertainty surrounding the economic outlook in the US, particularly after a number of events like the attack of 9/11, the increasing US deficit during the presidency period of W George Bush, and lately the sub-prime crisis that surfaced in middle of 2007 and intensified in 2008 (Annual Report, 2008, Central Bank of Oman).

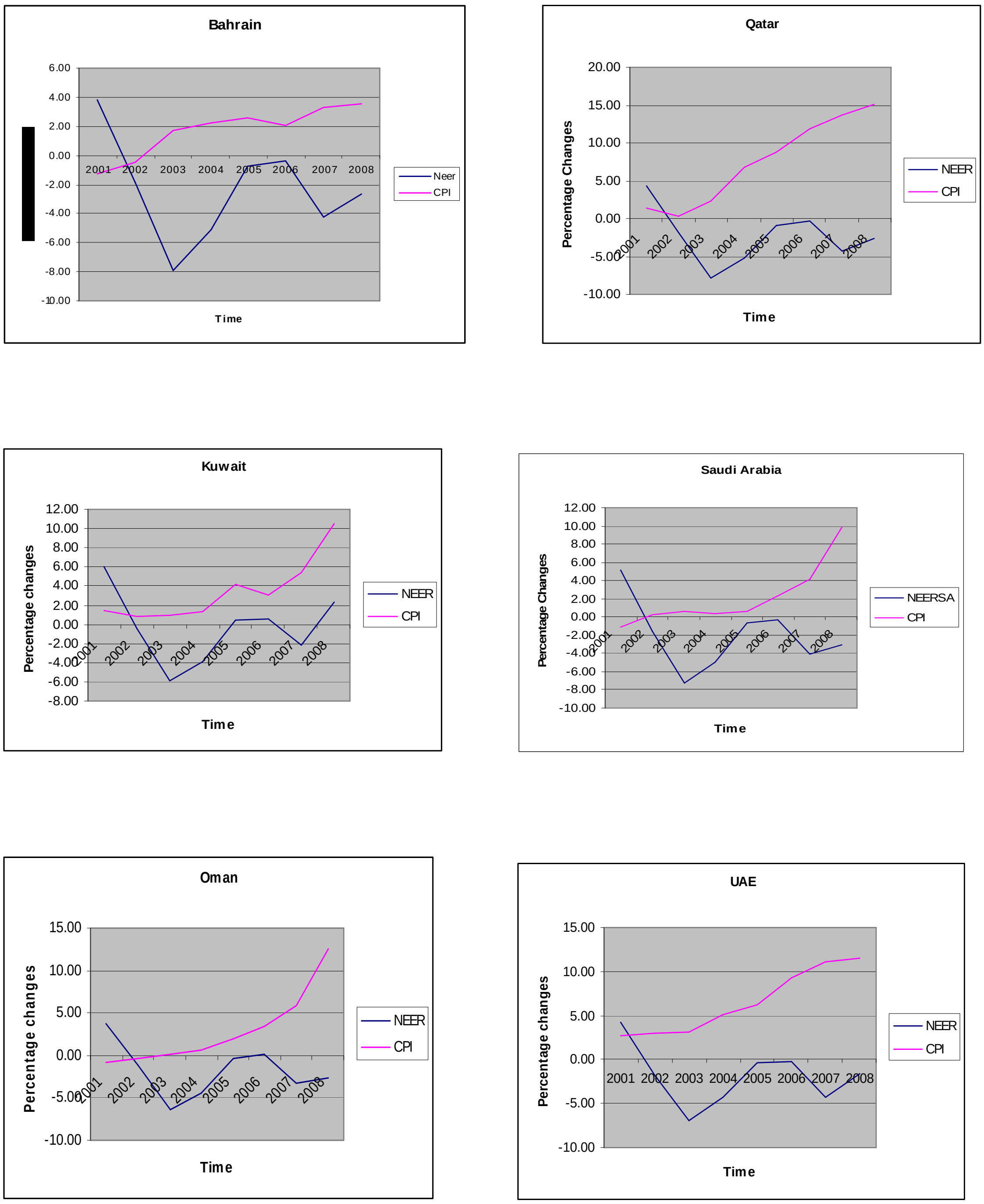
[93] The relatively lower depreciation of the Kuwaiti Dinar exchange rate is primarily due to the fact that this currency is not bilaterally fixed to the US dollar, but to a weighted basket of currencies, in which the US dollar is believed to form the major part given that most of the Kuwaiti exports (oil) are priced in US dollars and limited fluctuation occurred vis-à-vis the US dollar, and subsequently the fluctuations vis-à-vis GCC countries' currencies (Sturm and Siegfried, 2005).

between CPI inflation and exchange rate. However, movements in exchange rates and inflation rates were not simultaneous. Inflations in GCC countries started to increase slowly after some lags of at least six months and accelerated from 2007 onward in all the GCC economies with the exception of Qatar and UAE, where inflation picked up relatively quickly[94]. Moreover, despite that there were some ups (appreciations) in the exchange rate at some points of time in our sample period, however, inflation rates generally continued to increase in all the GCC countries with the exception of Bahrain and Kuwait, where there were some lagged declines in the inflations rates (figure 8, and Table 5). Accordingly, one could infer that depreciation in GCC economies can translate into a permanent increase in inflation rates (through expectation most probably). Nonetheless, this inference is unjustified as the sample of our period is characterised by an increase in the price of oil and partner inflation as well as persistent domestic demand, which is normally pro-cyclical to oil prices in the case of our sampled countries. Table (5) clearly indicates that the rising inflation rates during the period of our sample coincides with increases in oil prices and partner inflation, suggesting generally the important role of external and supply side factors in influencing the inflationary pressures in the GCC economies, as explained in the previous section. Yet the presence of other potential sources for inflation in the GCC countries during the period of our sample cannot rule out the important influence of movement in NEERs on inflation rate in these economies, as depicted in figure (8) and table (5) and as have been admitted/reported by the central banks of these countries and the Public Information Notices (PINs) of the IMF over the late years[95].

[94] The difference in inflation performance in these two countries compared to the rest of the block is owed primarily to the boom in the real estate sectors during our sample period, that have driven up the rent prices in these two economies, and to a lesser extent their comparatively faster growing economies in recent years.

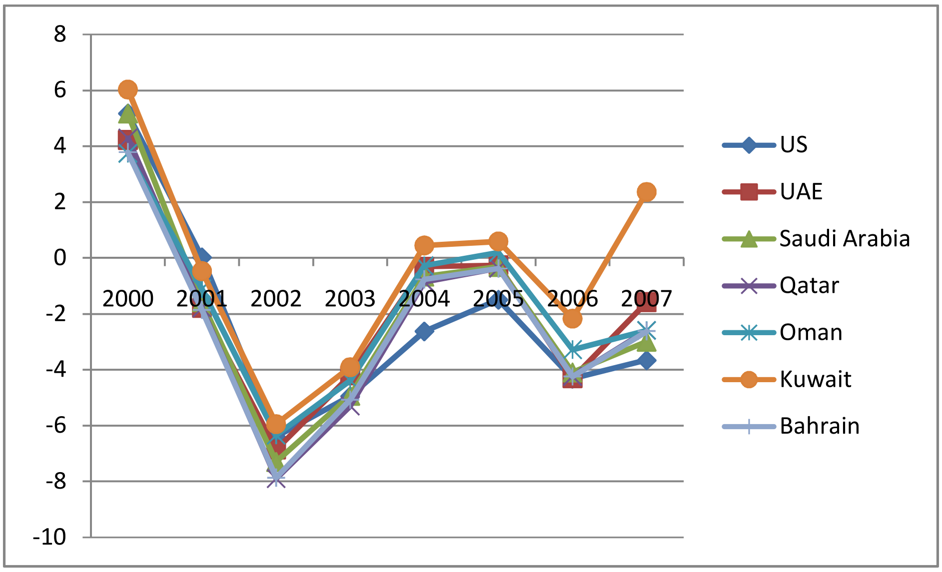
[95] E.g. see the annual report of the central banks of the GCC countries for the past three years.

Figure: 8



Source: IFS Statistics, IMF.

Figure: 9 (movement in NEER for US and the GCC countries)



Source: IFS Statistics, IMF.

Table: 5 (Summery Statistics:

Average Annual Percentage Changes)

Country	**Nominal Effective Exchange Rate**	**Consumer Price Index (CPI)**	**Partner CPI**	**Oil Price**
Bahrain				
2001	3.78	-1.22	4.06	-13.76
2002	-1.86	-0.50	3.36	2.41
2003	-7.86	1.68	3.65	15.41
2004	-5.08	2.25	3.57	32.74
2005	-0.77	2.62	3.63	42.14

2006	-0.38	2.04	3.52	20.12
2007	-4.24	3.25	3.84	11.20
2008	-2.62	3.53	5.64	34.31
Kuwait				
2001	6.03	1.45	4.06	-13.76
2002	-0.47	0.80	3.36	2.41
2003	-5.94	0.99	3.65	15.41
2004	-3.91	1.26	3.57	32.74
2005	0.45	4.12	3.63	42.14
2006	0.59	3.09	3.52	20.12
2007	-2.17	5.47	3.84	11.20
2008	2.37	10.50	5.64	34.31
Oman				
2001	3.74	-0.84	4.06	-13.76
2002	-1.11	-0.33	3.36	2.41
2003	-6.34	0.17	3.65	15.41
2004	-4.39	0.67	3.57	32.74
2005	-0.28	1.85	3.63	42.14
2006	0.19	3.44	3.52	20.12
2007	-3.28	5.89	3.84	11.20
2008	-2.59	12.61	5.64	34.31
Qatar				
2001	4.28	1.44	4.06	-13.76
2002	-1.80	0.24	3.36	2.41
2003	-7.90	2.26	3.65	15.41
2004	-5.30	6.80	3.57	32.74
2005	-0.86	8.81	3.63	42.14

2006	-0.37	11.83	3.52	20.12
2007	-4.24	13.76	3.84	11.20
2008	-2.60	15.05	5.64	34.31
Saudi Arabia				
2001	5.16	-1.14	4.06	-13.76
2002	-1.58	0.23	3.36	2.41
2003	-7.30	0.59	3.65	15.41
2004	-4.93	0.36	3.57	32.74
2005	-0.67	0.63	3.63	42.14
2006	-0.32	2.31	3.52	20.12
2007	-4.10	4.11	3.84	11.20
2008	-3.00	9.87	5.64	34.31
UAE				
2001	4.21	2.74	4.06	-13.76
2002	-1.80	2.93	3.36	2.41
2003	-6.86	3.16	3.65	15.41
2004	-4.21	5.02	3.57	32.74
2005	-0.32	6.19	3.63	42.14
2006	-0.26	9.27	3.52	20.12
2007	-4.31	11.12	3.84	11.20
2008	-1.59	11.45	5.64	34.31

Source: The World Economic Outlook, IMF

9. Unit Root Test

Our first step in the estimation process is to determine the order of integration of the variables. We have applied two unit root tests namely the Augmented Dickey-Fuller (ADF) test and the Phillip-Perron (PP) test[96]. The general form for the ADF test, including a constant and a linear trend, is presented in equation (5). Optimal lags were selected using Schwarz Criterion (SIC). With respect to the PP test, we selected the truncation lag for the variance estimate test by the rule of thumb suggested by Newey-West. The summary for the unit root tests is given in table (6). It is clear that all the variables are non-stationary at their level, however, their first difference is integrated of order zero I(0).

$$\Delta y_t = a + \alpha t + \beta y_{t-1} + \sum_{i=1}^{p} \delta_i \, \Delta y_{t-i} + u_t \qquad (5)$$

[96] The PP test is a modification of the ADF t statistics that takes into account the less restrictive nature of the error terms (Asteriou and Hall, 2007).

Table: 6 (Unit Root Tests)

Country	**ADF**		**PP**		**Integration**
	Constant	Trend	Constant	Trend	
Bahrain					
LCPI	(0) -2.89**	(0) -0.02	(6) -2.39	(6) -0.29	I(1)
DLCPI	(4) -1.92	(0) -12.36***	(7) -11.98***	(6) -12.34***	I(0)
LNEER	(1) -1.02	(1) -2.67	(4) -0.87	(4) -2.41	I(1)
DLNEER	(0) -7.07***	(0) -7.04***	(0) -7.08***	(0) -7.04***	I(0)
Kuwait					
LCPI	(0) 4.35	(0) 1.23	(6) 5.34	(5) 1.76	I(1)
DLCPI	(0) -9.80	(0) -11.13***	(6) -10.17***	(2) -11.08***	I(0)
LNEER	(0) -1.30	(1) -2.46	(3) -1.38	(3) -2.28	I(1)
DLNEER	(0) -8.02***	(0) -7.98***	(2) -7.96***	(2) -7.62***	I(0)
Oman					
LCPI	(0) 9.33	(0) 2.94	(3) 8.82	(2) 3.05	I(1)
DLCPI	(4) -1.02	(0) -8.60***	(5) -5.65***	(5) -8.90***	I(0)
LNEER	(1) -0.97	(1) -2.57	(4) -0.87	(4) -2.56	I(1)
DLNEER	(0) -7.83***	(0) -7.80***	(2) -7.82***	(2) -7.79***	I(0)
Saudi Arabia					
LCPI	(0) 8.17	(0) 2.70	(6) 6.09	(5) 2.16	I(1)
DLCPI	(5) -1.39	(5) -2.09	(7) -6.65***	(7) -9.42***	I(0)
$DLCPI^2$	(4) -7.62***	(4) -7.54***			I(0)
LNEER	(1) -0.98	(1) -2.77	(4) -0.90	(4) -2.66	I(1)

DLNEER	(0) -7.48***	(0) -7.44***	(1) -7.48***	(1) -7.46***	I(0)
Common Var.					
LWPI	(0) 0.97	(3) -2.48	(5) 1.04	(5) -2.76	I(1)
DLWPI	(1) -4.82***	(2) -4.81***	(5) -10.76***	(5) -10.96***	I(0)
LIMP	(0) 2.03	(0) -1.50	(1) 2.40	(2) -1.29	I(1)
DLIMP	(0) -11.57***	(0) -12.57***	(6) -11.48***	(0) -12.57***	I(0)
LFCPI	(1) -0.51	(1) -2.96	(5) -0.13	(5) -2.21	I(1)
DLFCPI	(0) -4.57***	(0) -4.52***	(4) -4.71***	(4) -4.66***	I(0)
LOP	(1) -1.26	(1) -1.84	(4) -1.29	(4) -1.86	I(1)
DLOP	(0) -8.26***	(0) -8.25***	(3) -8.31***	(3) -8.30***	I(0)

Note: Figures in brackets next to statistics represent number of lags in the test, *, **, *** denotes significance at 10%, 5%, and 1% levels respectively. CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = partner consumer price index, WPI = producer price index, OP = Oil price, L = log, D = first difference.

10. Correlation analysis[97]

To further assess the dynamic relationship between inflation rate and exchange rate in the GCC economies we performed cross correlation tests [98]. The cross correlation results in table (7) confirm earlier observation about the movement between exchange rate and inflation rate in the GCC countries and reveal further information about the magnitude of the link between these two variables. It can be

[97] Due to data availability in Qatar and UAE, our analysis from this section onward will be focused on four GCC countries namely, Bahrain, Kuwait, Oman, and Saudi Arabia. However, as mentioned earlier, the inferred implications from the estimated results of the four sampled countries can be applied to the entire GCC area given the similarity in the structure and conditions of the economies of the GCC state members.

[98] Due to the fact that the economic theory predicts lagged relationship between changes in exchange rate and changes in inflation rate, the simple correlation coefficient is viewed inadequate to characterise the link between the two variables (Tsay, 2002).

observed from table (7) that there is a significant lagged relationship between changes in exchange rate and inflation rate. However, this dynamic relationship is generally weak as evident from the low coefficients of correlation in the significant lags. The significant correlations range in between negative 0.27 to positive 0.27. The relatively higher coefficient of correlations in Bahrain and Kuwait at lag one reflects that changes in exchange rates filters more quickly into inflation rates in these two countries as compared to the other two countries in the sample. Moreover, the positive coefficient of Kuwait at lag one contradicts the PPP theory, given our definition of NEER. However, the positive sign suggests that appreciation increases the purchasing power of domestic savings (the wealth effect), leading to more spending and higher inflation (Kandil and Mirzaie (2002). Generally, the low correlation coefficients initially suggest that inflation in the GCC countries is not strongly influenced by fluctuations in exchange rate.

Table: 7 (Correlation between changes in NEER and inflation rate; $DCPI_{t+i}$)

	Country			
Period	Bahrain	Kuwait	Oman	Saudi Arabia
$DCPI_t$	-0.01	0.02	0.03	-0.07*
$DCPI_{t+1}$	-0.27***	0.27***	-0.01	0.06*
$DCPI_{t+2}$	-0.05*	0.15*	0.04	-0.01
$DCPIi_{t+3}$	-0.06*	-0.01	0.08*	-0.11*
$DCPI_{t+4}$	-0.01	0.04	0.00	-0.01
$DCPI_{t+5}$	-0.05*	0.01	0.03	-0.15**
$DCPI_{t+6}$	-0.09*	-0.02	0.08*	-0.09*
$DCPI_{t+7}$	0.00	0.08*	0.02	-0.05*
$DCPI_{t+8}$	-0.10*	-0.03	-0.02	0.01
$DCPI_{t+9}$	-0.13*	0.10*	-0.07*	-0.02
$DCPI_{t+10}$	-0.17**	0.02	0.07*	0.00
$DCPI_{t+11}$	-0.06*	0.07*	0.04	0.04

$DCPI_{t+12}$	-0.10*	0.02	0.09*	0.01

Note: *, **, *** denotes significance at 10%, 5%, and 1% levels respectively. D stands for changes in consumer price index (first difference).

11. Ordinary Least Square (OLS) Estimation

Given the results from the unit root tests, we estimated our OLS model with first differenced variables. By estimating the model in first differences we are ignoring the possible co-integration among the variables. The OLS regression was used for each country separately to estimate the extent of the pass-through. Furthermore, since we have a reasonably large sample, we applied the Newey-West Autocorrelation and Heteroscedasticity to correct the OLS standard errors for autocorrelation and heteroscedasticity (Gujarati, 2003). We relied on the available information criterion (e.g. AIC and SIC, etc) to decide on the optimal lag length for the explanatory variables. Generally, the optimal lag length for the countries in our sample ranged between a minimum of 5 (for Kuwait) and a maximum of 8 lags (Bahrain).

Table (8) summarises the results from the OLS estimation (Detailed OLS results are presented in Appendix 2). As per the estimation results, it appears that the depreciation of exchange rates of the GCC countries currencies is associated with increases in final goods prices in the short-run, as evidenced by a number of significant coefficients of the exchange rate, which reject the null hypothesis. Also, the results provide further support for the theoretical assumption regarding the lagged effect of changes in the exchange rate on inflation. Nonetheless, the estimated short term pass-through from exchange rate to inflation is very modest as the significant negative coefficients of exchange rate ranged between a minimum of 0.03 (Bahrain) to a maximum of only 0.16 (Oman). Accordingly, a 10 percent depreciation in the exchange rate increases inflation (measured by changes in consumer price index) rates by 0.3 to 1.6 percent in the short run in the GCC economies. Furthermore, such an increase in the inflation rate following depreciation in exchange rate is expected to take effect not before a lag of at least one to three months.

The calculated long-run pass-through, relying on the estimated coefficients from the OLS regressions, is 13%, -15%, -69%, and -10% for Bahrain, Kuwait, Oman, and Saudi Arabia, respectively. These figures clearly suggest the rejection of our second hypothesis for the complete pass-through from exchange rate to inflation rate as they are (the figures) less than 100%, hence confirming our earlier expectation from the analysis of the GCC countries' CPI baskets. Furthermore, a Wald test was performed to double check for complete ERPT in the long-run in the GCC economies. However, the hypothesis for full pass-through was rejected as the P-values were almost zero for all the countries. Hence, suggesting that the PPP theory does not hold for the GCC economies.

Further, the magnitude of the calculated long-run pass-through for Oman is quite puzzling given the similarity in economic structure between the GCC countries, particularly if we consider the structure of imports during our sample period (table 9). However, generally the results suggest that in the long-run, the impact from exchange rate changes to inflation rates in the GCC countries range, in absolute terms, between a minimum of around 10% to a maximum of around 69%, with an average of around 27%.

In terms of robustness, we tried to examine the sensitivity of the above results to some variation in the specification of equation (4). Oil prices in the case of our sample might not be considered to be a good representative of exogenous shocks because they were controlled by the state during the period of our sample, resulting in a cushioning of the impact of international price shocks on domestic energy prices. Furthermore, given the significantly high correlation between changes in the variables of oil prices and trading partners CPI (table 10), we have re-estimated our above OLS regressions for each country in our sample without the oil price variable. We have also re-estimated the regressions by including a dummy variable to account for the Iraqi War in 2003. However, we did not find very significant changes in the extent of pass-through from exchange rate to consumer prices under both the above suggested alternatives in specification.

In order to compare the ERPT on inflation with ERPT on other aggregate domestic prices, we replicated the OLS estimation but with import price index and producer price index as dependant variables. Tables (11) and (12) report the results from the OLS regressions for producer prices and import prices, respectively. It may be noted that in both tables, almost all the coefficients of exchange rate are correctly signed and statistically significant, particularly, those from the regressions of import prices. As per the result in table (11), producer prices are more elastic then consumer prices since coefficients of exchange rate are significant during the first month from changes in exchange rate, in the majority of our sampled countries. Nearly half the adjustment in producer prices, following changes in exchange rate, takes place in three months time and full adjustment occurs within the first seven months time in all four countries. Furthermore, the magnitude of changes in aggregate producer index following exchange rate changes, albeit less than one, is relatively higher than our above estimated changes in inflation rate. This is expected since producer price index is assumed to contain higher share of traded goods than CPI index.

With regard to import prices, our estimated pass-through in all four of our sampled countries is considerably higher than the above estimation for producer prices and consumer prices. Around 50 to 80 percent of adjustments in import prices occur within the first month following changes in exchange rate and around 40 to 60 percent of adjustments take place in the second month, suggesting an accumulated change of more than 100 percent. Out of the aggregate price indices, the import price index in each country in our sample is the most elastic and the highest in reaction to changes in exchange rate. This of course can be explained by the fact that the import price index includes the largest share of tradable goods compared to producer price and consumer price indices. The results also suggest that the pass-through from whole sale price to consumer price is low.

Table:8

OLS estimation for the effect of changes in exchange rate on inflation rates in GCC economies (2000: 01-2008:12)

	Country			
Variable	Bahrain	Kuwait	Oman	Saudi Arabia
DL(NEER)	0.01	0.00	-0.06	-0.02
DL(NEER),-1	0.00	-0.06	0.11***	-0.02
DL(NEER),-2	0.01	-0.04	-0.11***	0.00
DL(NEER),-3	0.02	-0.13*	0.03	0.00

DL(NEER),-4	-0.04	-0.05	0.05	-0.04*
DL(NEER),-5	0.00	0.07	-0.16***	0.00
DL(NEER),-6	0.03*		0.05	-0.01
DL(NEER),-7	-0.05*			
DL(NEER),-8	0.05**			
Adjusted R-squared	0.40	0.45	0.66	0.52
S. E of regression	0.00	0.00	0.00	0.00
LM test	0.32	0.51	0.28	0.21

Note: NEER: nominal effective exchange rate, D: first difference, *,**,*** denotes significance at 10%, 5%, and 1% levels respectively. D = first difference, L = logs

Table: 9 (The structure of imports in the GCC countries during 2000-2008)

Country	Imports/GDP
Bahrain	0.60
Kuwait	0.20
Oman	0.32
Qatar	0.23
Saudi Arabia	0.20
UAE	0.60

Source: International Financial Statistics, IMF

Table: 10 Pairwise Correlation Matrix

Variable	DLOG(WCPI)	DLOG(OP)
DL(FCPI)	1	0.58
DL(OP)	0.58	1

Note: FCPI = trading partner inflation, OP = Oil price, D = monthly changes, L = logs.

Table: 11 OLS estimation for the effect of changes in exchange rate on producer prices in GCC economies (2000: 01-2008:12)

	Country			
Variable	Bahrain	Kuwait	Oman	Saudi Arabia
DL(NEER)	-0.10**	-0.04	-0.10*	-0.10*
DL(NEER), -1	-0.01	-0.08	0.01	-0.02
DL(NEER), -2	-0.01	-0.02	-0.01	-0.01
DL(NEER), -3	-0.14**	-0.15***	-0.16**	-0.13**
DL(NEER), -4	-0.02	-0.04	0.04	0.02
DL(NEER), -5	-0.05	-0.03	-0.07	-0.10
DL(NEER), -6	-0.11	-0.08	-0.11	-0.10
DL(NEER), -7	0.20**	0.19***	0.25***	0.20***
DL(NEER), -8			-0.03	
Adjusted R-squared	0.33	0.32	0.33	0.30
S. E of regression	0	0.01	0	0
LM test	0.80	0.78	0.93	0.84

Note: NEER: nominal effective exchange rate, *,**,*** denotes significance at 10%, 5%, and 1% levels respectively. As per the information criterion, the optimal lag length is 7 for Bahrain, Kuwait, and Saudi Arabia, and 8 for Oman, D = first difference, L = logs.

Table: 12 OLS estimation for the effect of changes in exchange rate on import prices in GCC economies (2000: 01-2008:12)

	Country			
Variable	Bahrain	Kuwait	Oman	Saudi Arabia
DLNEER	-0.68***	-0.53***	-0.80***	-0.69***
DL(NEER),-1	-0.43*	-0.62***	-0.49**	-0.41**
Adjusted R-squared	0.37	0.28	0.30	0.35
S. E of regression	0.01	0.02	0.02	0.02
LM test	0.30	0.20	0.30	0.24

Note: NEER: Nominal Effective Exchange Rate, D: first difference, *,**,*** denotes significance at 10%, 5%, and 1% levels respectively. As per the information criterion, the optimal lag length for all the countries is one.

12. Summary and Conclusion

This chapter attempted to understand and analyse the nature of exchange rate pass-through into domestic CPI inflation in the GCC countries on account of the recent inflationary development in the region. It used an ordinary least square method to estimate the extent of pass-through from changes in the effective exchange rate of the individual GCC countries to their domestic CPI inflation. The estimation used monthly data from January 2000 to December 2008.

The main findings of the estimated model reflected a rejection of both the null hypotheses. The pass-through in the short-run was found statistically significant in a number of cases for all four countries.

However, the magnitude of the coefficients turned out to be very modest, with a maximum significant short-run pass-through of around 16% in the case of Oman. Accordingly, a 10% depreciation in exchange rate increased inflation rates (measured by changes in consumer price index) in the GCC region by a maximum amount of 1.6% in the short-run. On the other hand, long-run pass-through ranged between a minimum of 10% (Saudi Arabia) to a maximum of 69% (Oman), with an average of around 27%, hence, clearly indicating the failure of the PPP theory in the context of the GCC economies as the pass-through is incomplete in all cases.

We have further stretched our estimation by using the import price index and producer price index as the dependent variables in order to compare the ERPT on inflation with ERPT on other aggregate domestic prices. The Producer Price Index in all four countries was found significant and more elastic then consumer price index, with an average extent of pass-through of less than one and equal to around 21% in the short-run. On the other hand, the estimated extent of pass-through into import prices is considerably higher than in producer and consumer prices, with an average magnitude of around 70% in the short-run. Out of the aggregate price indices, import indices in all the countries of our sample are the most elastic and highest in reaction to changes in exchange rates. This of course can be explained by the fact that the import price index includes the largest share of tradable goods compared to producer and consumer indices. Such results suggest that the pass-through from whole sale prices to consumer prices is low.

Chapter Four

Exchange Rate Pass-Through into Inflation Rate: A Case Study on the GCC Countries using Vector Error Correction Method

1. Introduction

This chapter contains a re-estimation of the extent of the ERPT into inflation rate of the GCC countries using a vector error correct method (VECM). Additionally it is important to note, that despite our effort in the previous chapter to correct for some of the deficiencies while applying the OLS technique in measuring the ERPT, there are still some doubts concerning the legitimacy of the results due to a number of criticisms surrounding the OLS techniques. This means further justifying of the idea of testing the robustness of the results by applying another commonly applied technique, instead of depending solely on the results from the OLS method. Using two different methods form in fact further cross-check on the estimated results, on which we will base our implications and recommendations.

Furthermore, a major drawback in the single equation techniques is that they do not allow for the endogenous determination between the variables in the model. They a priori assume the dependent variable as endogenous to the movements/changes in independent variables, which are assumed to be exogenous. However, number of recent studies (e.g. Taylor, 2000) have argued that pricing strategies of firms does not depend only on the market conditions (e.g. competition, business cycle, etc.), but also on monetary policy or expected future of monetary policy (Bandt and Banerjee, 2008). For example according to Taylor (2000) the extent of pass-through from exchange rate to domestic prices depends on the inflationary environment of a nation. Low inflation environment decreases the extent of pass-through, because the later reflects the expected impact of monetary shocks on current and future costs, which in turn are reduced by a stable inflation environment (Choudhri and Hakura, 2006). Such argument has also been advocated by number of other theoretical and empirical studies including

Choudhri and Hakura (2006), Devereux and Yetman (2002), McCarthy (2000), and Gagnon and Ihrig (2004)[99].

Also, by employing a single equation technique with variables in first difference we are simply disregarding the majority of the theories in the literature of ERPT with regard to the long-run or steady state relationship in the levels of variables (Bandt and Banerjee, 2008). In fact this has been the case of most the empirical studies that failed to find a co-integration relationship between the variables prior to estimating the pass-through using the single equation methods or any other techniques like VAR. Accordingly, we intend to extend our analysis of the ERPT in the GCC by testing for the co-integration link.

The outline of the reminder of this chapter is organized as follows. Section two presents the estimation model. The estimation and analysis of the results are presented in section three. Section four discusses the potential factors for higher long-run ERPT in the GCC countries, while section five discusses factors for incomplete ERPT in the GCC countries. Potential policy implications is given in section six, and summery and conclusion are presented in section seven.

3- Estimation Model

Conventional theory in the literature of exchange rate pass-through (ERPT) states that the level of our variables is linked in the long-term[100]. According to Engel and Granger (1987), if a linear combination of two or more non-stationary variables is stationary, then these variables are said to be co-integrated, with the co-integrating equation interpreted to represent a long-run equilibrium relationship among the variables. The existence of co-integration implies the presence of a vector error correction representation showing the short run adjustment to the long-run equilibrium among the variables.

[99] Also, according to Betts and Devereux (2000) the extent of local currency pricing limits the degree of exchange rate pass-through and in the same time amplifies nominal and real exchange rate volatility.

[100] According to the PPP theory, there should be a co-integrating relation between the exchange rate, the foreign price index, and the home price index, with a co-integrating vector of (1,1,-1) (Choudhri and Hakura, 2001).

Accordingly, in this chapter we try to overcome some of the drawbacks that exist in earlier studies by simply using a co-integrating analysis with a Vector Error Correction Model (VECM). The strength of the VECM is its ability to incorporate short-run dynamics with long-run equilibrium relations among the variables[101] (Kim, 1998). In our model inflation is explained in terms of: past inflation, exchange rate, partner inflation, and oil prices (simply the same variables as in the preceding OLS estimation in chapter three):

$$P = f(S_t, P^*, P^{oil}) \qquad (1)$$

Where P_t is the domestic CPI, S_t is the nominal effective exchange rate (NEER), P_t^* is the trading partner CPI, and P_t^{oil} is the oil price. The Johansen approach will be used to establish the co-integration link between the variables. Our error-correction equation for the price level will take the following form:

$$\begin{aligned}\Delta p_t &= \alpha_0 + \delta_{ecm}(p_{t-1} - (\phi_1 s_{t-1} + \phi_2 p_{t-1}^* + \phi_3 p_{t-1}^{oil}) + \\ &\sum_{k=1}^{L} \alpha_{1,k}\Delta p_{t-k} + \sum_{k=0}^{L} \alpha_{2,k}\Delta s_{t-k} + \sum_{k=0}^{L} \alpha_{3,k}\Delta p_{t-k}^* + \sum_{k=0}^{L} \alpha_4 \Delta p_{t-k}^{oil} + \nu_t\end{aligned} \qquad (2)$$

The first line in equation (2) shows the long-run dynamics of inflation and the second line shows the short-run dynamics of inflation. The coefficient δ represents the speed by which the inflation rate converges to its equilibrium. We have included a dummy variable to account for the Iraqi War in 2003.

Further, some studies such as Hakkio and Rush (1991) argued that the frequency of the observations plays minor role in investigation co-integration links and that the time span is much more important than the frequency of the observation in studying co-integration. However, in a very recent study Zhou (2001), who despite agreeing with the argument regarding the importance of the time span in exploring co-integration relationships, has presented evidence suggesting that the use of a small sample of 30 to

[101] A VECM is basically a restricted version of VAR in first differences of variables with an additional error correction term, with the VAR being a priori restricted by the presence of a co-integrating relationship.

50 annual observations instead of more observations of higher frequency data can result in lower powerful tests for co-integration. Furthermore, Zhou (2001) has found that the use of small sample of annual data is particularly inappropriate for the application of the Johansen co-integration tests even if the data sets spans half century. Zhou (2001) has suggested based on his findings that studies that are limited with short time span of less than 50 years to use high frequency data in order to compensate for the loss in the power of the tests.

In the context of our sample of countries, there is the problem of data availability, particularly in high frequency data, for which a consistent database is generally available from the beginning of this decade. Furthermore, available data base of annual data is also relatively short and spans less than 40 years for most the macroeconomic variables. Accordingly, we based our co-integration analysis using monthly data from January 2000 to December 2008.

3. Estimation and results analysis

First we tested for the co-integration test between our variables using the Johansen procedure[102]. This test suggests a maximum likelihood estimation procedure that provides two test statistics (maximal eigenvalue statistic and trace statistic) for determining the number of co-integrating vectors as well as estimate of all co-integrating vectors that could exit among a group of variables. Furthermore, the Johansen test specifies three models; 1) non-trended variables, which presumes that there is no linear trend in the level and the underlying data generating process;2) trended variables, no trend in the data generating process, which presumes that all level variables have deterministic trend; 3) trended variables, trend in the underlying data generating process, which presumes that variables as well as the underlying data generating process have deterministic trend (Asteriou and Hall, 2007). Nonetheless, given the fact that our variables show rising trends, the relevant models are 2 and 3. Johansen (1992)

[102] Another method for testing for co-integration was introduced by Engle and Granger (1987). This approach relies on looking for co-integration by testing weather the residuals from the long run relationship is stationary. However, despite its simplicity, this way is found to suffer from number of weakness. For example, this approach does not say anything about which of the variables can be used as regressor and why. Another weakness is that in the case of more than two variables in the system, E&G approach does not give the number of co-integrating vectors. One last weakness is that it relies on two-step estimator, so if any error was made in the first step it will be carried out into the second step (Asteriou and Hall, 2007).

suggest the use of the so-called Pantula principle to decide on one of the models to use for testing for co-integration[103].

We relied on several information criterions for deciding on the optimal lag length for the explanatory variables. The primary objective from selecting an optimal lag length in order to come up with a model that features good diagnostic results in terms of e.g. autocorrelation, heteroscedasticity, and normality. By taking into account the above information, the optimal lag length for the countries of our sample ranged between one (for Kuwait) to seven lags (Oman).

The optimal error correction model is linear with intercept and no trend for all the four countries in our sample (model 2). The results for the co-integration test for the models of the four countries are presented in table (1). The table shows the LR test based on trace statistics and maximal eigenvalue statistic. Both tests generally suggest the rejection of no co-integration in all models for the four countries. Specifically, the trace statistics indicates the rejection of the null hypothesis of zero co-integration for Bahrain, Oman, Kuwait, and Saudi Arabia. However, the maximal eigenvalue statistics indicated the rejection of zero co-integration only in Bahrain and Saudi Arabia, but it failed to report any co-integration in case of Kuwait and Oman. Based on both tests we could conclude that there appear to be one co-integration for all the countries and that testing for more one co-integration is highly rejected by both tests.

[103] Generally speaking, the Johansen (1988, 1991) maximum likelihood method help overcome the limitations found in other co-integration methods (*e.g.* Engle and Granger) by avoiding the use of two-steps estimators, allowing to test for multiple con-integrating vectors, and allowing to test restricted version of the co-integrating vectors and speed of adjustment parameters (Asteriou and Hall, 2007). Additionally, Johansen approach does not require that all the variable in the system are of the same order of integration, which mean having some variables that are near-integrated or stationary is theoretically not an issue (Hjalmarsson and Osterholm 2007, Asteriou and Hall, 2007). However, number of studies has suggested that the Johansen tests (trace and max eginvalue) suffer from number of shortcomings. For example, the strict unit root assumption for at least some of the variables in the system render the results from such tests as spurious since unit root tests have very limited power to distinguish between a unit-root and a close alternative (Hjalmarsson and Osterholm 2007). There is also the problem of the finite-sample bias which affect the power and the size of the tests. The Johansen tests have the tendency to over reject the null hypothesis due to small sample bias (Gregory 1994, Harris and Judge, 1998). However, both tests are generally found to have similar properties with respect to small sample power (Lutkepohl et al 2001). Final problem concerns the sensitivity of the tests to the number of lag length in order to have Gaussian error term (Bewley and Yang 1998, Asteriou and Hall, 2007).

Table: 1

Co-integration Tests

Johansen Maximum Likelihood Procedure (Trended case, No trend in DGP)					
Cointegration LR Test Based on Trace Statistic					
Null	Alter	Bahrain	Kuwait	Oman	Saudi Arabia
0	1	67.46* (47.86)	57.87* (47.86)	61.16* (47.86)	78.19* (47.86)
1	2	21.25 (29.80)	23.77 (29.80)	24.80 (29.80)	29.0 (29.80)
2	3	10.98 (15.50)	12.61 (15.50)	14.46 (15.50)	14.57 (15.50)
3	4	0.01 (3.84)	2.97 (3.84)	4.60 (3.84)	2.16 (3.84)
Cointegration LR Test Based on Maximal Eigenvalue Statistic					
Null	Alter	Bahrain	Kuwait	Oman	Saudi Arabia
0	1	36.20* (27.58)	24.10 (27.58)	26.36 (27.58)	39.01* (27.58)
1	2	20.27 (21.13)	21.16 (21.13)	18.34 (21.13)	19.72 (21.12)
2	3	10.98 (14.26)	9.64 (14.26)	11.90 (14.26)	13.42 (14.26)
3	4	0.01 (3.84)	2.97 (3.84)	4.58 (3.84)	2.16 (3.84)

Note: * donates the rejection of the null hypothesis of no co-integration between the variables under 5% level of significance. Critical values are in brackets.

Tables (A1 to A4) in Appendix (3) show the results from the estimates of the VECM for each country in our sample[104]. The estimates for the long-run co-integration price equations for each country could be presented as follows:

Bahrain → $p_t = -0.54 s_t - 0.27 p^* + 0.09 p^{oil}$

(-3.87) (-1.42) (2.85)

Kuwait → $p_t = 0.57 s_t + 0.78 p^* + 0.01 p^{oil}$

(3.28) (4.53) (0.20)

Oman → $p_t = -0.54 - 1.45 p * + 0.05 p^{oil}$

(-1.78) (-3.12) (0.89)

Saudi → $p_t = -0.65 s_t - 0.60 p^* - 0.02 p^{oil}$ (-
3.98) (-2.86) (-0.52)

The estimates of the long-run pass-through from exchange rate to domestic prices in the GCC countries are significant in all our four sampled countries. Furthermore, the sign of the coefficient of the exchange rate is, as expected, negative for Bahrain, Oman[105] and Saudi Arabia, however, it is positive for Kuwait[106][107]. Also the coefficients of the exchange rates in all the four estimated models are less

[104] Respective diagnostic tests for all the VECM have generally showed that the estimated models are stable as the calculated roots of the characteristic polynomial are located within the unit circle. Furthermore, the multivariate LM tests statistics for residual serial correlation could not reject the null of no autocorrelation. Heteroscedasticity test could not be rejected in all countries. The Jarque-Bera test as suggested by Urzua (1996) had failed to reject the hypothesis of normality in all the countries with exception to Bahrain. However, the rejection of normality should not totally invalidate the Monte Carlo tests for serial correlation, which should still be accurate, though not exact (see appendix 3).

[105] It is quite difficult to explain why trading partner inflation would have an effect that is higher than one (as predicted by the theory) in case of Oman, which is like the rest of the countries in the sample an open economy with very low and stable tariff system.

[106] The positive sign for Kuwait could be explained that due to the appreciation of the currency (dinar) increases the purchasing power of wealth, stimulating higher expenditure and price inflation in the long-run. Alternatively, the positive sign suggests that inflation could be affected by many other factors that also influence the demand for and the supply of exports and imports in this economy. For example, if an appreciation of the nominal effective exchange rate of this country is accompanied by a reduced foreign supply, or by an increased domestic demand for imports, due to say a rapid growth in the money supply or income, the impact of the exchange rate on

than one, which indicates that the PPP theory does not hold in the GCC countries, hence confirming earlier results of the OLS estimation. Nonetheless, the estimated individual long-run elasticities of prices to changes in exchange rate are significantly higher than those estimated using our earlier OLS technique which suggest that depreciation in the nominal effective exchange rates plays a significant role in driving inflation in the long-run in the GCC countries. We can also note that the pass-through coefficients are very close from each other and they range from 0.54 (Oman) to 0.65 (Saudi Arabia). A 10 percent depreciation of exchange rate in the GCC countries will increase inflation in the long-run by 5.4 to 6.5 percent.

With regard to the short-run dynamics, despite bearing the correct expected negative sign, they were insignificant in all of the cases with exception to Oman, for which the coefficient of the exchange rate is found to have significant impact after two lags, however, with low magnitude of around 0.1, which is relatively less than the maximum estimated pass-through using the OLS technique in the previous chapter. The coefficient on the lagged error correction term for inflation is on average positive 0.03. That means if the price level was lower than the long run equilibrium level in the previous period by one percentage point, 3 percent of this deviation is adjusted for every month, so it takes around three years for inflation to adjust to its long-run equilibrium. Accordingly, that suggests that inflation is persistent.

By comparing our results for the extent of ERPT in the GCC countries with earlier estimates for other economies, we find our results broadly similar to earlier estimates, regardless of the applied methods, in some industrial as well as emerging countries. For example, Gagnon and Ihrig (2004), who estimated the pass-through for 20 industerlized countries for the period from 1971 to 2003, reported a pass-through coefficient that ranged between 0.02 (Sweden) to 0.53 (Greece). Other similar result to ours were reported by Mihaljek and Klau (2001), who used OLS with quarterly data from 1981 through 2001 to analyse ERPT in 13 emerging economies. Their estimated pass-through for some of their countries (Mexico, Hungary, and Turkey) ranged from 0.36 to 0.56. Choudhri and Hakura (2006),

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the consumer prices would likely be neutralized or consumer prices may even rise (Kim, 1998). In addition to that it could also be explained by the recent frequent adjustment in the exchange rate parity of the Kuwaiti currency by the authority following the recent increases in consumer prices.

[107] The presence of wrong sign for some of the variables in our models can be attributed to factors like data availability and price regulations for some items in the index of consumer prices by the local authority in the GCC countries.

who estimated ERPT for different economic regions, reported an average pass-through, for low and moderate inflation countries including industrial ones (inflation less than 10% and from 10% to 30%, respectively) that ranged from 0.16 to 0.35. However, in the moderate category, most of the estimates were from 0.3 to 0.60, an estimate which is very much similar in magnitude to our results. Another finding similar to ours include the one reported by Dobrynskaya and Levando (2005), who estimated a long-run pass-through into aggregate consumer price index of around 40% for Russia during the period from 1995 to 2002.

Further, we stretched our comparison to include the estimates of those studies that have focused on episode of large devaluations or financial crises. For example De Grauwe and Tullio (1994), who focused on the inflationary effect of the depreciations of 1992-1993 in Europe, have estimated an ERPT that on average ranged from 0.3 to 0.4. In a broader study, Goldfajn and Werlang (2000) analysed the pass-through for 71 countries following large devaluations and have reported a pass-through coefficient of around 0.5 and 0.9 for developing and emerging markets, respectively. Their estimated pass-through for Europe was around 0.5.

3.1 Analysis of Impulse Responses and Variance Decomposition

The impulse response functions and variance decomposition were used to further assess the impact from the exchange rate. The impulse response functions illustrate the effect of a temporary shock emanating from an endogenous variable to other variables through the dynamic structure of the VAR model. On the other hand, the variance decomposition indicates the amount of forecast variance in prices that can be attributed to exchange rate.

Figures (1) to (4) plot the impulse responses for consumer prices, to one standard deviation shock to the exchange rate change for each of our sampled countries. The vertical axes report the approximate percentage change in domestic prices in response to a one percent shock in exchange rate. An increase in exchange rate reflects an appreciation.

The impulse response functions for all the countries illustrate persistent inflationary effects, albeit very modest, from changes in the nominal exchange rates of these countries. In response to one standard deviation shock to the exchange rate (in the form of appreciation), the price level index exhibits sustained decline at least for over one year in all the countries with exception to Bahrain, where the price level index takes an opposite path in the form of persistent increase. Moreover, we can also notice that the shock to exchange rate does not contemporaneously affect domestic price level in all the four GCC countries. Such notice basically reflect and confirm the theoretically lagged effect from exchange rate to domestic prices owing to factors like pricing strategy by firms, dynamics of demand response, payment lags, hedging technique, menu costs, etc.

Now given the fact that our variables are co-integrated, we expect that the shock to exchange rate lead to the deviation of the price level from its equilibrium in the GCC countries only for a short period of time, after which we expect our individual series to converge to their long-run levels. This convergence is assured by the error correction terms, which on average is around 0.03 for inflation, suggesting that if inflation is below its equilibrium by 1 percentage point (e.g. because of a temporary exchange rate shock), around 3.0%, of this deviation is adjusted for every month, reflecting a half life of nearly 1.5 year. Accordingly, it takes about 3 years for inflation to adjust to its long-run equilibrium. Generally, the analysis of the impulse responses suggest low long lasting effect from changes in exchange rates to inflation in the GCC economies, or low ERPT into domestic inflation. Additionally, the persistence in inflation suggests that inflation process in the GCC countries has significant inertia.

Tables (2) to (5) show the results of the variance decomposition of the price level for the sample of our countries. The results demonstrate that the variations in the consumer price index are dominantly explained by its own innovations, in all the four countries. Shocks to exchange rate explain around one quarter of the movements in the price level during the first year and increases to around one third percent in two year time[108]. Such result implies that shocks to exchange rate are partly responsible for explaining the forecast error variance of the price level. It also reflect that changes in the price level evolve endogenously with changes in exchange rate, hence, confirming our earlier above findings regarding the significant effect of the later variable , albeit incomplete, on the former variable.

[108] This results is rather comparable to the one reported by McCarthy (1999), who used VAR model in investigating the pass-through of exchange rate in a set of nine industrial countries. From his variance decomposition analysis, McCarthy found changes in exchange rate to account for about 5 to 30 percent of the variations in consumer prices.

Figure: 1

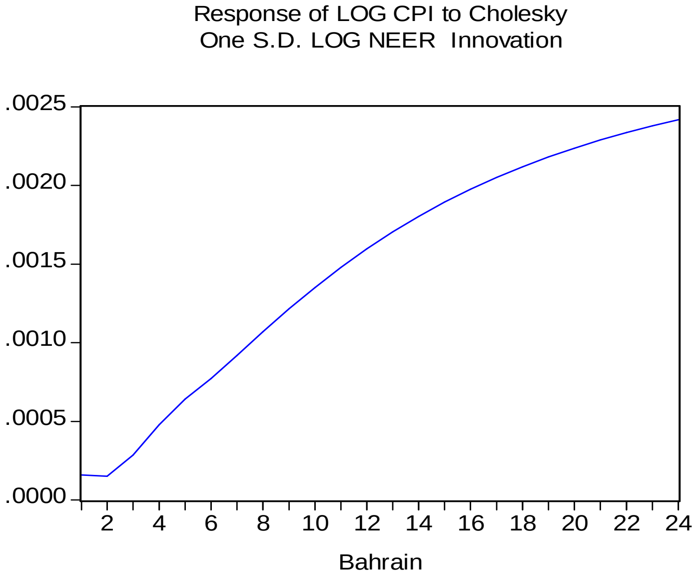


Figure: 2

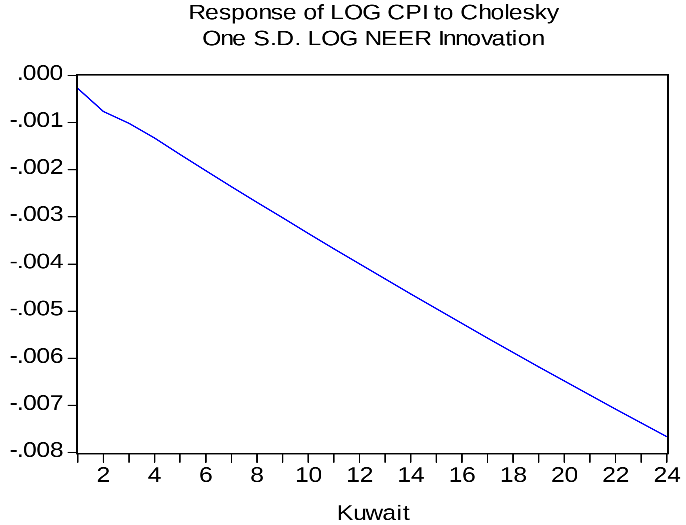


Figure: 3

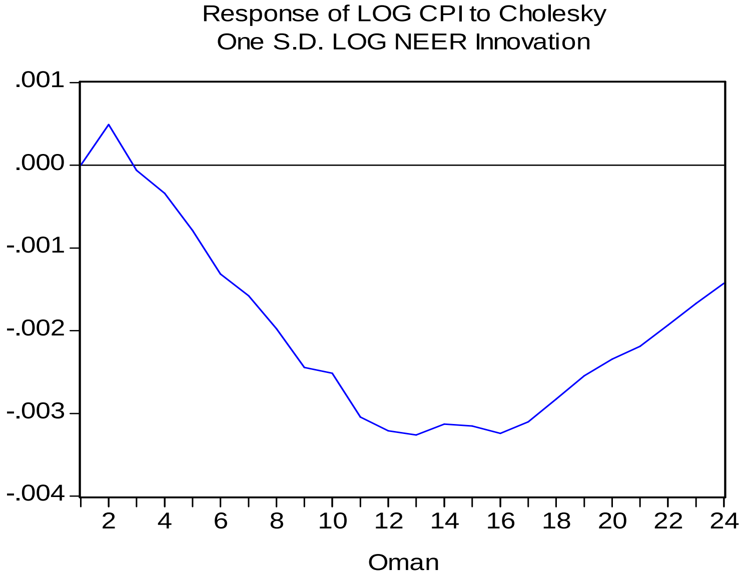


Figure: 4

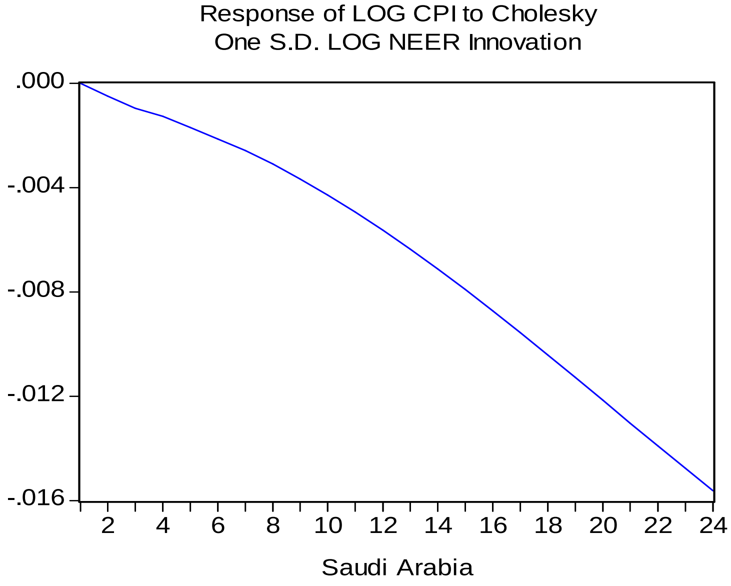


Table: 2

(Variance Decomposition)

	Bahrain			
	Periods			
	6	**12**	**18**	**24**
log CPI	86	68	55	48
Log NEER	5	14	19	22
Log FCPI	6	5	4	3
Log OP	3	13	22	27

CPI = consumer price index, NEER = nominal effective exchange rate, FCPI = Trading Partner consumer price index, OP = oil price.

Table: 3

(Variance Decomposition)

	Kuwait			
	Periods			
	6	**12**	**18**	**24**
log CPI	87	77	69	63
Log NEER	6	16	24	31
Log FCPI	5	5	5	4
Log OP	2	2	2	2

CPI = consumer price index, NEER = nominal effective exchange rate, FCPI = Trading Partner consumer price index, OP = oil price.

Table: 4

(Variance Decomposition)

	Oman
	Periods

	6	12	18	24
log CPI	91	86	85	87
Log NEER	3	9	11	9
Log FCPI	1	1	1	1
Log OP	5	5	4	4

CPI = consumer price index, NEER = nominal effective exchange rate, FCPI = Trading Partner consumer price index, OP = oil price.

Table: 5

(Variance Decomposition)

	Saudi Arabia			
	Periods			
	6	12	18	24
log CPI	84	72	63	55
Log NEER	8	16	25	35
Log FCPI	7	10	10	8
Log OP	1	1	2	2

CPI = consumer price index, NEER = nominal effective exchange rate, FCPI = Trading Partner consumer price index, OP = oil price.

4. Potential factors for higher long-Run ERPT in the GCC countries

Furthermore, the above results show generally that changes in the exchange rate have a significant impact on inflation in the long-run in the GCC economies. However, the findings from recent studies (Taylor 2000, Gagnon and Ihrig 2004, Campa and Goldberg 2006, and Choudhri and Hakura 2006) have indicated a declining trend in the extent of ERPT in several countries including developing economies. Nonetheless, the relatively higher exchange rate pass-through into inflation rate in the GCC countries in the long-run can be explained by a number of factors.

The degree of openness of an economy has been presented by number of studies (Dornbusch 1987, Goldfajn and Werlang 2000, Kang and Wang 2003) among the influential factors on the extent ERPT. The more open an economy, the more it would be exposed to higher pass-through. Other studies (McCarthy 1999, and Ho and McCauley 2003) have particularly emphasized the importance of imports penetration ratio in the consumption basket of consumers. By considering the characteristics of the GCC economies, and based on their trade pattern explained in previous chapter, we find that these countries are comparatively very open and highly import dependant. Particularly since the beginning of this century, the statistics show that both the openness and the import have increased substantially (figure 5-8 and table 6).

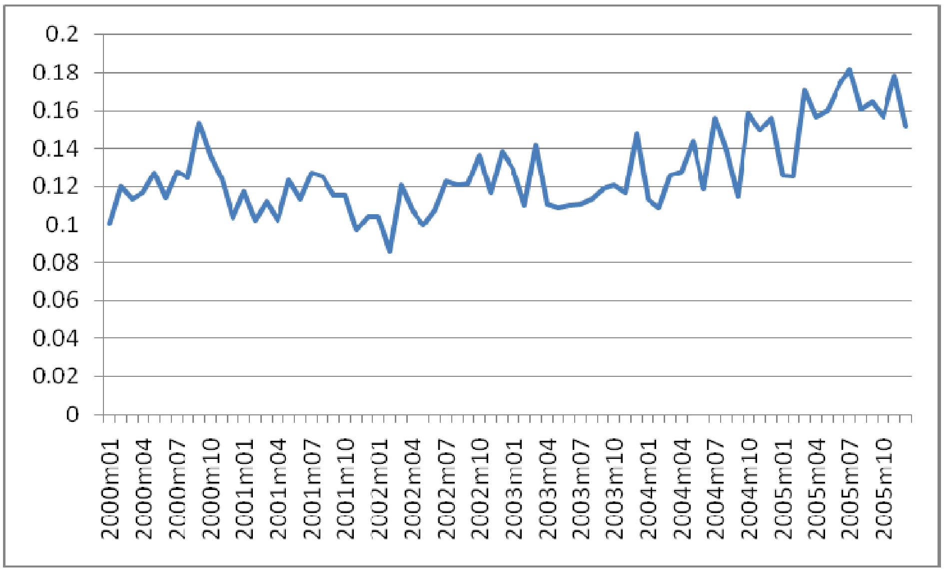
Based on Taylor (2000) theory, persistence of inflation is expected to influence the link between movements in exchange rate and domestic prices. If increases in domestic prices are viewed to be of persistent nature, then it is highly likely that traders will pass the higher cost (e.g. because of exchange rate depreciation) to their prices, which would lead to higher inflation. In the case of our sample, there are number of factors to suggest increasing inflation persistence in the GCC economies. The recent significant depreciation in the US dollar, to which the currencies of the GCC countries are pegged, against the major trading partners of the GCC countries have resulted in a depreciation in the exchange rate of the GCC countries' currencies. This depreciation has coincided with an accommodative monetary policy due to the fixed exchange rate regime. The monetary authority in the GCC countries have been tracking the footsteps of the US monetary policy by similarly lowering their short term interest rates, in order to fend off potential speculations. Furthermore, the depreciation in the currencies of the GCC countries have also coincided during the period of our sample with an expansionary fiscal policy due primarily to increased revenues from a prolonged period of high oil prices[109].

Another further factor for the increasing long-run effect from exchange rate to inflation in the GCC economies can be attributed to the expected GCC monetary union (January 2010). The expected potential ramification to the incipient GCC monetary union might have influenced firms pricing strategies in these economies which in turn have led toward an increasing pass-through in the long-run. Furthermore, the experience of the Euro countries at the early period of the monetary union (depreciation of the Euro) might have accentuated the firms' expectations regarding the persistence of depreciation in the exchange rate of the GCC's currencies.

[109] The recent surge in oil prices have resulted in a substantial trade balance surpluses that have enabled the governments in GCC countries to increase public expenditure and investment, and subsequently demand of private sector. According to Fasano and Wang (2002), the fiscal policies in the GCC economies are highly pro-cyclical and therefore government spending is correlated with oil prices. In period of low oil prices (like those during late1990s) government spending in GCC countries is cut back rather than expanded as one might expect if an active fiscal policy were being pursued.

Figure: 5

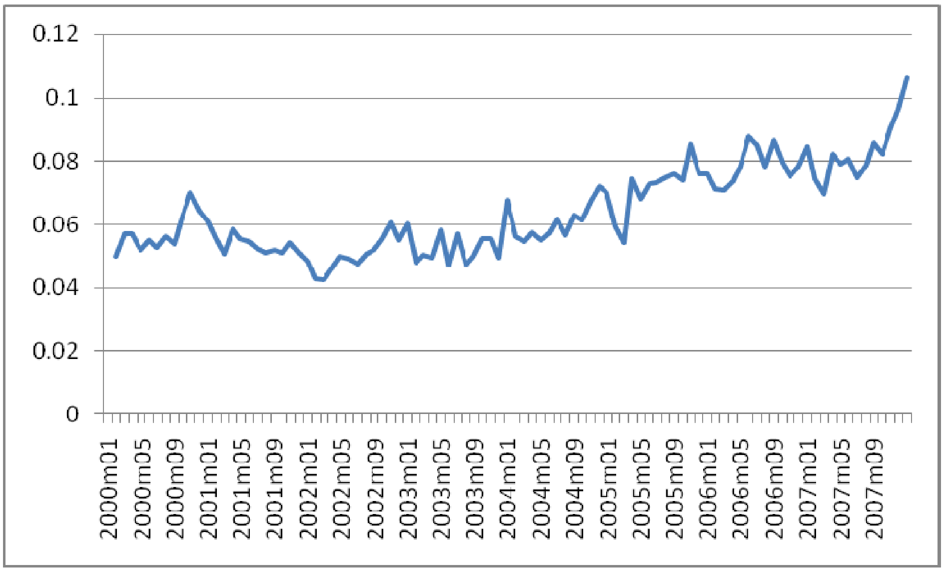
Degree of Openness in Bahrain (2000 January-2007 December)



Source: Calculated by the author using data from the DOTS, IMF

Figure: 7

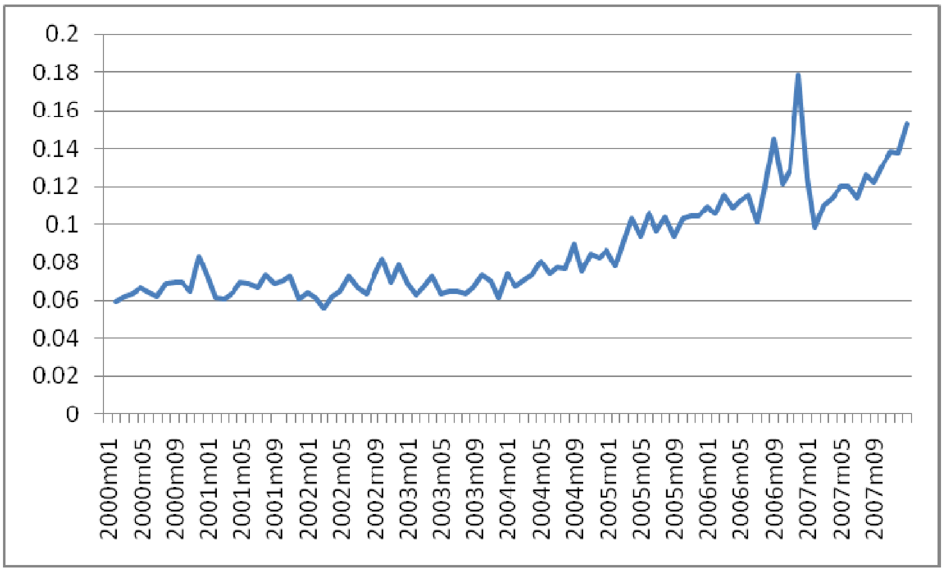
Degree of Openness in Kuwait (2000 January-2007 December)



Source: Calculated by the author using data from the DOTS, IMF

Figure: 7

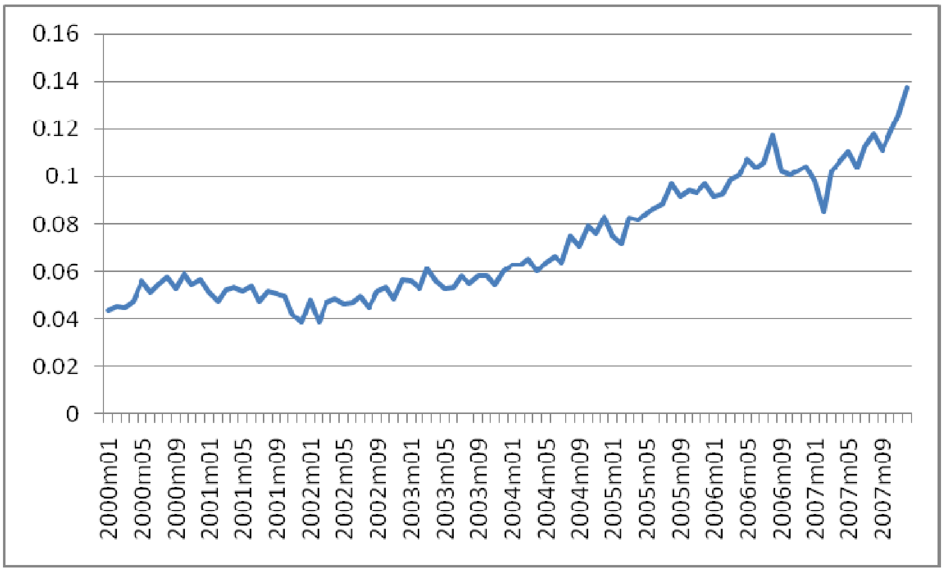
Degree of Openness, Oman (2000 January-2007 December)



Source: Calculated by the author using data from the DOTS, IMF

Figure: 8

Degree of Openness, Saudi Arabia (2000 January-2007 December)



Source: Calculated by the author using data from the DOTS, IMF

Table: 6

Imports In the GCC Countries (Units: US Dollar) (Scale: Millions)

	Country

Years	Bahrain	Kuwait	Oman	Saudi Arabia
2000	4633.24	7157.04	5039.53	30197.3
2001	4306.12	7869.48	5797.92	31181.3
2002	4987.77	9007.39	6005.46	32293.3
2003	5657.18	10991.6	6572.17	36914.7
2004	7384.84	12630.6	8865.28	44744
2005	8790.16	15801	8827.05	59458.7
2006	8944.41	17242.5	10915.2	69799.7
2007	11293.1	21352.1	15977.6	90214.8
2008	12530	24873.9	22924.6	115133

Source: DOTS, IMF.

5. Factors for Incomplete ERPT in the GCC countries

From the vast theoretical literature in the pass-through of exchange we can cite a number of reasons to explain the incomplete pass-through in the GCC countries or the failure of the PPP theory in these economies. One reason could be attributed to the low share of traded goods in the CPI baskets of the GCC countries. Despite the fact that the share of imported goods is considerably large in the GDP of GCC economies, however, this share could be modest as compared to the weight of non-tradables. A related issue is that the cost of retail services, as a fraction of the value of consumer goods, could be, in many instances, larger than the cost of the physical tradable goods. This was facilitated by two conditions. One is that during our sampled period there has been an increasing pressure on non-tradable services due to heated development in the GCC countries. The second condition is related to the increasing competition between markets due mainly to globalisation, which have resulted in lower prices of tradable goods around the world.

A further reason could be that the common claim of low PTM in developing country is invalid in the context of the GCC countries. Given the relatively considerable size of the economy of the GCC region and the strategic importance and the prominent role of the GCC countries with respect to trade around the globe, it is expected that exporters to these countries use PTM strategy to maintain their market share in this region. Also exporters might have realized that changes in exchange rates are transitory and not permanent, so they were willing to absorb part of the exchange rate impact by adjusting their mark-up.

The presence of relatively modern financial markets in the GCC countries have allowed the importers in these economies to shelter their profit and eventually consumer prices from fluctuation in exchange rates through hedging contracts. Moreover, since the US dollar forms the leading currency in the trade around the globe and given the fact that the entire oil exports of the GCC countries is priced and paid for in US dollar, it is expected that importers in these countries to be less affected by changes in exchange rates, which in turn would mean lower pass-through to producer and consumer prices.

The composition of a nation's import can also play another factor in the extent of the pass-through according to Campa and Goldberg (2004). As per their findings, moving away from raw materials and energy imports towards manufacturing sectors (where more differentiated goods are produced and thus where PTM is likely to be more prevalent) was a primary factor in reducing the extent of pass-through in the OECD countries. This was also confirmed by Otani et al (2003) for Japan, and Marazzi et al (2005) for the US, and Khundrakpam (2007) for India. By considering the composition of imports in the case of our sample (table 7), we found that the share of the manufactured items constitutes more than 70 percent of the total imported goods for each country. Hence, further explaining the incomplete pass-through in the GCC economies and rendering further support to the theory of Campa and Goldberg (2004).

The monetary environment in the GCC countries could have played another significant role in lowering the pass-through from exchange rate to inflation. Inflationary expectations through depreciation of effective exchange rates in the currencies of the GCC countries is believed to have been anchored through the pegged exchange rate regime that is furthermore highly credible in light of large foreign reserves and the open capital account. One last factor to be cited for the lower ERPT in the GCC countries concerns some institutional factors in the form of price regulations of essential products in these countries. It is in fact common in these economies, and generally in many oil producing countries, that the state will intervene by regulating prices either by way of subsidies or putting caps on prices of certain necessary goods, and this was the behaviour/actions of most the authorities in the GCC countries as a reaction toward the surge in consumer prices over the past two years.

Table: 7

Share of Manufactured Imports in the GCC countries

	Country			
Year	Bahrain (%)	Kuwait (%)	Oman (%)	Saudi Arabia (%)
2001	84	96	78	74*
2002	83	96	75	74*
2003	85	96	79	71
2004	85	96	80	72
2005	88	96*	82	74
2006	87	97	85	77
2007	88	97	85	77
2008	86*	96*	76*	76

Note: * These are averages as data for these years were not available. Source: Economic Reports from the websites of the central banks of the GCC countries.

6. Potential Policy Implications of the Results

An average pass-through of around 57% indicates that changes in the exchange rate have significant impact on inflation in the long-run in the GCC economies. In the long run depreciation of 10% in exchange rate will result in an average of 5.7% increase in the price level of the GCC countries.

However, the fact that the pass-through is incomplete or significantly less than one, suggests the failure of the PPP theory in the economies of the GCC countries. It indicates that there is not a very high risk, as predicted by the PPP theory for small highly tradable dependant economies, on inflation in the GCC countries from fluctuations in the foreign exchange rate markets. This is further confirmed by the results of the impulse responses and the variance decompositions analysis. The results also suggests an influential role for other external as well as domestic factors on inflation in the GCC economies, and this is consistent with the our earlier inference from the preliminary analysis, in the previous chapter, regarding the simultaneous rise in consumer price indices of the GCC countries, partner inflation, and oil prices.

From policy perspective, risk from imported inflation through fluctuations of the US dollar against the currencies of the trading partners of the GCC countries is considered generally low. Based on the fact that the appropriateness of an exchange rate regime should be based on how it performs over time and not only on how it performs under stress, the single dollar peg will still be viewed viable for the economies of the GCC countries. A retrospective analysis shows that the macroeconomic conditions in the GCC countries has been stable over the past two decades, even during the periods of dollar fluctuations.

Average inflation rates over the past two decades remained on average low and stable in most of these economies, with an average inflation ranging between a minimum of around 0.65 in Bahrain to maximum of around 4.77 in Qatar, hence, further signifying the success of the existing monetary policy/regime in maintaining price stability. The pegged regime is also viewed to have helped the GCC countries avoid nominal shocks from geopolitical risks feeding into their economies. Also during the past two decades the GCC countries continued to register continuing growth in the size of their economies that jumped, in terms of nominal GDP, from an average of around US 251.3 billion during 1991-2000 to an average of around US 604 billion during 2001-2008, hence, further confirming that the existing pegged exchange rate regime has served its purpose and has supported economic performance.

In addition to that, more than 50% of the GCC's countries imports and exports are priced in US dollar, which further suggest that it is still worth keeping stable exchange rate with the US dollar for all the GCC countries. This in fact can be substantiated by the case of Kuwait, which despite its recent movement from the single US dollar peg to a weighted basket of undeclared currencies it continued to maintain generally a stable link with the US dollar which reflect that the US dollar has a significant weight in the basket. All in all, the results suggest that continuing to have a strong link with the US dollar in the form of the existing pegged regime is still viewed as a viable choice to ensure credibility of monetary policy and stability of trade as well as to protect the value of the financial wealth of the GCC countries.

However, still the significant role of exchange rate on inflation in the long-run necessitates some cautionary actions by the authorities in the GCC countries. Furthermore, the recent persistent depreciation in the US dollar, the expansionary fiscal and monetary policies, suggest that the pass-through could rise in the short to medium term, which implies that local authorities in the GCC countries should be vigilant in assessing potential impact from exchange rate to inflation. Given the fact that under the peg system the monetary authorities in the GCC country have limited control over the effect of exchange on inflation, it is suggested that through actions like partial monetary policy (required reserve, credit controls, and open market operations), containing domestic demand and addressing supply bottlenecks might help in maintaining low impact from external side on domestic prices.

7. Summery and Conclusion

In this chapter and the previous chapter we tried to develop an idea about the nature of the link between changes in exchange rate and inflation in the GCC countries. The results from our two models (OLS and VECM) are found to be generally consistent with the results observed from preliminary analysis of the data in the preceding chapter. Our estimated results from both models have confirmed the link between movements in exchange rate and inflation in the GCC countries. Furthermore, the results of the short-run dynamics from the OLS and VERM model have showed very modest impact from exchange rate to inflation in the short-run. The estimated short-run coefficients were only from 0.04 to 0.16. On the other hand, average estimated long-run pass-through was 27% and 57% based on the OLS and the VEC models, respectively. The difference in the magnitude of the long-run effect from exchange rate to CPI inflation between the two models can be attributed to the different features of second model, VECM, which exploits the information contained in the level of variables and allow for the endogenous determination between the variables as compared to the OLS model that was estimated in first difference and a priori assume the dependant variable as endogenous to the movements/changes in independent variables.

The incomplete pass-through indicates that the PPP theory does not hold, with regard to the price level, in the context of the GCC countries. Our results also invalidate some familiar claims in the existing literature of ERPT that view ERPT on consumer price inflation as almost complete in small less developed economies. Incomplete pass-through also implies that change in real exchange rate is long lasting and devaluation in nominal effective exchange rate is not neutral (Borens & Gregorio, 1999). Moreover, the impact of exchange rate was found to be larger and relatively quicker on producer prices and import prices (as per the estimates from the OLS model). Nonetheless, the largest effect was found on import prices across all sampled countries, with the extent of pass-through exceeding 100% in some cases in less than three months[110]. Furthermore, we found our results for the effect from exchange rate to inflation more comparable with those estimated on the industerlised nations as well as developing countries.

The increasing long-run pass-through in the GCC countries during the period of examination can be attributed to many factors : the degree of openness of the GCC economies, the recent persistent depreciation of the US dollar against the currencies of the trading partners of the GCC countries, the rapidly domestic demand, and the expected potential ramifications to the incipient GCC monetary union. Moreover, the generally incomplete pass-through to consumer price inflation of the GCC countries can also be attributed to some other factors. For example the low share of traded goods in the CPI baskets of the GCC economies, the presence of PTM strategy by many firms dealing in the GCC economies, the presence of modern financial markets that facilitated hedging contracts, the composition of the import of the GCC economies, the credibility of the monetary environment, and some institutional factors like price regulations of some essential goods.

From policy prospective, the incomplete ERPT suggest that there is no need for monetary authority in the GCC countries to adjust money supply to fluctuations in exchange rates as such fluctuations are not considered harmful/risky to the domestic prices stability in these economies. Despite persistent depreciation of the exchange rates of the currencies of the GCC countries during the period under review, domestic inflation remained on average low and stable in most of these economies (table 5 in

[110] In this chapter we have also used the Johansen procedures to test for the co-integration using producer prices and import prices, however we failed to find any co-integration in all countries of our sample for both prices with exception for producer prices in case of Kuwait, where the estimated long-run coefficient for exchange rate was small and insignificant.

chapter four), Accordingly, the results suggest the success of the existing monetary policy/regime in maintaining price stability, and lends further support to the credibility and relevancy of the pegged exchange rate regime in these countries.

It also suggests (incomplete pass-through) a big role for other external as well as domestic factors in influencing inflation in the GCC economies. However, the significant long term influence of exchange rate on inflation suggests that the local authority in the GCC countries should be vigilant and take some cautionary action, if viewed necessary. Finally, given the peg system in the GCC countries and by considering the recent conditions of the GCC economies, it is suggested that through actions like partial monetary policy (required reserve, credit controls, and open market operations), containing domestic demand and addressing supply bottlenecks, the GCC economies will be able to maintain low impact from the external side on domestic prices and to generally control rising inflation.

Chapter Five

Demand Policies and Pass-through of Exchange Rate: A case study on the GCC Countries

1. Introduction

In this chapter we attempted to analyse the influence of demand polices of the GCC countries on the effect from changes in exchange rate to inflation rates in these economies during the period 2000-2008. The chapter begins by presenting some literature review on the potential determinants of the pass-through of exchange rate to domestic prices.

Low or incomplete pass-through from exchange rate to consumer prices is seen to provide a better atmosphere in which to carry out an independent monetary policy and to facilitate the implementation of inflation targeting (Choudhri and Hakura, 2006). However, there is no consensus in the literature on the conditions that lead to a low exchange rate pass-through (ERPT). Early studies that focused on the US market and other industrial markets have mainly analysed the pass-through into import prices (Goldberg and Knetter, 1997) and have primarily stressed the role of imperfect competition and price discrimination in international markets (Dornbusch 1987, Krugman, 1987). Based on this literature the extent of pass-through from exchange rate to import prices (at the sectoral or aggregate level) is essentially a function of some microeconomic factors such as demand elasticities, degree of market integration or segmentation, and degree of substitutability between domestic and imported goods (determined by the degree of product differentiation). For example, the extent of ERPT is expected to be high if the profit-maximizing firm has substantial market power in a given industry (Phillips, 1988). In contrast, if the primary target of a firm is to maximize its market share, ERPT will be lower (Hooper and Mann, 1989). Similarly, Bailliu and Bouakez (2004) have explained that the decline in the exchange rate pass-through to the higher degree of market segmentation is due to (i) more firms engaging in pricing to market (PTM) behaviour and/or (ii) a larger proportion of goods being subjected to price discrimination across international markets.

Recent micro-based theories include the study done by Burstein *et al.* (2002) who analysed the reaction of inflation rates to devaluations during the 1990s for nine industrial and developing nations. Burstein *et al.* (2002) have attributed the recent declining trend in pass-through from exchange rate to CPI to the disappearance from consumption of newly expensive import goods, and their replacement in the indices by inferior local substitutes, a phenomena that they dubbed 'fright from quality'.

Along a somewhat different line, Campa and Goldberg (2005) have argued that the microeconomic factors related to the composition of a nation's imports may dominate the macro factors in influencing the extent of pass-through elasticity and the pass-through relationship over time. The authors have reported that changes in the composition of imports caused by moving away from raw materials and energy imports towards manufacturing sectors (where more differentiated goods are produced and thus where PTM is likely to be more prevalent) have been the primary factor behind the recent pass-through changes into domestic prices among the OECD countries. This has also been confirmed by Otani *et al.* (2003) for Japan, Khundrakpam (2007) for India, and Marazzi *et al.* (2005) in the case of the US[111].

Recently the decline of the exchange rate pass-through has been seen to be related to some macroeconomic factors. This development is drawn from the new open economy macroeconomic models (NOEM). This literature suggests, based on studies like Obstfeld and Rogoff (1995), Betts and Devereux (1996), and Devereux *et al*. (2003), that the extent of pass-through depends on the pricing strategies used by firms. Under producer currency pricing (PCP), where domestic nominal prices are fixed in producers' currencies, consumers' prices would be expected to show a one to one change with changes in exchange rates. However, under local currency pricing (LCP), where domestic nominal prices are set in advance in consumers' currencies, changes in exchange rates are not expected to exert any effect on consumer prices in the short run. In these models choices for the appropriate pricing strategy (PCP or LCP) relies on monetary policy, in that economies with relatively stable monetary policies are assumed to have a prevalence of LCP.

[111] Marazzi *et al.* (2005) have presented additional explanations that include the increasing market shares of Chinese imports and changes in the pricing behaviours of firms in East Asia following the currency crises in 1997-98.

The link between the pass-through and monetary environment has also been articulated more influentially by Taylor (2000) who argued, based on a microeconomic model with staggered price setting and monopolistic competition, that the recent decline in the degree of ERPT is due to the low inflation environment. According to Taylor (2000), firms that normally set prices in advance for several periods, react to changes in costs (either as a result of depreciation or some other costs) only if these changes are perceived to be of a persistent nature. Countries with high average inflation tend to have more persistent costs. As a result, the extent of pass-through tends to increase in a high inflation environment. Therefore, a more stable regime with low inflation is going to be characterised by a relatively lower rate of pass-through, while a high inflation regime would tend to reverse the effects.

Taylor's study has sparked a handful theoretical and empirical studies to show how a low inflation environment can lead to lower degree of pass-through. Emphasized mechanisms in this regard include a decline in the expected persistence of cost and price changes (*e.g.*Choudhri and Hakura, 2006), a fall in the frequency of price changes (*e.g.* Devereux and Yetman, 2002), and an increase in the prevalence of LCP (*e.g.* Devereux et al, 2003).

Further, recent strand in the literature of inflation have emphasized the role of globalization as a major factor for the declining role of exchange rate on the inflation process. For example, according to Borio and Filardo (2006), in a cross-section globalization means that price differentials for identical goods is expected to narrow, arbitrage opportunities increase and location matters less for the production of certain products and services as production is delocalised. On the other hand, changes in exchange rates over time may tend to reflect more real and financial factors and less nominal influences, such as persistent and large inflation differentials. As a result, under such conditions, changes in exchange rates will be viewed temporary (reversible) and hence may have a smaller effect on the corresponding prices, at least in the short-run.

Another mechanism, through which globalization may weaken the role of exchange rate on domestic prices is by enhancing global economic integration. This mechanism is clearly articulated in the work of Gust et al (2010), who attempted to theoretically attribute the decline in the extent of exchange rate pass-through to an increase in trade integration and changes in relative productivities across countries. According to their model, firm's pricing decision depends not only on its marginal cost but also the prices of its competitors. As a result, firms do not want their prices to deviate much from their competitors, and because of that they find it optimal to vary its mark-up more and their prices less in response to an exchange rate movement. Lower trade costs due to increasing trade integration and higher productivity induce domestic producer to lower their mark-ups in response to the decline in the prices of foreign exporters, thus leading to fall in the average mark-up across all producers, and eventually lower pass-through. In summary, the proposition of Gust et al (2010) is that higher trade integration lowers the market power of firms, thus squeezing their profit margins and resulting in lower pass-through.

Further, another recent mechanism on the link between the pass-through of exchange rate and domestic prices was proposed by Parsley and Popper (1998). However, their work was focused on how the actions of monetary policy, following changes in the exchange rate, can affect (*e.g.* reinforce or weaken) the extent of pass-through from exchange rate into domestic prices in a country. Specifically, they have stressed the role of domestic monetary policy in effecting the link between depreciation and domestic prices. The authors have argued that theoretically the estimates of the responsiveness of the domestic prices to changes in exchange rates may reflect, in addition to other factors, the policies of the central bank during the period examined.

According to Parsley and Popper (1998), a central bank that is concerned with price stability will react to insulate prices from fluctuations in exchange rates. The central bank is expected to adjust money supply, particularly in economies where there is high ERPT, in order to moderate price volatility. For example, in response to depreciation in the exchange rate value of domestic currency, the central bank will pursue a contractionary monetary policy to strengthen the currency and to moderate the impact of the depreciation on prices. In contrast, if the monetary authority followed an expansionary monetary policy, it would probably reinforce the inflationary effect of the exchange rate depreciation in domestic prices. Accordingly, if the action of the monetary policy is ignored, the estimation of the effect of the depreciation on prices may appear to be lower/higher than the underlying effect. In other words, the omission of the monetary policy variable in the estimation of the ERPT would result in biased estimates of pass-through.

In fact, the hypothesis of Parsley and Popper (1998) can be extended to generally represent the role of the demand policy following changes in the exchange rate. What we mean to suggest is the importance of the aggregate demand policies of an economy in influencing the price volatility caused by external shocks such as the change in the exchange rate. From the work of Parsley and Popper (1998) we find an important role for demand policy in the form of a central bank action in determining the impact of the exchange rate on prices in a floating exchange rate regime. Likewise, the fiscal policy can be expected to have a significant role, especially in the context of a fixed exchange rate regime. Also, both kinds of demand policies can be found to play an important role in exchange rate regimes where the currency is pegged; however, the central bank still has on hand some monetary policy instruments that can be used to influence the money supply. Our emphasis on the demand policies in general is not completely new, as in some earlier empirical studies both monetary policy and fiscal policy were found to have played significant roles on the low impact of the depreciation in Europe between 1992 and 1993. For example, De Grauw and Tullio (1994) have primarily attributed the low pass-through from the depreciation to inflation in Europe to the policy of a high real interest rate following the devaluation. In a similar, but more recent, empirical study Amirtano *et al.* (1997) have reported the restrictive demand policies (fiscal and monetary policy) that followed the depreciation in Europe were among the major factors that led to the low impact on inflation. More recently, Gagnon and Ihrig (2001), Baily (2003), and Bailliu and Fujii (2004), have as well argued that the depreciation of home currency might be countered with a tightened monetary policy given goals of maintain low and stable inflation.

The outline of the reminder of this chapter is organized as follows. Section two presents some theoretical background on the argument of Parsley and Popper (1998). Section three presents the role of demand policies in influencing the link between exchange rate and consumer prices in the GCC countries. Section three presents the estimation framework. Data description and unit root tests are given in section four and five, respectively. The estimation and results analysis are presented in section six. Section seven presents policy implication and finally summery and conclusion are presented in section eight.

2. Theoretical presentation for the argument of Parsley and Popper (1998)

Parsley and Popper (1998) were one of the first to present a theoretical representation for the role that monetary policy plays in influencing the observable pass-through relationship. To briefly demonstrate the theory of Parsley and Popper (1998) suppose that the price of a particular good is determined by the following function: in each period, t,

$$p_{it} = E\{f_i[e_t, m(g_t), z_{it}]/I_i\} \tag{1}$$

Where P_{it} is the price of the i^{it} good; e_t is the nominal exchange rate in terms of foreign currency units per domestic currency unit; $m(g_t)$ is monetary policy, implemented using some instruments g_t; z_{it} summarizes all other factors that affect the individual price; and I_t represents the information available when the price is determined.

Then, the underlying responsiveness of individual and aggregate prices to the exchange rate can be characterized as follows:

$$\gamma_i = \frac{\partial E\{f_i\{e_t, m_t, z_{it}]/I_t\}}{\partial e}, \text{ and } \gamma = \int_0^1 \alpha_i \gamma_i d_i$$

When monetary policy is unrelated to exchange rate changes, these parameters, γ_i and γ, can be estimated directly. In practice, measuring the effect from exchange rate to domestic prices may be complicated by the actions of the central bank. The monetary policies of many nations respond to movements in the exchange rate, even if only implicitly. That is, often

$$\frac{dm(g_t)}{de} \neq 0$$

Which means that monetary policy is endogenous to movements in exchange rate. In such cases, changes in exchange rate affect domestic prices in two ways; directly, through the parameters γ_i and γ; and indirectly, through its influence on monetary policy:

$$\frac{\partial p_{it}}{\partial m(g_t)}\frac{dm(g_t)}{de} \quad \text{and} \quad \frac{\partial p_t}{\partial m(g_t)}\frac{dm(g_t)}{de}$$

Ignoring the role of monetary policy will simply bias the estimated responsiveness of domestic prices to changes in exchange rate. This problem affects estimates of the responsiveness of both individual prices and the aggregate price index: ignoring the action of monetary policy would underestimate the effects of exchange rate on prices. For example, if the central bank offsets the aggregate price response by a factor of θ, where $0 \leq \theta \leq 1$, then the monetary policy response to movements in exchange rate can be expressed easily. Let δ denote the aggregate response of prices to monetary policy; that is, $\delta = \frac{\partial p_t}{\partial m(g_t)}$. Then monetary response to a change in the exchange rate is

$$\frac{dm(g_t)}{de} = -\frac{\theta\gamma}{\delta}.$$

Correspondingly, the apparent responses of prices to exchange rates will differ from their underlying responses. While the underlying aggregate response is γ, the apparent aggregate response will be $(1-\theta)\gamma$. In the extreme case, where $\theta = 1$, aggregate prices can appear to be completely unresponsive to the exchange rate. Parsley and Popper (1998) have empirically supported their hypothesis through a study of disaggregated and aggregated prices of nondurable goods in the US market.

3. Demand Policies in the GCC Countries as a Case Study

In this chapter we intend to follow the work of Parsley and Popper (1998) and to empirically test for the effect of the actions of the demand policies (monetary and fiscal policies) on the extent of pass-through from exchange rate to inflation in the GCC economies[112] during the period from January 2000 to December 2008.

Our main objective from this work is to draw some implications regarding the current exchange rate regimes policies of the GCC countries. The choice of exchange rate regime by the GCC nations and the subsequent economic implications are critical topics that necessitate additional examination and in particular given potential ramification to the incipient GCC monetary union. Moreover, this work is assumed to further enrich latest discussions on whether the individual members of the GCC countries need to consider their fixed exchange rate regimes following many recent economic development including evolving national objective and deeper integration with global trade and financial markets. Accordingly, analyzing the ERPT into the regional member countries inflation rates, as in this work, would undoubtedly add value to the body of studies on the regional block as a whole.

Apart from its importance to the macroeconomic policies of the GCC countries, this work attempts to contribute to the relevant literature of ERPT. The study of Parsley and Popper (1998) was applied in the context of floated exchange rate regime, while we contribute by applying the model on fixed exchange rate regimes and for hydrocarbon based economies. Accordingly by extending the model of Parsley and Popper (1998) to include fiscal policy has enriched the model.

Further, by focusing our analysis on the GCC countries, which are small and less developed countries, we are redressing the imbalance in country study coverage regarding the analysis of ERPT (Menon, 1995). With regard to the recent trend in the literature of the ERPT that deals with the conditions of the decline in the ERPT, this work contributes by empirically investigating the demand policies as potential determinants on the extent of ERPT. Furthermore, given the inconclusive evidence on the prediction of full pass-through from exchange rate to domestic prices of small less developed economies, the study can be considered to provide further tests for such hypothesis in the context of the GCC countries. Also unlike most earlier available studies that focused on episodes of large sudden depreciations (De Grauwe and Tullio 1994, Amirtano et al 1997, Goldfajn and Werlang 2000, Ito et al. 2005) the focus of our study is on economies that have experienced sustained depreciations in their currencies over a period of time. Moreover, we further contributes to the literature by employing

[112] The Gulf Cooperation Countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

monthly macrodata as compared to most other studies that were faced with data availability and have to use lower frequency data like quarterly times series. According to Choudhri et al. (2005) and MacCarthy (2007) using monthly frequency is considered more preferable in studying the pass-through.

During the period of our sample the exchange rates of the currencies of the GCC countries experienced persistent and significant decline due mainly to the depreciation of the US dollar against the currencies of the trading partners of the GCC countries. As matter of fact, the US dollar has been the *de facto* anchor for all the GCC countries' currencies, with the exception of the Kuwaiti Dinar, for over two decades. Except for a short period when it was exclusively pegged to the US dollar, the Kuwaiti Dinar has been linked to a weighted basket of currencies in which the US dollar forms the major part given that most Kuwaiti exports (oil) are priced in US dollars and limited fluctuation occurred vis-à-vis the US dollar, and subsequently the fluctuations vis-à-vis GCC countries' currencies (Sturm and Siegfried, 2005). Figure number 1 shows the movements of the nominal effective exchange rates of the GCC countries along with the movement in the exchange rate of the US dollar during the period of our review. However, during the same period the economies of the GCC countries witnessed some expansionary conditions due primarily to the sharp increase in global oil prices and to less extent by the pegged system.

The revenue from the hydrocarbon sectors (oil and gas) in the GCC countries forms around three quarters of government revenues in most of these nations (figure 2). As a result, fiscal policies in these economies are very active during the periods of buoyant oil revenues. According to Fasano and Wang (2002), the fiscal policies in the GCC economies are highly pro-cyclical to variations in oil revenues and therefore government spending is correlated with oil prices (figure 3). In periods of low oil prices (like those during 1990s) government spending in GCC countries is cut back rather than expanded, as one might expect if an active fiscal policy were being pursued. However, the recent surge in oil prices has resulted in a substantial trade balance surplus that has enabled the governments in GCC countries to increase public expenditure and investment, and subsequently increased the demand of the private sector (figure 4, 5). In the wake of high revenues from increased oil prices, the governments in most the GCC countries became expansionary and increased investment in various sectors of the economy, primarily in real estate, construction, and services that stirred income multiplication; this, in turn, increased demand for consumer goods that could not be fully entertained due to supply bottleneck. Furthermore, the increase in the number of expatriates that flow into most of the GCC countries due to the economic growth has further increased demand for most consumer goods, particularly the real estate, where rents have shot up due mainly to a shortage of accommodation[113]. The recent high price rents along with the increase in the price of other consumer goods, like food, which is also due to global factors, have led to demands for higher wages by employees in both public and private sectors in the GCC countries[114]. That situation has further deteriorated with the recent decrease in the value of the GCC countries' currencies in foreign currency terms due to the depreciation of the US dollar against the trading partners of the GCC economies (figure 1). The interaction of high prices in various consumer goods, due to high domestic demand because of expansionary fiscal policy and high global prices, and the depreciation of the GCC countries' currencies appear to have been the potential factors behind the recent inflationary pressures in the GCC countries (Sturm et al. 2008, Marzovilla et al. 2010, Central bank of Oman 2008). As of 2008, inflation rates in the GCC countries ranged between a single digit figure of around 5% (Bahrain) to a double digit figure of around 15% (Qatar), with an average of around 11% (figure 6).

In accordance with Parsley and Popper's (1998) proposition, the recent expansionary fiscal policies of the GCC countries is believed to have helped to influence the extent of pass-through from exchange rate to inflation in these countries both directly and indirectly. The direct influence is through higher government spending that led to higher demand for goods and services, and eventually reinforced the spill over from depreciation of exchange rate to inflation in the GCC countries. The indirect influence is through its effect on wages. For example, if domestic prices started to adjust following depreciation in the currency, wage adjustment would be expected to follow. However, adjustments in wages are assumed to depend on a number of factors like the slack in the labour market and the state of aggregate demand (Ghars El-Din and Mohammed, 2005)[115]. If the economy is in a recession, wage adjustments

[113] The GCC labour markets are highly dependent on foreign labour forces. With the exception of real estate markets, where it is around 95%, the percentage of expatriates represents around 50% to 75% of the total labour force in most of the markets in the GCC countries.

[114] Gulf Talent (2008, 2009).

[115]The relatively high dependency on foreign labour makes inflation pressures in the GCC economies more sensitive to external factors like exchange rates. For example, depreciation in the exchange rates of the GCC countries' currencies will lower the purchasing power of the foreign labourers' remittances and hence the amount of wages required to attract them or to retain them in the GCC markets (Hasan and Alogeel 2008). It is worth noting that government expenditure in the GCC countries is the main exogenous factor that causes wage adjustment as the role of trade unions is negligible in these countries (Ghars El-Din and Mohammed, 2005).

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will be weak, hence reducing the overall pass-through of the currency depreciation. Therefore, if the fiscal authorities in the GCC countries choose a restrictive fiscal policy following currency depreciation, this will weaken/moderate any chance of a wage-price spiral, thereby reducing the inflationary effects of depreciation.

Furthermore, due to the pegged system of the exchange rate regimes in the GCC countries the recent monetary environment in these economies can be described as expansionary or loose. As the Federal Reserve Bank started to decrease its short term rate in a precautionary step to avoid a recession after the attack on 11th of September 2001, the exchange rate of the US dollar has generally declined (compared to its level prior to the attack) against other major currencies in the world[116]. As a result, the exchange rates of the GCC countries' currencies have exhibited a corresponding decline in relation to other non-US currencies. Moreover, given the fixed regimes with the US dollar, the monetary authorities in the GCC countries have been tracking the monetary changes in the US by similarly lowering their short term interest rates, thus accommodating the demand for higher nominal money balances due to lower real money balances because of the depreciation (figure7). Further downward pressures on domestic interest rates in the GCC economies during the period of our sample were stirred up through higher injunction of liquidity into the monetary system on account of higher oil revenues that facilitated credit and aggregate spending.

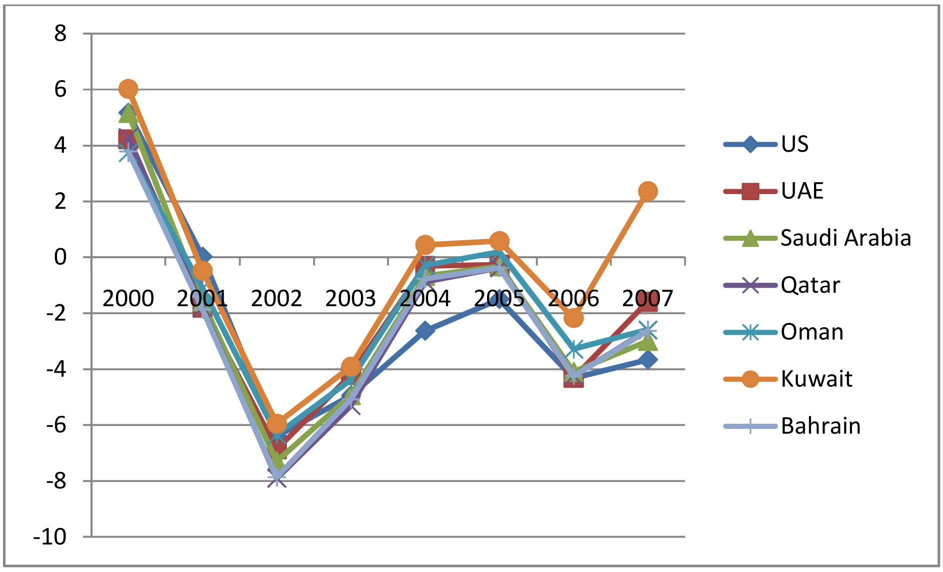
Accordingly, given the active stance of both demand policies in the GCC countries during the period of significant depreciation in the exchange rate of the currencies of these economies, one would expect some influence of the action of these policies on the extent of pass-through from exchange rate to inflation rates in the GCC countries, at least based on the hypothesis of Parsley and Popper (1998). The recent inflationary effect of the exchange rate depreciation in the GCC countries is believed to have been reinforced or sustained through higher money growth that in turn was triggered by expansionary fiscal policy because of higher oil wealth and to less extent by the pegged exchange rate system (figure 8). Furthermore, since the stance of both policies had been expansionary in most the GCC countries, it is expected that these policies have accentuated the extent of pass-through into inflation in these economies. Indeed, by looking at the behaviour of inflation rates from 2000 to 2008, we could infer, initially, that our expectation is right. Figure 6 shows the behaviour of inflation rates as measured by the changes in the consumer price index, along with the changes in the nominal effective exchange

[116] Particularly, since 2002 the US dollar has lost around 40 percent of its value *vis-à-vis* a basket of major currencies, weighted by their countries' trade with the US (Mishkin 2008).

rates of the GCC countries during the period of our sample. It is very clear that the depreciation of the currencies of the GCC countries currencies *vis-à-vis* the currencies of their other non-US trading partners had been followed by an increase in the inflation rates of the GCC countries. Such conditions provide a good atmosphere to test/validate the theory of Parsley and Popper (1998) and generally the importance of demand policies in influencing the pass-through relationship.

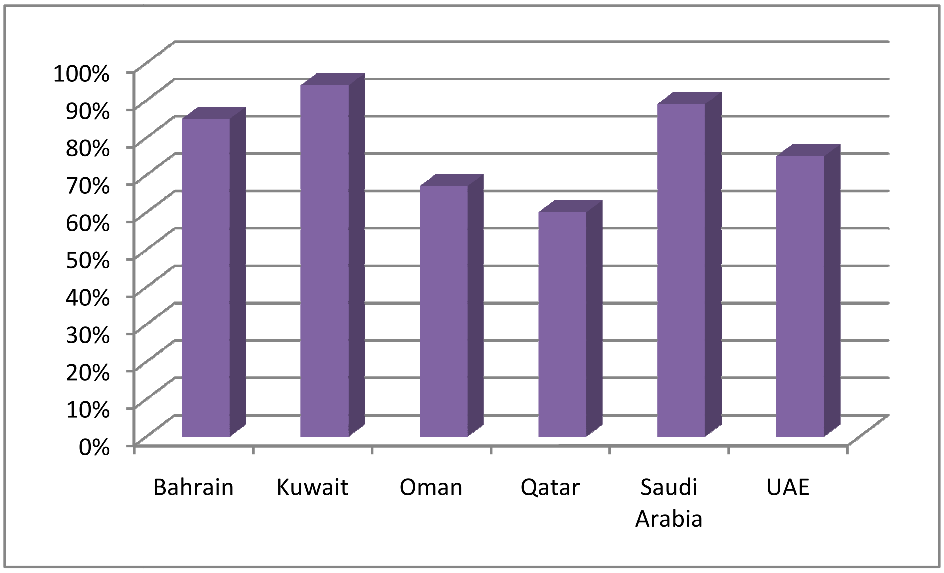
However, it is worth noting at the onset that it can be argued that the assumed active role for the monetary policy to influence domestic demand by stimulating economic activity is negligible in our sample of countries due to the fixed exchange regimes that are highly credible in light of large foreign reserves and the open capital account. Nonetheless, that does not totally rule out the ability of the monetary authority in the GCC countries to influence domestic demand through instruments like credit controls, required reserves, open market operation, *etc.* That leaves us with only the fiscal policy as the main stimulus of real demand in the GCC countries. Indeed, this had been the case in the GCC economies, as explained above.

Figure: 1(Percentage changes in nominal effective exchange rate for the US and the GCC countries)



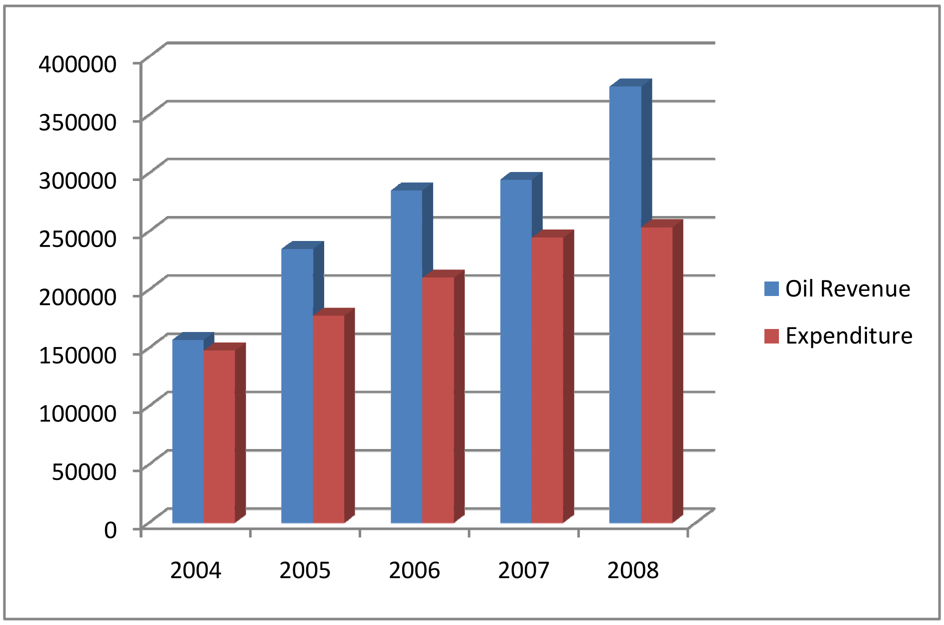
Source: International Financial Statistics, IMF.

Figure: 2 (Ratio of oil revenue to total government revenue in the GCC countries in 2008)



Source: Central Banks' Annual Reports of the GCC countries

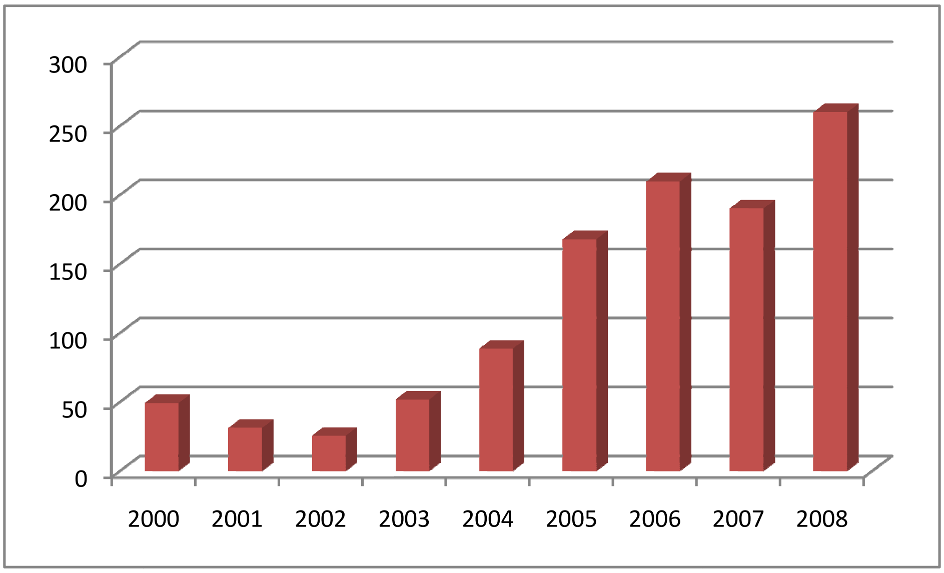
Figure: 3 (Oil Revenue and Government Expenditure of the GCC countries*)



*Oil revenue and expenditure of 2008 for UAE are not included

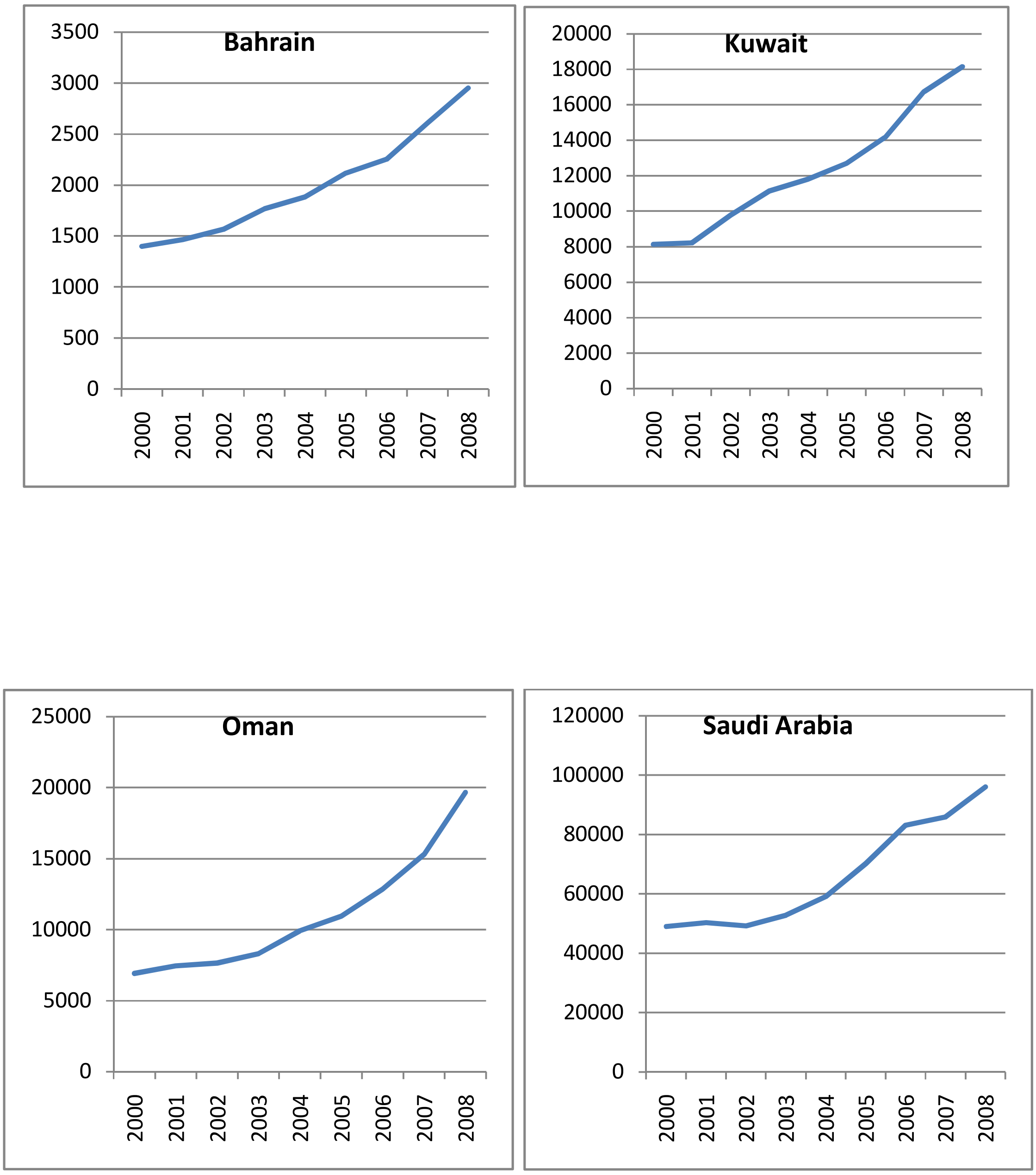
Source: Central Bank' Annual Reports of the GCC countries

Figure: 4 (Combined Current account surpluses of the GCC countries)



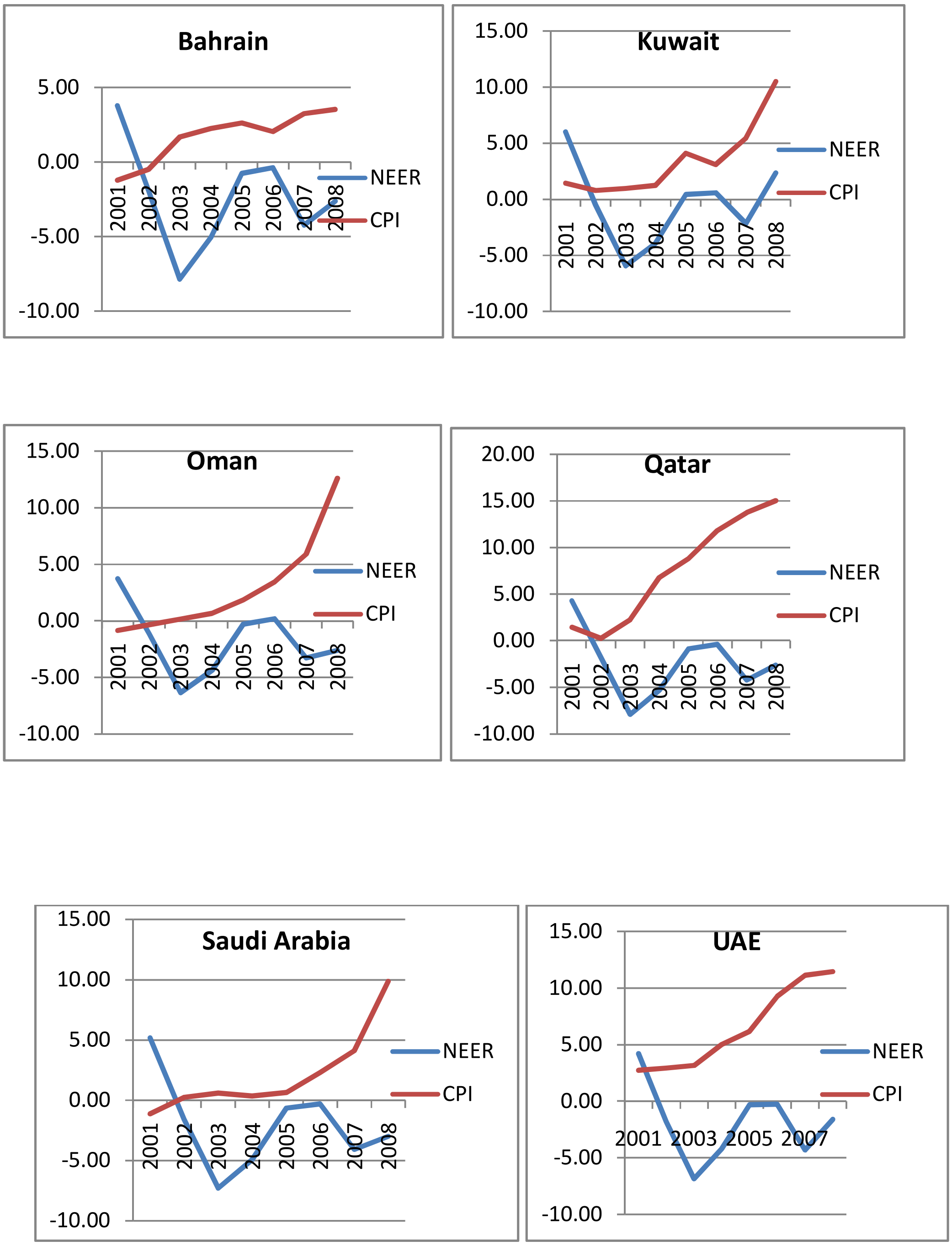
Source: World Economic Outlook, IMF

Figure: 5 (Government Spending in GCC countries, Units, US Dollars, scale: Millions)



Source: Central Bank' Annual Reports of the GCC countries

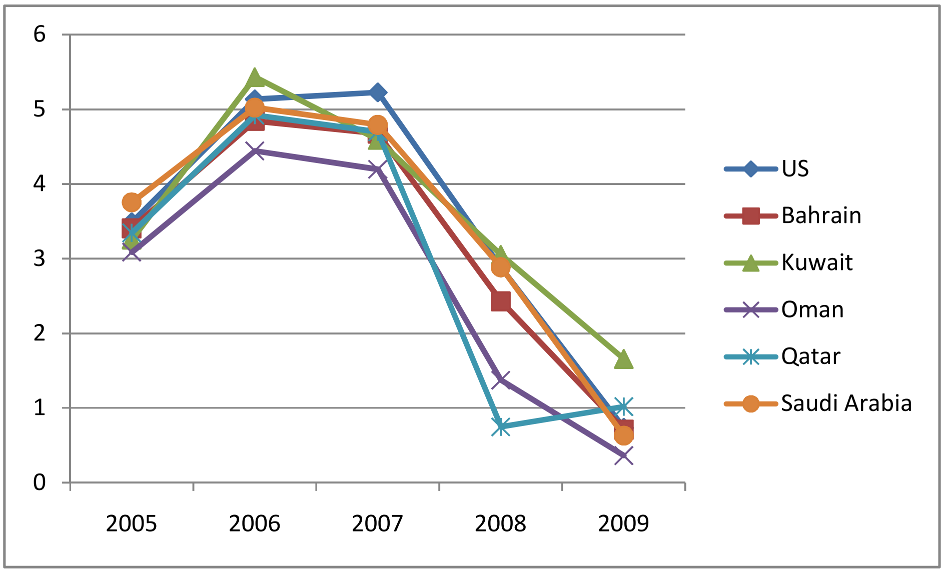
Figure: 6 (Percentage changes in NEER and CPI indices of the GCC countries*)



**NEER = Nominal effective exchange rate, CPI = Consumer price index.*

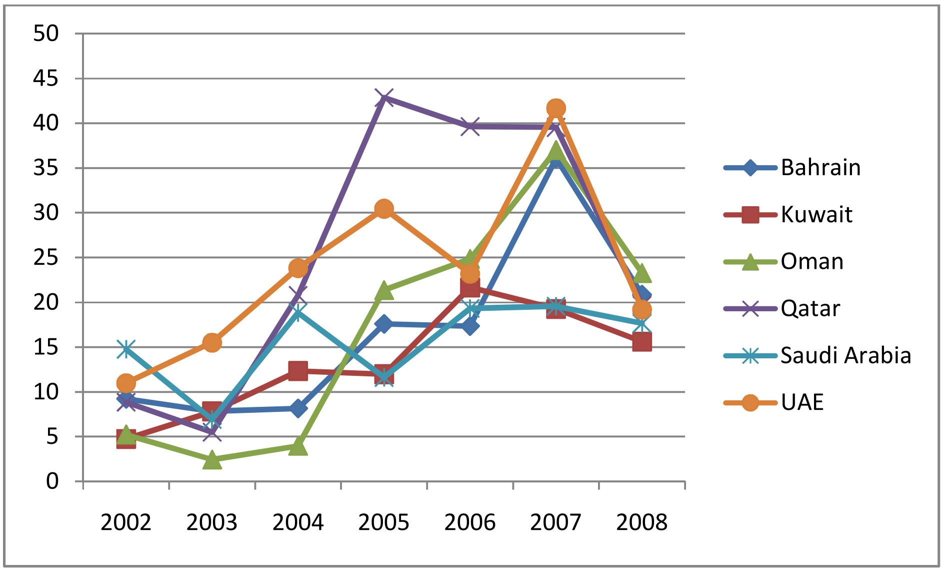
Source: International Financial Statistics, IMF.

Figure: 7 (Three months inter-bank rates in US and the GCC countries)



Source: Quarterly Statistical Bulletin (2010), Saudi Arabia Monetary Authority

Figure: 8 (Growth in Broad Money in the GCC countries)



Source: International Financial Statistics, IMF.

4. Estimation Framework

Following Parsley and Popper (1998), and due to data availability, we use aggregate price level in the form of the consumer price index, which will allow us to better understand the transmission from exchange rate to inflation, enhance our ability to identify the influence of demand policies to prices during the exchange rate depreciation, and differentiate our research from other related studies in the literature that focused on imports and exports.

However, we attempt to slightly differentiate ourselves from Parsley and Popper (1998) by building a theoretical frame work for our empirical estimation based on micro-foundations of pricing behaviour by exporting firms, and then augment such specifications with some variables for demand policies. Drawing from the literature (*e.g.* Bailliu and Fujii, 2004), a profit maximizing problem for an exporting firm is:

$$\max \pi = s^{-1}PQ - C(Q) \qquad (2)$$

Where π denotes profits in the exporting firm's currency, S is the exchange rate of domestic currency per unit of foreign currency, P is price in domestic currency, C is the cost function in foreign currency (exporting firm's currency), and Q is the quantity demanded. The first order condition for equation (2) is:

$$P = sC_q\mu \qquad (3)$$

Where C_q represents marginal cost of production and μ is the mark-up of price over marginal cost. Equation 3 states that the domestic price of imported good depends on the exchange rate, marginal cost, and mark-up of the exporting firm. Furthermore, changes in marginal cost is mainly subject to changes in the cost of local input (in the exporting country), whereas changes in the mark-up are assumed to be mainly affected by the demand pressure in the importing country. On the other hand, demand pressure in the importing country is assumed to be mainly stirred by domestic policies, *e.g.* fiscal or monetary policies. Accordingly, it is necessary to take into account the movements in other determinants of the price when measuring the pass-through in order to properly isolate the effects of exchange rate on prices. Thus, a reduced from for the price equation can be drawn as follows:

$$P_t = \alpha_0 + \alpha_1 S_t + \alpha_2 P_t^* + \beta_3 Y_t + \varepsilon_t \qquad (4)$$

Where P^* represents the marginal costs of the foreign firm and Y represents the demand conditions in the importing country. Equation 4 defines the exchange rate pass-through as the partial elasticity of domestic price with respect to the exchange rate.[117]

Furthermore, given the fact that the conventional theory states that the level of exchange rates and prices are linked in the long run, we used an error correction framework to estimate equation 4. We also took into account the non-stationarity of the variables, and the lagged effect of the explanatory variables. Moreover, we used World CPI as a proxy for the marginal cost of the foreign firm, which is normally difficult to measure. We followed other studies (*e.g.* Campa and Gonzalez, 2005) that have assumed, based on the integration of international markets, that there exists a single market for each product, regardless of its origin, destination or currency of domination[118]. Fiscal policy variables and monetary policy variables were used as proxies for demand pressure in the importing country. Specifically, we estimated the following model:

$$\begin{aligned}\Delta p_t = \alpha_0 + \delta_{ecm}(p_{t-1} - (\phi_1 s_{t-1} + \phi_2 y_{t-1} + \phi_3 p_{t-1}^* + \phi_4 p_{t-1}^{oil}) + \\ \sum_{k=1}^{L}\alpha_{1,k}\Delta p_{t-k} + \sum_{k=0}^{L}\alpha_{2,k}\Delta s_{t-k} + \sum_{K=0}^{L}\alpha_{3,k}\Delta y_{t-k} + \sum_{k=0}^{L}\alpha_{4,k}\Delta p_{t-k}^* + \sum_{k=0}^{L}\alpha_{5,k}\Delta p_{t-k}^{oil} + v_t\end{aligned} \qquad (5)$$

[117] According to Goldberg and Knetter (1997), variants of equation 4 are widely used as an empirical foundation for estimating the pass-through of exchange rate into prices.

[118] Furthermore, other reason for using the World CPI as a proxy for foreign CPI includes the relatively large and diverse trading partners of the GCC countries.

Where the small letters indicate log form, P_t^{oil} represents the oil price, and v_t is the error term. The first line in equation 5 shows the long-run dynamics of inflation and the second line shows the short-run dynamics of inflation. The coefficient δ represents the speed by which the inflation rate converges to its equilibrium. We will employ the Johansen procedure to test for the presence of co-integration between the variables of our model.

Also, our analysis will be based on the comparison of the estimated long-run coefficients of the exchange rate from equation 5 with and without variables representing demand policies, Y. The signs for the long-run parameters in equation 5 are expected to be all positive with exception to the coefficient of exchange rate, which is expected to be negative.

Based on the theory of Parsley and Popper (1998) and given the conditions of the GCC countries during the period under review, we expect the biased ERPT (without a variable for fiscal or monetary policies) to be higher than the underlying/true aggregate response (including a variable for fiscal or monetary policies).

5. Data Description

It is necessary to note at the outset that similar to many other developing countries, the GCC countries suffer from a data availability problem. In particular, high frequency time series are mainly available only from the beginning of the current decade onward. Furthermore, times series data on microeconomic variables are not compiled on a regular basis in most the GCC countries, hence making the micro-based analysis of exchange rate pass-through difficult.

All the data are times series with monthly frequency for the period January 2000 to December 2008. The rationale for choosing such a period is firstly because the US dollar, to which the currencies of the GCC countries are pegged, has showed relatively significant fluctuations during that period, and secondly due to the heated economic conditions of the GCC countries during the same period. Hence, the period provides fertile grounds to test the influence of demand policies on the extent of pass-through from exchange rate to inflation. Furthermore, we further contributes to the literature by employing monthly macrodata as compared to most other studies, including Parsley and Popper (1998) that were faced with data availability and have to use lower frequency data like quarterly times series (Mihailov, 2010). According to Choudhri et al. (2005) and MacCarthy (2007) Using monthly frequency is considered more preferable in studying the pass-through.The main sources of the data are the International Financial Statistics (IFS), IFS Direction of Trade Statistics, and the central banks of the examined countries. Due to a lack of data for Qatar and the UAE, the test will be confined to only four GCC members: Bahrain, Kuwait, Oman, and Saudi Arabia. However, given the similarity in the structure and conditions of the economies of the GCC state members (large share of oil production in total, dependency on oil exports, highly import-dependent, and similar trading partners' weights), the inferred implications from the estimated results of the examined country members can be applied to the entire GCC area.

Furthermore, we use NEER as a proxy for exchange rate, and consistent with the IMF, we define NEER as the foreign currency price per local currency, so an increase in it would indicate an appreciation[119]. For monetary policy, we will use domestic credit instead of any broad money measure on account of instability in money demand in the GCC economies[120]. Monthly series on government spending/expenditure for the period of our sample were only available for Kuwait and Oman. As a result, for the rest of our sample (Bahrain and Saudi Arabia) we used monthly total oil exports as a proxy for government expenditure due to the pro-cyclicality of fiscal policies in the GCC economies with revenue from exports of oil. A dummy variable was considered in the case of Kuwait to account for the Iraqi War in 2003.

6- Unit Root Test

[119] We did not use the bilateral exchange rate *vis-à-vis* the US dollar for two reasons. The first reason is that the exchange rates of the GCC countries are pegged to US dollar. The second reason is that normally the NEER is viewed to be more appropriate for capturing the total impact of the exchange rate on domestic prices in countries with diversified trading partners (Ito *et al*. 2005).

[120] Reported results by Al Raisi and Pattanaik (2005) and Hasan and Alogeel (2008) on the link between money supply and inflation on the GCC countries were not in favour of using broad money as a proxy for monetary policy or demand side in general.

Our first step in the estimation process is to determine the order of integration of the variables. We have applied two unit root tests, namely the Augmented Dickey-Fuller (ADF) test and the Phillip-Perron (PP) test[121]. The general form for the ADF test including a constant and a linear trend is presented in equation 6. Optimal lags were selected using Schwarz Criterion (SIC). With respect to the PP test, we selected the truncation lag for the variance estimate test by the rule of thumb suggested by Newey-West. The summary for the unit root tests is given in appendix 4. It is clear that none of the variables are stationary at their level, however, their first difference is integrated of order zero I(0).

$$\Delta y_t = a + \alpha t + \beta y_{t-1} + \sum_{i=1}^{p} \delta_i \, \Delta y_{t-i} + u_t \qquad (6)$$

7. Estimation and results analysis

Following Parsley and Popper (1998) we started to estimate equation 5 without including variables for demand policies. After testing for the non-stationarity conditions in the level of our variables we used the Johansen procedure to establish the co-integration link between these variables. In both cases, with and without variables for demand policies, our co-integration tests, which are detailed in Appendix 5, indicate the presence of co-integration (long-run relationship) between the variables in our model.

Our analysis will focus on the estimated values and the significance of the coefficients on the exchange rate variable and whether the addition of variables for demand policies influences the pass-through from exchange rate to inflation in the GCC countries. However, unlike Parsley and Popper (1998), who focused on short term coefficients of exchange rate, our analysis will be confined on the long-term coefficients of exchange rate. Also unlike Parsley and Popper, we attempted to utilize the results of the variance decompositions from our estimated model in our analysis.

[121] The PP test is a modification of the ADF t statistics that takes into account the less restrictive nature of the error terms (Asteriou and Hall, 2007).

The results from the normalized co-integrating coefficients from estimating equation 5 without variables for demand policies are summarized in table 1. Detailed versions of the estimated VECMs along with system diagnostic tests are attached in appendix 6. The VECMs were subject to single equation as well as system diagnostic tests and the results generally suggest that our VARs are acceptable.

Table (1)

Country	Co-integration Equation for Consumer Price Level
Bahrain	$p_t = -0.54 s_t - 0.21 p^* + 0.1 p^{oil}$ (-3.34) (-1.12) (2.88)
Kuwait	$p_t = 0.57 s_t + 0.78 p^* + 0.01 p^{oil}$ (3.28) (4.53) (0.20)
Oman	$p_t = -0.54 - 1.45 p* + 0.05 p^{oil}$ (-1.78) (-3.12) (0.89)
Saudi Arabia	$p_t = -0.65 s_t - 0.60 p^* - 0.02 p^{oil}$ (-3.98) (-2.86) (-0.52)

From the results of the estimated co-integration equations presented in table 1 we can see that there is a long-run link between inflation (given by changes in the consumer price index) and changes in the nominal effective rate in the GCC countries. In other words, changes in exchange rates can be considered a significant long-run influential factor on the inflation rates of the GCC countries. Moreover, the sign of the coefficient of the exchange rate is, as expected, negative in all countries, except in Kuwait[122,123]. The coefficients of the exchange rate in the models of the four countries are

[122] The positive sign for Kuwait could be explained by the appreciation of the currency (dinar), which increases the purchasing power of wealth and stimulates higher expenditure and price inflation in the long-run. Alternatively, the positive sign suggests that inflation could be affected by many other factors that also influence the demand for and the supply of exports and imports in this economy. For example, if an appreciation of the nominal effective exchange rate of this country is accompanied by a reduced foreign supply, or by an increased domestic demand for imports, due to say, a rapid growth in the money supply or income, the

very close and range between a minimum of 0.54 (Oman) to a maximum of 0.65 (Saudi Arabia). This amount of elasticity is considered to be at odds with the expected theoretical argument of the PPP theory that claims a complete pass-through from the exchange rate to domestic prices. Furthermore, the results of the variance decompositions for the price level index for all the countries presented in table 2 confirm the link between an effective exchange rate and inflation in the GCC economies. Changes in the exchange rate are found to explain on average around 15 percent and 25 percent over one and two years, respectively, in the GCC economies. However, the majority of the variations in the price level index are explained by its own lags in the four GCC countries.

Table: 2 (Variance decompositions for price level indices of the GCC countries)

	Log CPI	logNEER	logFCPI	logOP
Bahrain				
6	86	5	6	3
12	68	14	5	13
24	48	22	3	27
Kuwait				
6	87	6	5	2
12	77	16	5	2
24	63	31	4	2
Oman				
6	91	3	1	5
12	85	9	1	5

impact of the exchange rate on the consumer prices would likely be neutralized or consumer prices may even rise (Kim, 1998). It could also be explained by the recent frequent adjustment in the exchange rate parity of the Kuwaiti currency by the authority following the recent increases in consumer prices.

[123] The presence of the wrong sign for other of the variables in our models can be attributed to factors like data availability and price regulations for some items in the index of consumer prices by the local authority in the GCC countries.

24	86	9	1	4
Saudi Arabia				
6	84	8	7	1
12	72	17	10	1
24	55	35	8	2

We repeated the estimation of equation 5, but this time by including a variable that represents the partial monetary policy in the economies of our sample, namely the domestic credit. The estimation results for the equations of the price level are summarized in table 3. Detailed VECMs, along with the respective system diagnostic tests, are presented in Appendix 7. The coefficient of domestic credit is significant in all the countries of our sample and it got the expected positive sign for both Kuwait and Oman; however, it is negative for both Bahrain and Saudi Arabia. The negative sign in Saudi Arabia and Bahrain can be attributed to the large share of highly subsidised industrial and development loans, and it can also be interpreted to suggest that credit growth eases capacity constraints in these two economies and lowers price inflation in the long-run. Furthermore, the sign of other variables in the models for all four countries have generally improved after including the domestic credit variable. Most importantly, from the results of table 3 it can be seen that the coefficients of the exchange rate have showed some significant changes after including the variables of domestic credit. In all cases, we can note that the coefficients of exchange rates or the pass-through elasticities have decreased and have become less negative. For example the pass-through elasticity for Bahrain, Kuwait, Oman, and Saudi Arabia decreased from -0.64, 0.57, -0.54, and -0.65 to -0.25, 0.38, -0.21, and -0.19, respectively. Hence, confirming the arguments of Parsley and Popper (1998) on the importance of monetary policy on the pass-through elasticity from the exchange rate to prices.

Also, the results of the variance decomposition are presented in table 4. Variations in the price level index are found to be explained by domestic credit in Bahrain and Saudi Arabia, and by their own innovation in Kuwait and Oman. However, changes in the exchange rate are found to be negligible in all four countries.

Table (3)

Country	Co-integration Equation for Consumer Price Level
Bahrain	$p_t = -0.25 s_t + 1.97 p^* + 0.04 p^{oil} - 0.38 dc$ (-3.99) (12.84) (2.42) (-10.18)
Kuwait	$p_t = 0.38 s_t + 0.26 p^* + 0.03 p^{oil} + 0.11 dc$ (7.92) (2.88) (3.49) (3.77)
Oman	$p_t = -0.21 s_t + 2.79 p * + 0.10 p^{oil} + 0.40 dc$ (- 2.03) (2.96) (5.35) (8.41)
Saudi Arabia	$p_t = -0.22 s_t + 1.35 p^* + 0.02 p^{oil} - 0.10 dc$ (-7.24) (3.69) (2.79) (10.56)

Table: 4 (Variance decompositions for price level indices of the GCC countries)

	Log CPI	logNEER	logFCPI	logOP	logDC
Bahrain					
6	5	5	6	6	78
12	2	6	1	4	87
24	1	6	1	4	88
Kuwait					
6	72	2	12	1	13
12	69	2	7	0.3	21.7
24	66	5	5	0	24
Oman					
6	93	5	1	0.7	0.3
12	84	4	5	4	3
24	49	6	33	8	4

Saudi Arabia					
6	23.7	0.3	2	2	72
12	1	0	3	0	96
24	1	0	3	0	96

Additionally, we repeated the estimation for all the countries in our sample, but we included a public expenditure variable to represent the action of the fiscal policy during the period of our sample. Table 5 summarizes the results of the estimation (detailed VECMs are presented in appendix 8 along with the respective system diagnostic tests). From table 5, we can see that the fiscal policy variable is significant in all the models for the four countries of our sample. However, the expected positive sign is found in the cases of Bahrain and Kuwait, and it was negative in the cases Oman and Saudi Arabia. The negative sign can be interpreted to suggest that government spending in Oman and Saudi Arabia is geared toward easing capacity constraints and structural bottleneck in order to eventually reduce inflationary pressure in the long-run. With regard to the coefficient of the exchange rate, it had decreased remarkably in all countries except for Saudi Arabia, where it decreased to only 0.57. In case of the Kuwait, the exchange rate coefficient had showed very similar decrease to that produced in the preceding estimation when the domestic credit was included. Furthermore, we can also see that the pass-through is significant for only Kuwait and Saudi Arabia, while it turned out to be insignificant in the cases of Bahrain and Oman. Results of the variance decomposition in table 6 indicate that the variance of the consumer price level index is dominated by its own innovation, followed by foreign inflation, in all four countries, with an almost negligible role for changes in the exchange rate.

Table (5)

Country	Co-integration Equation for Consumer Price Level
Bahrain	$p_t = -0.11s_t + 0.01p^* - 0.29p^{oil} + 0.46gov$ (-.71) (0.03) (-4.74) (5.58)
Kuwait	$p_t = 0.36s_t + 1.65p^* + 0.122p^{oil} + 0.15gov$ (2.47) (1.53) (4.49) (6.96)

Oman	$p_t = -0.20 s_t - 0.39 p* + 0.03 p^{oil} - 0.35 gov$ (0.48) (-0.73) (0.40) (-2.93)
Saudi Arabia	$p_t = -0.57 s_t - 0.64 p^* + 0.26 p^{oil} - 0.22 gov$ (-5.01) (-4.85) (3.29) (-2.77)

Table: 6 (Variance decompositions for price level indices of the GCC countries)

	Log CPI	logNEER	logFCPI	logOP	logGV
Bahrain					
6	90	0	8	0	2
12	91	0	7	0	2
24	91	0	7	0	2
Kuwait					
6	76	5	17	2	0
12	69	4	24	3	0
24	66	4	27	3	0
Oman					
6	78	1	12	1	8
12	67	1	14	1	17
24	54	1	13	1	31
Saudi Arabia					
6	78	8	13	1	0
12	72	15	10	3	0
24	72	15	8	4	1

In a fourth attempt, we re-estimated the error correction model for all four countries, but this time we included both domestic credit and fiscal expenditure variables. Table 7 presents the estimated long-term coefficients of the price level equations (detailed VECMs are presented in appendix 9 along with the respective system diagnostic tests). This time, both variables are significant for all countries, with the exception to the domestic credit in the case of Kuwait where this variable turned out to be insignificant. Furthermore, government expenditure continued to bear the expected positive sign for Bahrain and Kuwait and continued to be negative for Oman and Saudi Arabia. On the other hand, the domestic credit variable continued to retain a positive sign only in the case of Oman, where the magnitude of the coefficient was the same as in the second estimation. Consistent with the above theoretical discussion and with the last two estimations, the coefficient of the exchange rate has shown significant decline in all countries as compared to its magnitude in our first estimation (without variables for demand policies). It continued to bear the correct sign in all countries, with the exception to Kuwait where it is insignificant. The average estimated ERPT in the countries of our sample is 0.23, as compared to 0.60 before taking account of the actions of the demand policies during the period of our sample. The results of the variance decompositions in table 8 indicate that the variations in the price level index is explained by its own lags, followed by the domestic credit and government expenditure, respectively, with a negligible role for changes in exchange rates.

Table (7)

Country	Co-integration Equation for Consumer Price Level
Bahrain	$p_t = -0.14s_t + 2.63p^* - 0.07p^{oil} - 0.31dc + 0.16gov$ (-2.30) (5.51) (-3.05) (-6.26) (4.71)
Kuwait	$p_t = 0.26s_t - .83p^* + 0.17p^{oi} - 0.02dc + 0.21gov$ (1.43) (-3.28) (4.67) (-0.22) (6.73)
Oman	$p_t = -0.19s_t + 2.16p* + 0.12p^{oil} + 0.41dc - 0.10gov$ (-1.95) (2.47) (6.25) (8.98) (-1.56)
Saudi Arabia	$p_t = -0.34s_t + 0.46p^* + 0.11p^{oil} - 0.10dc - 0.10gov$ (-9.98) (1.18) (3.54) (-5.36) (-3.21)

Table: 8 (Variance decompositions for price level indices of the GCC countries)

	Log CPI	logNEER	logFCPI	logOP	logDC	logGV
Bahrain						
6	79	0	6	0	4	11
12	74	0	3	0	8	15
24	68	0	2	0	11	19
Kuwait						
6	56	1	12	0	23	8
12	43	1	11	0	40	5
24	35	1	10	0	50	4
Oman						
6	93	2	0	1	0	4
12	83	0.5	0.5	8	3	5
24	50	3	22	13	6	6
Saudi Arabia						
6	4	2	1	1	92	0
12	4	1	2	0	93	0
24	4	1	2	1	92	0

The above results confirm the arguments of Parsley and Popper (1998) on the importance of economic policies on the pass-through elasticity from the exchange rate to prices, or generally on the relationship between the economic variables of interest. However, our result is at odds with the findings of Parsley and Popper (1998), who found that the omission of monetary policy variables leads to a lower exchange rate pass-through, implying that the monetary policy in the United States is aimed at reducing the effect of the exchange rate on prices. We found that failure to take into account variables representing demand policies will lead to biased estimates of pass-through from the exchange rate to prices. During the period of our sample the expansionary stance of monetary policy and the pro-cyclical fiscal policy were found to have further accentuated the long-run effect of depreciation in the exchange rate to consumer prices in the GCC economies.

8. Policy Implications

The different estimated coefficients for exchange rate variables have a number of implications. For example, they generally suggest how important it is to account for the actions of economic policies when studying the relationships between economic variables in an economy. They also confirm earlier findings in the literature, including Parsley and Popper (1998), regarding the relevancy of domestic demand policies in determining/influencing the impact of changes in the exchange rate on domestic prices. To the extent that changes in macroeconomic policies are not properly taken into account, the apparent relationship between the exchange rate and the inflation rate may be spurious.

Moreover, the results confirm that the primary aim of monetary policies in the GCC economies is not to control inflation. Given the pegged exchange rate regimes, the primary aim of the monetary policies in the GCC countries is to maintain the internal, as well as the external, value of their currencies. That explains why our results contradict those of Parsley and Popper (1998) and why monetary policy in the GCC economies does not eliminate ERPT, but, on the contrary, made it stronger during the period of our sample.

The independent effect of the exchange rate on consumer prices in the GCC countries is misleading when the variables of demand policies are neglected in the estimation. By taking into account the actions of demand policies, the average long-run ERPT in the GCC economies is estimated to be about 0.23, as compared to an average of 0.60 when the demand policies are neglected. Furthermore, such a relatively moderate pass-through should be *a priori* expected given the recent anti-inflationary actions that were carried out by most of the local authorities in the GCC countries. In a step to keep inflation in check, particularly following the recent regional and international macroeconomic development, the GCC countries have introduced number of anti-inflationary measures; *e.g.* imposing some administrated prices, like announcing certain caps on permitted increases in house rents[124]; introducing further subsidies in consumption of certain essential commodities (*e.g.* water, energy, and food); lifting bans on certain importable items; and lowering or cancelling tariffs on certain imports, like steel. Furthermore, the central banks in the GCC economies have introduced additional measures, like increasing the reserve requirement, tightening the lending ratio in order to rein in fast credit growth, and increasing the volume of absorption of surplus liquidity through open market operations.

Generally, an average pass-through of 0.23 indicates that changes in the exchange rate have significant impact on inflation in the long-run in the GCC countries. Ten percent depreciation in the exchange rate will result in an average of 2.3 percent increase in the price level of the GCC countries, in the long-run. Moreover, the fact that in absolute terms the extent of pass-through in all the sampled countries is less than 1, suggests the failure of the PPP theory in the context of the GCC countries. Also, an average long-run pass-through of 0.23 is considered very moderate and does not signify high risk from fluctuations in the foreign exchange market for domestic prices. In other words, the volatility of exchange rates of the currencies of the GCC countries does not necessitate the adjustment of the money supply in these economies, hence indicating the relevancy and success of the existing fixed exchange regime in these economies. Furthermore, the relevancy of the existing exchange rate regimes is also supported by the success of this regime over the past two decades by generally playing an active role in maintaining price stability, stable value of the currency, and credible monetary policy, while also providing a good environment for economic growth in the GCC countries despite the regular fluctuations in the international price of oil.

Also, the results suggest that the recent impact of the exchange rate on the inflation rate in the GCC countries is influenced by the actions of the domestic demand policies that had followed/accompanied the recent decline in the effective value of the currencies of the GCC countries. In other words, the recent expansionary actions of the domestic demand policies of the GCC countries are found to have reinforced the inflationary pressure of the exchange rate depreciation in their economies. The fiscal policy and the pegged system is believed to have accentuated the impact of the weaker values of the currencies of the GCC countries on domestic price levels in these countries as firms are expected to be more willing to change prices, rather than adjusting their profit margins during a demand boom (Mann, 1986). That implies that the depreciation of the currencies of the GCC countries has not been the major or primary factor for the abnormal rise in inflation rates in these economies during the past few years.

[124] For example, a maximum annual increase of 15% in Oman, 10% in Qatar, and 7% in UAE.

That lends further support to the opinions that view the existing pegged exchange rate regimes of the GCC countries as still viable macroeconomic policy to these economies.

Now, given the fact that fully independent monetary policies in these economies do not exist, as they do in other economies with more flexible exchange rate regimes, it can be argued that the domestic credit variable that we have used in our above estimation would mainly be an indication of money growth or liquidity and not the action of monetary policy. Furthermore, since revenue from exports of oil forms the main source for money growth in the GCC economies and given the pro-cyclicality of fiscal policy in the GCC economies to oil revenues, fiscal policies should be considered among the dominant factors that influence the pass-through from the exchange rate to domestic prices and eventually to inflation in the GCC economies[125]. In other words, fiscal policy forms the key macroeconomic tool in the hands of the policy makers in the GCC countries to contain inflation.

Further, it is normally believed that inflationary consequences of depreciation in the exchange rate are temporary, since once the price level reaches its new equilibrium, the rate of inflation falls back to its previous level (Kahn, 1987). However, that is subject to the assumption that the authority will not try to permanently accommodate the depreciation by increasing money growth in the economy (Kahn, 1987). Now, since the growth in money, through the pegged exchange regime and pro-cyclical fiscal expansion, has accompanied the recent decline in the value of the GCC countries' currencies, and has given optimistic economic growth in these economies because of substantial budget surplus from oil prices, it is imperative that the authorities in these countries take some prudent actions in order to control the increases in the price levels.

Among the suggested solutions for lowering the influence of fiscal policies on the extent of ERPT to domestic prices and inflation in general in the GCC countries is to pursue some gradual steps toward domestic development in the economy, since such development is mainly dependant on government spending, which is the main source of money growth in the GCC economies. Gradual development is particularly stressed during the periods of perceived continuous depreciation of the currency, like the

[125] Fiscal policies in the GCC countries are generally considered the main source for money growth in these economies and are believed to lead directly to an increase in the money supply due primarily to less developed financial markets (Keran, and Malik 1979). Furthermore, government spending forms the major stimulator for private sectors in the GCC economies.

case of our above examined sample period, in order to avoid any monetary accommodation to depreciation in the exchange rate[126].

Additionally, the problems of supply bottleneck in labour and raw material in these economies amid the recent heated economic growth has further stressed the effect of the expansionary fiscal policies on the extent of ERPT in the GCC countries during the period of our sample. Therefore, the fiscal expansion in the GCC countries also needs to take into account the absorptive capacity of the respective economies and to avoid triggering supply bottleneck, which will eventually trigger inflationary pressures. This also includes attempting to address supply bottlenecks in order to maintain a low impact from the external sector in general. Addressing a supply bottleneck can be achieved through directing public and private resources toward easing binding capacity constraints and capitalizing on the generated revenues of oil resources.

With regard to the incipient monetary union, the different signs in the model may reflect the lack of fiscal divergence among the GCC countries, which suggest a failure to meet the OCA criteria of fiscal convergence despite the pro-cyclicality trend between oil prices and government expenditure.

Finally, despite the pegged exchange rate system, the monetary authority is believed to be able, to some extent, to participate in moderating the inflationary effects of the exchange rate by attempting to contain the liquidity of the GCC economies through instruments like credit controls, required reserves, open market operation, *etc.*

9. Summery and Conclusion

This chapter attempted to explore the influence of the demand policies on the pass-through from exchange rate to inflation rates in the economies of the GCC countries. The link between demand

[126] Others may argue that this recommendation might be difficult in practice, in particular when oil price on the rise to offset the effect of the depreciation, and the urgency to build and expend physical and social infrastructure, keeping in mind that the GCC countries are still not fully developed in many areas. The concept of opportunity cost comes to mind here.

policies and the extent of ERPT into domestic CPI inflation in this chapter is basically based on the work of Parsley and Popper (1998), who have theoretically argued that the estimates of the responsiveness of domestic prices to changes in exchange rates may reflect, in addition to other factors, the policies of the central bank during the period examined. Based on the proposition of Parsley and Popper (1998), the recent inflationary effect of exchange rate depreciation in the GCC countries during the period of our review (2000-2008) is believed to have been reinforced or sustained through higher money growth that in turn was triggered by expansionary fiscal policies because of higher oil wealth and to less extent by the pegged exchange rate system.

A VECM was used to estimate a model for the price level in the GCC countries. The model was estimated two times; with and without the variable for demand policies. After taking into account the action of the fiscal and monetary policies, the estimated coefficients of exchange rate is significantly lower, in all the sampled countries, than the estimated ones when the model was not including variables representing demand policies. Average ERPT in the log-run turned out around 23%, as compared to an average of around 57% when the actions of demand policies were not accounted for.

An average exchange rate pass-through of around 23% indicates that depreciation in nominal effective exchange rates has a significant impact on inflation in the GCC economies in the long-run. Depreciation of 10% in exchange rate will results in an average of around 2.3% increase in the price level of the GCC countries in the long-run. Moreover, the fact that in absolute terms the extent of pass-through is far less than one, suggest the rejection of the PPP theory in the economies of the GCC countries. Furthermore, an average long-run pass-through of around 23% is considered very moderate and does not signify high risk from fluctuations in the foreign exchange market for domestic prices in the GCC countries. In other words, the volatility of exchange rates of the currencies of the GCC countries does not necessitate the adjustment of the money supply in these economies, hence indicating the viability of the existing pegged regime in these economies. The results of the pass-through also indicate more freedom for the monetary authorities in the GCC countries to pursue the main macroeconomic goals without disturbance from external side like fluctuations in the exchange rate of their currencies.

Further, the results generally suggest how important it is to account for the actions of economic policies when studying the relationship between economic variables in oil exporting nations like the

GCC countries. The important role of fiscal policies in the GCC countries can mainly be attributed to level of their economic development and to the pegged exchange rate regime that paralyses their ability to use independent monetary policy to sustain internal stability and growth. Moreover, the recent impact of the inflationary depreciation of the exchange rate in the GCC countries was mainly influenced by the actions of the expansionary fiscal policies in these economies. Accordingly, to the extent that changes in macroeconomic policies are not properly taken into account, the apparent relationship between exchange rate and the inflation rate may be spurious.

Chapter Six

Literature review on the choice of exchange rate regime

1. Introduction

In this chapter and the next we shall attempt to complement our analysis of the relevancy of the current pegged exchange rate regimes to the GCC economies by trying to identify the most suitable alternative exchange rate regime for these countries. More specifically, we assumed that the GCC countries may decide for reasons other than recent inflationary pressures, such as changing national priorities, to shift to some other available alternative exchange rate regimes. Accordingly, we shall attempt to give a thorough analysis on potential choices available to the GCC countries with regard to their exchange rate policies. Furthermore, our analysis included an empirical testing for the proposition of pegging the currencies of the GCC countries with a basket of two currencies, namely the US and the euro, instead of the current single dollar peg. We start by presenting brief survey of the recent literature on exchange rate regimes. In the next chapter, we focus on analysing the alternative exchange rate regimes within the context of the GCC countries.

The exchange rate regime of a country is normally defined as the mechanism by which a country manages the monetary value of its currency in the foreign exchange market. They are generally categorized on the basis of flexibility that the local monetary authority of a country shows against the variability in the exchange rates of the country's currency. Since the last third of the 19th century, the world has witnessed a variety of historical exchange rate regimes. These regimes include the classical gold standard, the inter-war gold (fixed rate) exchange standard, the inter-war floating rate experience, the Bretton Woods fixed (adjustable peg), and post-Bretton Woods regime, in which currencies are allegedly floating (MacDonald, 2007). Between the two extreme corner exchange rates (firm fixing and free floating) there exist intermediate regimes, which are normally referred to as "soft pegs", containing limited flexibility in comparison to the two corner regimes. Soft peg is defined as "exchange rates that are currently fixed in value (or a narrow range of values) to some other currency or basket of currencies, with some commitment by the authorities to defend the peg, but with the value likely to change if the exchange rate comes under significant pressure" (Fischer, 2001, P.3).

Furthermore, a variety of intermediate exchange rate regimes have been identified in the literature; however, the list is not exhaustive, since chances remain available to mix these regimes in order to generate new hybrid regimes. For example, Frankel (1999, 2003) has described nine exchange rate regimes including the two corner regimes, and listed them based on their degree of flexibility; currency union, currency board, truly fixed, adjustable peg, crawling peg, basket peg, target zone or band, managed float (dirty float), and free float[127]. Their flexibility increases as we move down from the very rigid system (currency union) to the very flexible system (free float).

The reminder of this chapter is organized thus. Section two attempts to present recent trends in the choice of exchange rate regimes. The factors that determine the choice of exchange rate regimes based on the literature are summarized in section three. A summary and conclusion are given in section four.

2. Recent Trends in Exchange Rate Regimes

Some recent studies have reported, based on the official (de-jure) exchange rate policies, that since the late 1990s a great number of countries have increasingly shown shifts toward either one of the extreme exchange rate regimes (fixed or floating). Such trends have been dubbed bipolarity, hollowing out, the missing middle, and the hypothesis of vanishing intermediate regime (Frankel, 1999, 2003). According to Fischer (2001), one of the main proponents of the bipolarity assumption, countries open to international capital flows are in the process of shifting away from adjustable peg exchange rate regimes toward firm fixing or systems with greater flexibility. Such movements or trends in vanishing soft pegs were initially applied to the developed economies[128], however they were extended to the emerging markets after the East Asian currency and financial crises in 1997-1998. The claim for the vanishing middle hypothesis was supported by apparently existing trends during that time and by official statistics about the classification of the regimes during the 1990s. For example, based on the IMF annual report 2000 , Fischer reported that between the period 1991-1999 the proportion of IMF members that followed soft systems decreased from 62% (98 countries) to 34% (63 countries) . On the

[127] Dollarization is included under firm fixing.

[128] Earlier reference to the corner hypothesis of missing middle include Eichengreen (1994), Crocket (1994), Obstfeld and Rogoff (1995), and Summer (2000).

other hand, the portion of floating regimes had increased from 23% (36 countries) to 42% (77 countries), and firm fixing had increased from 16% (25 countries) to 24% (45 countries)[129].

Further, according to the "bipolar view", soft pegs are not sustainable long term and their viability is suspect, since they assumed to make an economy, particularly those that are open or opening to the international capital market, prone to currency and financial crises. Fischer (2001) reported that all major capital market crises since 1994 have involved a pegged or fixed exchange rate system[130][131]. A number of factors have been presented in the literature to justify the fragility and nonviability of the soft peg systems. For example Fischer (2001) has cited the laxity and false perception of stability, the impossible trinity, and ineffectiveness of capital controls[132].

Laxity and false perception develop after a few years of stability under an exchange rate regime, as the agents come to believe that the exchange rate won't ever change resulting in a reduced perception of risk while conducting a commercial or financial transaction in foreign currencies, to the extent that hedging is viewed as unnecessary. As a result, rapid excessive risk taking will take place during booms in capital flows. According to Larrain and Velasco (2001) sudden withdrawal of capital will leave the domestic financial sector at severe distress. Furthermore, the sudden large reversal of capital under a pegged exchange rate can result in self-fulfilling crisis as the monitory authority may not be able to defend its currency due to depleted reserves of foreign currency. When an exchange rate crisis occurs, its consequences will be unusually severe and damaging to different sectors of the economy[133].

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[129] Statistics on the exchange rate arrangements based on the IMF annual report on the exchange rate arrangement dated (2002) had shown further trends from soft pegs to one of the corner regimes.

[130] Fischer (2001) has also blamed to some extent the soft pegged regime for the collapse of the Bretton Woods system in the early 1970s.

[131] However, other studies (e.g. Daniel 2001, Corsetti and Mackowiak 2005) have emphasized inconsistency between the fixed exchange rate and fiscal policy fundamentals.

[132] Another argument in favour of the corner solution was presented by Frankel (2000), who argued that it is diffcult for the public to judge announced government policy in the case of intermediate targets, such as exchange rates, due to factors like the complexity of some intermediate regimes and the amount of information needed.

[133] The episodes during which banking and currency crises occur together, are normally called twin crises (Larrain and Velasco, 2001). Others (e.g. Aghion et al., 2004) call them triple crises due to the fall in output through the credit channel.

The impossible trinity, or the “macroeconomic trilemma”, suggests that a country cannot simultaneously maintain a fixed exchange rate, an independent monetary policy, and an open capital account (Obstfeld and Taylor, 2004). This theory hints directly at the relevance of the “bipolar view” or the hypothesis of vanishing intermediate regime. On the basis of the “impossible trinity”, any attempt by an economy with unrestricted cross border movement of capital to enjoy both a fixed exchange rate and a monetary policy will end up creating conflicting goals, and eventually fail. Moreover, Fischer (2001) states that the inconsistency of domestic goals, as expressed in the “impossible trinity”, is further apparent with the increasing openness of capital accounts combined with the associated development of private agents capital flow toward emerging markets. Being faced with picky foreign investors and rapidly depleting foreign exchange reserves, emerging countries are not left with many options but to abandon their pegs to float, or go to the opposite extreme, if they are prepared to do so (Frankel, 2003).

Capital controls have been imposed as a way to protect the exchange rate from the effect of unwanted capital flows. It is regarded as suitable to create breathing space within which to carry out policy adjustment (Goldstein, 2002). However, in the long-run the effectiveness of capital controls diminishes, and the associated costs increase. Also there are problems associated with the application of capital controls. For example, controls on outflows are likely to have an effect on capital inflows, as foreign investors may stop sending their capital to the country, where controls in outflow had been imposed. That also includes remittances of immigrants, who would also seize from transferring their income, which would further dry up the inflow of foreign exchange to the country. Also controls are believed to become both distorting and less effective as a country develops and experiences an increasing range of economic contracts with foreign economies. Furthermore, controls on outflow are considered ineffective to prevent a devaluation of the currency if domestic policies are inconsistent with the maintenance of the pegged exchange rate (Fischer, 2001).

However, some recent studies have attempted to argue against the “bipolar view”, by providing evidence that the soft peg or interior solution is still at work, particularly in emerging and developing economies. For example Frankel (2003) has argued that, despite each of the arguments (laxity and false perception of stability, the impossible trinity, and futility of capital controls) offered by proponents of the “bipolar view” having some truth, none of them looks to be able to stand as a theoretical rationale for the superiority of the two extreme regimes over the intermediate regimes[134]. Another counter-argument can be found from the phenomena of "fear to float" (Calvo and Reinhart 2000, 2002) or "fear to peg" (Levy-Yeyati and Sturzenergger, 2005).

Based on Calvo and Reinhart, (2002) fear to float reflects a situation where a country is experiencing a very small variability in the exchange rate of its currency against other currencies, or in the foreign exchange market, but at the same time has high variability in its reserves and interest rate, despite the monetary authority not making any official commitment to maintain parity. According to Calvo and Reinhart countries are generally reluctant to freely float their exchange rate on account of issues like credibility, loss of excess to international capital markets, high exchange rate pass-through, and international compatibility[135]. In the case of free floating, high depreciation of exchange rates can have severe repercussions in economies with inflation targeting monetary policy and developing countries with high liability in foreign currency, financial fragility, and large share of imports. The fear of floating is believed to be more widespread in emerging economies that have to worry not only about the depreciation of their currencies, for the above-mentioned reasons, but also about their international compatibility in case of appreciation, due to its likely adverse affect on exports. Also, due to their relatively limited access to international capital market, a high volatility of exchange rates in emerging markets might trigger downgrading by credit rating agencies, leading to drying up of foreign investment, and possibly triggering a financial crisis (Calvo and Reinhart, 2000). Accordingly, central banks in many floating economies intervene in the exchange rate markets to smooth variability in the exchange rate. Calvo and Reinhart (2002) have reported that massive open market operations or interest rate changes are being used increasingly in countries claiming free float in order to manage their exchange rate, which makes these countries similar to those who have explicitly announced less

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[134] H. Akiba et al. (2009) have also argued that the theoretical foundation for the comparison between the intermediate regimes with corner solutions, particularly in terms of welfare points of view, is scant and still in its early stage.

[135] Hausmann et al. (2000) have also justified the fear of floating to higher liability in foreign currency. The authors have argued that cross country variations in fear of floating are better explained by currency mismatch than differences in pass-through of exchange rate into inflation. Another argument for fear to float was presented by Alesina and Wagner (2006), who suggested that economies with comparatively poor institutional arrangements are less likely to adhere to their announcements of fixing and abandon it more often. A more recent argument was given by Barajas et al (2008), who suggested that the international capital market might reward countries that are categorized toward the flexible, and once this flexibility is declared there appears to be no punishment for fear of floating.

flexible exchange rate regimes. Based on this, Calvo and Reinhart have concluded that "when it comes to exchange rate policy, the middle has not disappeared" (Calvo and Reinhart, 2002, p 404).

On the other hand, Levi-Yeyati and Sturzeneger (2005) define fear of pegging as a situation where a country runs a fixed exchange rate system without explicitly declaring that they do. In other words, a country may exhibit a pegged exchange rate, while it intervenes frequently in the exchange market to adjust the parity of its currency against other currencies. Moreover, the study of Levi-Yeyati and Sturzeneger (2005) is one among many that have found evidence for an asymmetry between the de-jure and the de-facto exchange rate policy, leading to re-evaluation of many hypotheses, including the bipolar view. Their classification of the de facto regimes was based on data, compiled during the period 1974-2000, on the behavior of changes in the nominal exchange rate, the volatility of these changes, and the volatility of international reserves. With this data they ended up clustering the exchange rates systems into four groups; fixed, intermediate (including crawling peg and dirty floats), flexible, and inconclusive. The last classification included countries, in which the implemented exchange rate regime is not clear from direct comparison with the rest of the sample. Levi-Yeyati and Sturzeneger have reported that, despite finding some evidence for the "hollowing out hypothesis", the number of countries which used fixed rate as their de facto has been relatively stable during the 1990s, in contrast reports by the IMF classification (*e.g.* 1997, 2000, and 2002). Levi-Yeyati and Sturzeneger's interpretation of the asymmetry in exchange rate policy is that the de facto fixers, who declare a more flexible regime, are reluctant to announce a fixed rate, in order not to attract any speculative attacks associated with explicit commitments. Levi-Yeyati and Sturzeneger (2005) have called this phenomenon or behavior "hidden pegs"[136][137].

Another prominent de-facto classification was carried out by Reinhart and Rogoff (2004), who distinguished 15 de-facto exchange rate systems for 153 countries during the period 1946-2001. Their classification is considered the most comprehensive de-facto classification in the literature. They focused on market-determined dual and parallel exchange rates, as well as on statistical analysis of

[136] Genberg and Swoboda (2005) concurred with the findings of Levi-Yeyati and Sturzeneger (2005), by reporting that countries which actively use monetary policy instruments to stabilize their exchange rate may rationally not want to declare and commit to a fixed exchange rate, in order not to attract speculative attacks.

[137] In Levi-Yeyati and Sturzeneger (2007), the data set was extended to cover the period 1974-2004. Based on the new sample period it was revealed that, as of 2004, the share of the non-floats (intermediate, conventional peg, and hard) stood at 75%, which is exactly the same as 2000.

observed behavior in the exchange rate. Based on their classification, the authors reported that the pegged exchange rate has been the most popular exchange rate system (around 33% of their 150 countries during 1970-2001), followed by crawling peg (accounted for over 26% of the observations), or a variant thereof. They also reported that among the announced freely floating regimes, only 20 percent practically operate as true float, while 60 percent were either intermediate or pegged regimes, and the remaining 20 percent had “free falling currencies”. Free falling is a term that the authors introduced for those regimes in which 12 months inflation equals or exceeds 40%. Moreover, using the classification of Reinhart and Rogoff, Husain et al (2005) found that intermediate regimes have categorized the bulk of exchange rate regimes in the emerging economies for the past two decades. Husain et al have also reported that very few emerging countries have shifted to true firm fixing or to pure free float as late as 2001[138][139].

Furthermore, other studies have argued in favour of the intermediate regimes, on account of the superiority of these regimes over the two corner solutions from the welfare point of view. For example, Goldfajn and Silveira (2002) have shown, in a general equilibrium model for a small open economy, that exchange rate intervention is Pareto-improving where foreign investors are pessimistic about the home country’s performance, and hence about its ability to repay its debts. More explicitly, Goldstein (2002) have presented a case in favor of managed floating regime for emerging economies, by arguing that such a regime could work as a deterrent to currency mismatch, balance sheet vulnerability and fear of floating. They also argue that a managed floating regime would ensure sufficient monetary independence, deal with shifts in capital, and maintain a workable nominal anchor to control inflation. Recently, H. Akiba et al (2009) have theoretically argued that the expected loss of an intermediate system in the form of managed floating, with appropriate intervention by the monetary authority, is no less than that of a freely floating system when there is informational friction (asymmetry in the exchange rate policy) in a small economy. This finding implies that hidden intervention by deceiving the private agents is welfare improving, at least for the short term.

[138] Among other studies that have introduced alternative classification methods include Shambaugh (2004), Dubas et al (2005), and Frankel and Wei (2008).

[139] It is worth noting at the outset that the findings of increasing recent studies on de facto classification do not imply the total irrationality of the announced official regimes, since these are still believed to have an active role in guiding the financial market’s expectations on exchange rate developments, and influence international financial policy decisions (Rodriguez,2009).

3. Choice of Exchange Rate regimes

The choice of exchange rate regime is an important policy component for all countries. However, there has been long-standing debate on the choice of appropriate regime. Despite increasing studies over the past three decades, there is still no consensus on subjects like the optimal choice of exchange rate regimes, their determinants, and whether regimes are sustainable or not (Kato and Uctum, 2008). Traditional approaches to the selection of exchange rate regimes were based on the optimum currency criteria (OCA) developed by Mundell (1961, 1963), McKinnon (1963), and Kenen (1969). The analysis in this literature had mainly taken the form of comparison between purely fixed exchange rate regimes against fully flexible. The nature of economic disturbance in the form of nominal and real shocks, and the fundamentals of OCA, were the main criteria on which to base the selection of an exchange rate regime. For example, the flexible exchange rate is preferable in the case of supply-side shocks (changes in exports and terms of trade) and the fixed regime is preferred in the case of monetary and financial market disturbances[140].

Based on the OCA criteria, the advantages of a fixed exchange rate increase with higher degree of economic integration. The most commonly stressed type of economic integration is asymmetry in economic shocks. If the neighboring nations/regions have a high degree of symmetry in their business cycles, then there would be less advantage in having separate currencies, and the two neighbors can share monetary expansion in tandem (Frankel, 2003). However, if the neighboring economies face widely varying economic conditions, then it is more effective for stability purposes to stick with the conventional view of an independent monetary policy with flexible exchange rates (Patridge and Rickman, 2005).

Economic integration includes other criteria like trade openness, labor mobility, fiscal cushions, and political willingness (Frankel, 2003). Small and very open economies (highly trade dependant) are more likely to adopt a fixed exchange rate regime than large and closed economies, which are more likely to have an independently floating currency (McKinnon, 1963). The smaller the economy, the more prone it is to external shocks through exchange rate, and thus the higher probability that it will choose a regime with lower flexibility. The degree of openness of the economy is assumed to be

[140] Originally it was Milton Friedman (1953) who argued in favor of the flexible exchange rate regime, based on the fact that in a world of sticky prices, the nominal exchange rate could be employed to insulate the economy from real shocks.

related negatively to flexibility of exchange rate. The higher the degree of openness, the worse-off is the inflation-unemployment trade-off with a flexible exchange rate due to the depreciation of the currency, and large is the impact of external shocks on the economy (Rogoff, 1985). Thus, these countries will most likely choose a regime of lower exchange rate flexibility in order to reduce the disadvantage of openness on the economy (*e.g.* inflation)

High labor mobility between one country and its neighbors, particularly in the case of wage and price stickiness, would less likely lead to the need of monetary expansion or devaluation in case of asymmetric shocks. According to MacDonald (2007), the ease of worker movements between the countries will assist in restoring equilibrium under a fixed exchange rate regime. In other words, the flexible labour market lowers the need for higher flexibility in the currency, in order to bring about adjustment in the economy following an exogenous shock.

Moreover, the presence of a fiscal transfer among the OCA member countries offers another way to assist in mitigating the macroeconomic shocks, when independent monetary policy has been foregone. Finally, if the economies are integrated in terms of political relations, in the sense that they have common economic priorities (e.g. fighting inflation vs. unemployment), then there would be less need for an asymmetric economic response to common shocks (Frankel, 2003)[141][142].

Following the breakdown of the Bretton Woods system, the period of high inflation during the 1970s and 1980s, and the recent currency crises since the 1990s, the literature on the choice of exchange rate regime narrowed to macroeconomic performance under alternative regimes. In this regard, our review can be divided into two basic categories; the relevant theoretical properties of each regime (fixed vs.

[141] Kenen (1969) has argued that diversified economies are less likely to require a flexible exchange rate to mitigate the impacts from adverse shocks. Whereas undiversified economies with very concentrated production structure are more likely to adopt a flexible regime.

[142] Given the emphasis on the condition of symmetric economic shocks in OCA theory, much of the empirical work focused on examining synchronisation in the business cycles between the potential OCA members; e.g. Partridge and Rickman for US (2005), Buigut and Valev for east African countries (2005), Abu-Qarn and Bader for GCC countries (2008), Economidou and Kool for Europe (2009), Lee and Azli for East Asia (2009), among many others.

flexible), and the empirically tested behavior of macroeconomic performance under alternative exchange rate regimes.

Among the main arguments for the fixed exchange rate regime is its ability to import credibility and ensure low inflationary environment (Dornbusch, 2001)[143]. Due to inflationary bias, in the case of a monetary policy with full discretion, the anti-inflationary central bank can provide more commitment to its intention by fixing the exchange rate to hard currency with stronger monetary discipline. In such cases, economic agents (e.g. workers, managers) would set prices on the basis of low inflation expectation, since it is believed that the currency pegging will prevent central banks from pursuing expansionary polices by increasing money supply. Accordingly, that will lead to a lower level of inflation rate at any given level of output[144]. Other advantages of fixed exchange rate regimes include reducing exchange rate uncertainty, thus promoting trade and investment and better allocation of resources[145], preventing competitive depreciation or competitive appreciation[146], importing financial

[143] The credibility view was mainly raised in the late seventies and early eighties. The literature in this regard was mainly based on the theory developed by Barro and Gordon (1983) on monetary policy credibility. During the same time and in contrast to the credibility view that argued for the fixed exchange rate regime, the consistency view, that was originally introduced through the writings of Kyndland and Prescott (1977), had called for retaining the flexible exchange rate regime when the potential inflation bias is stronger. According to this view, government restraints need to be established through domestic institutions, to guarantee that discretion is not misused, and economic policies are consistent and sustainable in order to avoid inflation.

[144] Domestic inflation can also originate on account of excessive government budget deficits (Obstfeld and Rogoff, 1995). Because of this, the credibility of the fixed regime is also justified on the grounds of some political factors. It is argued that the pegged regime is an instrument for governments to address credibility-deficits and dynamic inconsistency problems. Based on the credibility view, the fixed regime ties the hands of the policy makers to a specific policy course (Carmignani et al., 2008). In contrast, other studies have shown the viability of flexible exchange rate regimes when political costs are taken into account. E.g. Poirson (2002) and Carmignani et al., (2008), among many others.

[145] This issue is particularly emphasized in the case of developing countries with incomplete forward markets. Also, some recent studies that have focused on developing countries were able to find some relationship between exchange rate volatility on trade and investment (Parsley and Rose 2001, Frankel and Rose 2002).

[146] Frankel (2003) has updated the interpretation of this advantage by the currency crises that took place in the 1990s, where the strategy of improving trade balance through devaluation was ineffective, as such strategies between the neighbouring economies made them feel at a competitive disadvantage.

stability[147], and allowing for more efficient adjustments when shocks are of nominal nature (Corbo, 2003).

On the other hand, countries with floating exchange systems tend to enjoy independent monetary policies. Countries with independent monetary policies are viewed as able to quickly pull their economies out of recessions by monetary expansion and depreciation of exchange rate, leading to stimulation of domestic as well as global demand (export), eventually returning the economy to the desired level of employment. In contrary, countries with fixed regimes have to depend on the automatic mechanism of wage and price flexibility that may take a long time to manifest, thus resulting in longer recessions in these countries (Baqueiro et al., 2003).

A second advantage to flexible exchange rates is their ability to facilitate real exchange rate adjustments when real shocks make those adjustments necessary. An early case for the flexible exchange rate regime was pioneered by Milton Friedman (1953), who argued that in a world of stick prices and wages, flexible exchange rates are necessary to insulate the economy from real shocks. A third advantage of flexible exchange rate regimes is that they offer economic stability compared to fixed rate regimes that are prone to speculative attacks and periodic crises (Frankel, 2003). Also, under the flexible exchange rate regime, the monetary authority of a country is allowed to enjoy two potential advantages of an independent central bank: lender of last resort and seigniorage (Frankel, 2003). Two more advantages of flexible exchange rate regimes is their ability to let the world economy function with less barriers to trade (e.g. tariffs and quotas) and the unnecessary need to hold foreign reserves (MacDonald, 2007). Depending on policy objectives, intermediate exchange rate regimes tend to cash in on some of the benefits from the two corner solutions.

With regards to costs associated with the two corner solutions, fixed exchange rate regimes normally suffer from fragility in commitment, and forfeiting of monetary policy independence. Another potential cost associated with fixed regimes is the pre-requisite that domestic interest rates movements trail those of the anchor country. While this pre-requisite was meant to mitigate arbitrage conditions and subsequently capital outflows, economic conditions may be divergent between the anchor country and the follower country, thus requiring some misalignment between domestic interest rates and those of the anchor country. Another cost attributed to fixed exchange rate regimes is a potentially expensive

[147] One form can be through preventing speculative bubbles.

currency crisis that could result from difficulties in mitigating external as well as internal shocks, given the lack of a sovereign monetary policy. Economies with floating regimes are also prone to the risk of imported inflation, and contraction in international trade or transfers of savings in the presence of major exchange rate volatility (Obstfeld and Rogoff, 1995). As was the case with respect to benefits, intermediate exchange rate regimes tend to some of the costs from the two-corner solution.

Furthermore, it is worth noting at the onset that, despite the amount of vast empirical literature on the macroeconomic performance under different exchange rate regimes, there is no consensus between the studies as to which exchange rate regime is optimal to continuously promote and maintain the macroeconomic status of a country. The different classification schemes of the de facto exchange rate regimes are viewed to be among the main factors of the debate (Bleaney and Francisco, 2007).

A great part of the empirical studies investigated the influence of the choice of the exchange rate regime on inflation and economic growth. For example, Ghosh et al (1997, 2002), who relied on the IMF classification, found a negative relationship between fixed exchange rate regime and inflation; however, they failed to find evidence for a strong link between the choice of exchange rate regime and economic growth. Similar findings were also reported by Bleaney and Francisco (2005), who relied on the classification of Bubula and Otker-Robe (2002), that is slightly different from the IMF classification. A weak link between output growth and exchange rate arrangement had also been reported by Razin and Rubinstein (2005), who based their analysis on the IMF classification, as well as on Reihart and Rogoff (2004).

In contrast, Levy-Yeyati and Sturzenegger (2001,2003b)[148], who used their own de facto classification, reported lower inflation rates and slower growth in developing economies with pegged systems, compared with their more flexible counterparts.
A low inflation environment under fixed exchange regime was also confirmed by Edwards and

[148] Levy-Yeyati and Sturzenegger (2003) justify rapid growth for flexible exchange rate regimes on account of rapid resource allocation following real shocks, where short run price stickiness is significant. On the other hand, the authors have argued that the inability of rigid systems to absorb trade shocks forms a major factor behind lower growth under such regimes. A similar reason was presented by Calvo (1999), who argued that the need to defend the pegged regime following an adverse external shock may lead to a high real interest rate (as nominal interest rates are temporarily raised to stop capital outflow) and, eventually, lower growth.

Magendzo (2003), who reported that, dollarized economies and economies under union currency (e.g. Euro area) enjoy a significantly lower inflation rate than countries with their own currencies. Their finding implies that the harder the fix, the higher its effectiveness in enhancing credibility. Similarly, Bleaney and Francisco (2007), who relied on different de facto classification schemes, have reported in their study on developing countries that hard pegs have lower inflation than other regimes (floats and soft pegs)[149]. Bleaney and Francisco have also reported that growth is similar in floating and pegged regimes; however, it is lower in hard fixed than in other regimes. A positive strong link between hard peg and growth was confirmed by Frankel and Rose (2002), who reported higher trade between trading partners under currency unions.

A similar link between exchange rate arrangement and inflation and economic growth was found in the studies of Rogoff et al (2004) and Husain et al (2005). Both studies used the de facto classification of Reinhart and Rogoff (2004) to analyse the performance of exchange rate regimes in developing and developed economies. Generally, both studies concluded that pegged systems work well and are able to deliver both relatively low inflation and relatively high exchange rate durability, without compromising growth objectives for poor nations with little access to international capital markets. On the contrary, both studies also concluded that as countries become richer and more mature in terms of institutional frameworks, they can enjoy higher growth without any cost to credibility, if they adopted more flexible exchange rate regime. Similar findings were reported by Bailliu, Lafrance, and Perrault (2001), who provided evidence that more flexible exchange rate arrangements are associated with higher economic growth, but only for countries that are relatively open to international capital flows and, to a lesser extent, have well developed financial markets.

Further to the link between the level of development and exchange rate arrangement, Dodge (2007) has argued that under market-based, liberalized trade and financial order, flexible exchange rates are viewed as a key element in promoting good economic performance, both domestically and globally. Dodge particularly emphasized the choice of flexible exchange rate for large economies with well-developed and well-functioning domestic financial markets. By citing the Canadian experience, Dodge argued that the flexible exchange rate had helped the economy to deal with economic shocks without forcing very difficult changes in the overall level of output, wages and prices. On the other hand, he

[149] Bleaney and Francisco (2007) based their analysis on the de facto classification of Bubula and Okter-Robe (2002), Levy-Yeyati and Sturzenegger (2005), Shambaugh (2004) and Reinh art and Rogoff (2004).

also acknowledged that a fixed exchange rate system can be necessary for small economies, where an independent monetary policy is difficult to execute and the costs associated with having floating currency can outweigh the benefits.

Furthermore, exchange rate arrangements and economic performance are also evaluated from balance sheet effects and the probability of currency crises. This strand of studies has accelerated, particularly following the currency crisis during the 1990s. Some studies, such as Goldstein (2002) Calvo and Reinhart (2002), Hausmann et al (2001), Aghion et al (2004), and Meissner and Oomes (2009) have indicated that the greater the importance of foreign debts in the balance sheet, the less likely the option for flexible exchange rates, particularly in the case of emerging markets, where liability dollarization is relatively very large .

Currency crises, on the other hand, are generally defined as events of large depreciation of exchange rates triggered by speculative attacks (Esaka, 2009). The famous claim in this context is that pegged regimes are considered to be among the main factors leading to currency crisis. This claim is clearly explained on account of the laxity and false perception under pegged arrangement with open capital accounts explained earlier. The pegged regimes under liberalized capital accounts encourage a large capital inflow under reduced perception of risk, which in turn makes the economy prone to currency crises, in the case of sudden large reversal of capital.

However, unlike the case in the balance sheet effect, and similar to the above exhibited empirical studies on the link between exchange rate regime and inflation and growth, there is no conclusive evidence on the impact of exchange rate arrangement and the occurrence of currency crises. For example, Ghosh et al (2003) investigated the occurrence of currency crises under different regimes during the period from 1972 to 1999, using the IMF classification, and concluded that floating regimes are the most likely to experience banking crises. Similarly, and more recently, Esaka (2009), who used a probit model to examine whether the de facto exchange rate regimes - as per the classification of Reihart and Rogoff (2004) - influenced the occurrence of currency crises during the period from 1980-2001, reported that pegged systems significantly decrease the probability of currency crises compared with floating. Furthermore, the author concluded that pegged systems with capital account liberalization are substantially less prone to speculative attacks, due to enhanced credibility by abandoning monetary policy autonomy.

In contrast, Rogoff et al (2004) and Husain et al (2005) have reported, based on statistical analysis for the period 1970-2000, that the highest probability of a banking crisis occurred in the emerging markets, and that the probability of a crisis increases with the increase in the rigidity of the exchange rate regime. Similarly, Razin and Rubinstein (2005) have reported, based on a probit estimation during 1971-2002, that the probability of a crisis increases with the switch to a pegged exchange rate. Furthermore, in an earlier study by Otker-Robe (2003), who used a probit model based on the de facto classification of Otker-Robe (2002) to estimate the probability of currency crises under alternative regimes, it was reported that the probability of currency crises is significantly higher under intermediate regimes than for both hard pegs and floating regimes. Their results are supportive of the "bipolar view" of Fisher (2001) discussed earlier.

On the other hand, Hail and Pozo (2006) analysed the probability of currency crises by focusing on developed countries. They used probit estimation for the period 1974-1998, with two alternative classifications; namely the de jure of the IMF and the de facto classification of the Levy-Yeyati and Sturzenegger (2005). Under the IMF classification, they found a higher probability of currency crises for the pegged regime than for other regimes. However, they failed to find any link between exchange rate arrangement and currency crises when the Levy-Yeyati and Sturzenegger (2005) classification was used .

4. Summary and Conclusion

Exchange rate arrangement forms one of the most controversial issues in international economies. From the above brief survey, the relevant literature does not have a consensus on subjects like optimal exchange rate regimes and their determinants. A great number of recent studies, particularly those that have depended on the de-facto classification of regimes, have provided evidence against the move toward the corners, and that intermediate regimes are still viable and not vanishing. Accordingly, this further confirms the arguments of scholars like Frankel (1999, 2003) that there is no single regime is right for all countries at all times. According to Frankel, the appropriate exchange rate system varies, depending on the specific conditions of the nation in question, and depending on the conditions of the time period in question.

The assessment of exchange rate regimes has evolved over time. Given the growing importance of international capital flows and the predominance of external over domestic monetary shocks, the traditional trade-off has narrowed down to a price stability-growth dilemma, according to which fixes are expected to enhance the credibility of non-inflationary monetary policies, reducing inflation and the volatility of nominal variables, while floats are seen as allowing necessary price adjustments in the face of external (real and financial) shocks, reducing output fluctuations and improving growth performance. Such evolvement has been enhanced and justified due to a series of economic crises including the Exchange Rate Mechanism crisis in 1992, the Mexican peso crisis in 1994, and the Asian crisis in 1997.

One of the key assessments in selecting an appropriate exchange rate regime pertains to a country's economic structure. For emerging markets, the literature that examines the determinants of choice of the exchange rate regime has identified a number of factors, including international financial market integration, macroeconomic performance, financial sector development, and political economy considerations. For example, a sound and well-developed financial sector is a necessary precondition to establish a floating exchange rate regime, as flexible systems are associated with increased volatility in the nominal exchange rate. However, emerging markets are also permeated with shallow capital, making it difficult to manage a flexible exchange rate regime. To a certain extent, the literature has confirmed the positive co-integration link between the choice of the exchange rate regime and macroeconomic performance.

Chapter Seven

Choice of Exchange Rate Regime in the Case of the GCC countries

1. Introduction

In this chapter we attempt to analyse the alternative exchange rate regimes to the GCC economies based on the recent economic development in the region and their level of development. We also attempted to empirically test the feasibility of pegging the currencies of the GCC countries with a basket peg of two currencies; namely the US dollar and euro. The chapter begins by presenting some background on the exchange rate regime policies of the GCC countries and some brief analysis of the recent economic development in the region.

The US dollar has been the *de facto* anchor for all the Gulf Cooperation Council (GCC) countries' currencies, with exception of the Kuwaiti Dinar, for over two decades (table 1). Except for a short period when it was exclusively pegged to the US dollar (May 2003-May 2007) pursuant to an agreement in the context of the GCC's monetary integration process, the Kuwaiti Dinar has been linked to an undisclosed weighted basket of currencies, in which the US dollar is believed to form the major part, given that most of the Kuwaiti's exports (oil) are priced in US dollars and limited fluctuation occurred vis-à-vis the US dollar, and subsequently the fluctuations vis-à-vis GCC countries' currencies (Sturm and Siegfried, 2005).

The choice of the dollar as an anchor currency had been based primarily on the account of the dominance of this currency in the international oil trade (Sturm et al., 2008). Continuing with the dollar has been influenced by a number of factors, such as the large share of stabilizing exports as well as fiscal revenues (since oil revenue constitutes the major part of government budget), credibility of monetary policy under the peg, and shielding the value of the financial wealth from fluctuation in the exchange rate with the US dollar[150]. Furthermore, in terms of internal stability, the pegged system looks to have maintained the purchasing power of the currencies of the GCC country members as the

[150] On average, revenue from hydrocarbon, based on 2008 data, accounts for around 80% of government revenue, around 70% of exports, and around 50% of the GDP in the GCC economies.

average annual inflation rate during the period 1990-2002 ranged between a minimum of -0.23 (Bahrain) to a maximum of 3.3 (UAE)[151].

Table: 1 (National Currency per US Dollar)

Time	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
1990	0.38		0.38	3.64	3.75	3.67
1991	0.38	0.28	0.38	3.64	3.75	3.67
1992	0.38	0.29	0.38	3.64	3.75	3.67
1993	0.38	0.30	0.38	3.64	3.75	3.67
1994	0.38	0.30	0.38	3.64	3.75	3.67
1995	0.38	0.30	0.38	3.64	3.75	3.67
1996	0.38	0.30	0.38	3.64	3.75	3.67
1997	0.38	0.30	0.38	3.64	3.75	3.67
1998	0.38	0.30	0.38	3.64	3.75	3.67
1999	0.38	0.30	0.38	3.64	3.75	3.67
2000	0.38	0.31	0.38	3.64	3.75	3.67
2001	0.38	0.31	0.38	3.64	3.75	3.67
2002	0.38	0.30	0.38	3.64	3.75	3.67
2003	0.38	0.30	0.38	3.64	3.75	3.67
2004	0.38	0.29	0.38	3.64	3.75	3.67
2005	0.38	0.29	0.38	3.64	3.75	3.67

[151] Other factors that are believed to have participated in the low inflation environment during the past two decades include open trade regime, flexible labour market, prudent fiscal policy (*e.g.* the introduction of oil funds to sterilize the effect of oil revenue), and benign global inflationary conditions (Iqbal, 2010).

2006	0.38	0.29	0.38	3.64	3.75	3.67
2007	0.38	0.28	0.38	3.64	3.75	3.67
2008	0.38	0.27	0.38	3.64	3.75	3.67

Source: International Financial Statistics, IMF

However, since the beginning of the current decade and following the rapid economic growth facilitated by higher oil revenue, some inflation pressure has emerged in all the GCC member states. The average inflation rate in GCC countries stood around 10% as of 2008, with significant differences between the member countries (table 2). Factors that are believed to have driven up recent inflation in the GCC economies include increasing domestic demand accompanied by rapid money and credit growth, emerging bottlenecks in labour and materials caused by economic booms, and rising import prices (Sturm et al. 2008, Marzovilla et al. 2010, Central bank of Oman 2008).

Furthermore, apart from being a global phenomenon, rising import prices in the GCC economies have been also due, to some extent, to the recent persistent depreciation of the US dollar against the currencies of the major trading partners of the GCC countries (notably the Euro, since a very significant share of the GCC's imports come from Europe). The nominal effective exchange rates of the currencies of the GCC countries have witnessed significant depreciation since 2002 due mainly to the dollar's decline against the currencies of the trading partners of the GCC economies (figure 1), notwithstanding that a significant share of imports comes from economies whose currencies are pegged to, or highly influenced by, the US dollar and to a lesser extent from the US (further detail on trade pattern of the GCC countries is given in section 2).

Table: 2 (Inflation Rate, Average consumer prices)

Time	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
1990	-0.91	15.80	10.01	3.01	2.08	0.60
1991	0.93	8.13	4.60	4.42	4.56	5.50

1992	-0.29	-0.32	0.96	3.06	-0.37	4.31
1993	2.62	0.60	1.14	-0.87	0.84	5.23
1994	0.42	2.37	-0.66	1.32	0.65	5.72
1995	3.13	2.53	-1.13	2.96	5.05	4.37
1996	-0.19	3.04	0.50	7.26	0.87	2.98
1997	-4.59	0.81	-0.36	2.60	-0.43	2.95
1998	-0.42	0.60	0.43	2.92	-0.17	1.96
1999	-1.26	3.08	0.51	2.16	-1.31	2.10
2000	-0.73	1.57	-1.20	1.68	-1.10	1.36
2001	-1.18	1.45	-0.84	1.44	-1.14	2.80
2002	-0.50	0.80	-0.33	0.24	0.23	2.92
2003	1.68	0.99	0.17	2.26	0.59	3.12
2004	2.25	1.26	0.67	6.80	0.36	5.04
2005	2.62	4.12	1.85	8.81	0.63	6.20
2006	2.04	3.09	3.44	11.83	2.31	9.29
2007	3.25	5.47	5.89	13.76	4.11	11.65
2008	3.53	10.50	12.61	15.05	9.87	11.54
Average	0.65	3.47	2.01	4.77	1.45	4.72

Source: World Economic Outlook, IMF

Furthermore, the high dependency of the GCC economies on foreign workers (from neighbouring countries like India, Pakistan, Indonesia, Egypt, *etc.*) has further accentuated the inflationary effect of the dollar peg (Willett et al, 2009). The recent economic growth in the area, following high revenues from a hike in oil prices, has led to economic development that resulted in higher demand for foreign labour in the GCC countries, given the low level of unemployment and the fact that most of the national labourers are being absorbed by the public sector. Given the supply bottlenecks, on account of limited agricultural production and manufacturing, recent higher migration of labourers into the GCC countries fuelled demand for various consumer goods (*e.g.* food stuffs) that are mainly imported, thus, magnifying supply constraints and eventually enhancing the increase in domestic prices (Marzovilla et al. 2010).

Moreover, another influence of higher dependency on foreign labour on domestic prices of the GCC countries is believed to have been transmitted through demand for higher wages (Gulf Talent, 2007). The depreciation of the US dollar has lowered the value of wages, and as results the purchasing power of the foreign workers' remittance decreased. That has made it difficult to attract/retain staff, particularly skilled and highly qualified workers, in the GCC countries, thus resulting in a price-wage spiral (Ghars El-Din and Mohammed, 2005).

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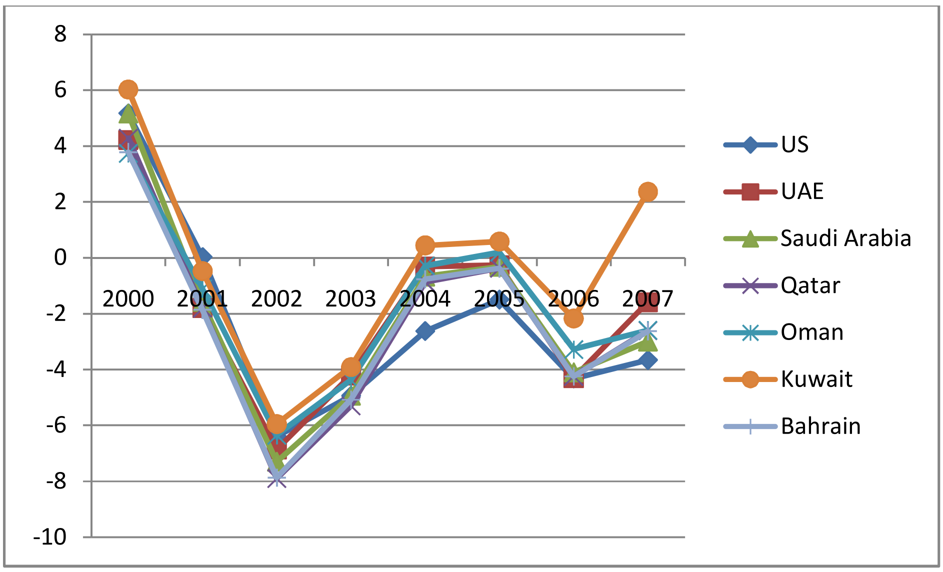
Figure: 1(Movement in NEER for US dollar and the GCC currencies)



Source: International Financial Statistics, IMF.

However, in addition to the above inflationary implications of the adverse movements in the US dollar, the US dollar peg is believed to have amplified the inflationary effects of oil prices due to divergence in the business cycles between the United States and the GCC economies (Sturm *et al.* 2008, MacDonald 2010). The recent development in the region, in the form of rapid economic growth due to massive revenues because of a hike in oil prices, has necessitated the use of stringent monetary policy in order to contain inflationary responses to the expansion of monetary circulation. However, given the peg with US dollar, the GCC countries were forced to align their interest rate with that of the US, which lowered its interest rate to resist recessionary tendencies in the aftermath of the September 11 attack and the recent sub-prime market crisis in September 2007, in order to resist any appreciation due to speculation in the form of capital inflow (figure 2). That, in turn, has motivated further borrowing and credit expansion and further fuelled the inflationary pressure from the oil surpluses recorded by the GCC countries. Given the policy constraint under the peg system, there were fewer incentives for the GCC economies to depend on monetary policy to curb inflation. As a result, most of the GCC economies have resorted to some alternative tools like administrative and prudential measures. In fact, a similar scenario took place in the late 1990s when the economic conditions of the GCC countries necessitated the pursuit of expansionary monetary policy in order to avoid deflationary pressures because of a strong dollar and low oil prices (MacDonald, 2010).

The significant persistent depreciation of the US dollar and its adverse consequences on the import prices of the GCC economies has caused huge monetary losses in the region (*e.g.* rising inflation and higher budgetary expenditures invoiced in non-dollar currencies) and cast doubts on the dollar-peg; these doubts have resulted in an increasing pressure from the public demanding for an up-ward revaluation of the GCC countries' currencies or even a de-pegging from the US dollar. Moreover, the fears that the US current account may be unsustainable have further enhanced the grounds for the demand to de-peg from the US dollar.

Other reasons that have been advanced to support the idea of de-pegging the currencies of the GCC countries from the current hard fix with the US dollar include the necessary alignment in the real exchange rate of these economies. The current scenario of rising oil prices calls for an adjustment in the real exchange rate of the GCC countries. However, under the dollar peg, such adjustment is only expected to take place via domestic inflation of the local currency, which is experienced by most of the GCC countries. The downside of such a process is that it is slow and can create inflationary expectations, which can result in further misalignment in the real exchange rate in the form of real overvaluation (MacDonald, 2010)[152].

Relevant to the issue of misalignment is the undervalued nominal effective exchange rate of the GCC countries' currencies against some other leading international currencies like the euro and the sterling pound. In a flexible exchange rate system, the recent increase in oil prices and the consequent inflow of foreign exchange would have caused the currencies of the GCC countries to appreciate. Instead, owing to current peg and the depreciation of the US dollar, the currencies of the GCC countries have been falling.

Other reasons for de-pegging include the emerging changes in trade and investment patterns (Abed *et al.*, 2003, Sturm *et al.*, 2008, Iqbal 2010). This has particular relevance to countries like Oman and Bahrain because of their limited oil resources. As a result, these countries are required to promote non-oil exports (tourism, financial sector, hydrocarbon-based industries, *etc*.). So, as these countries diversify their manufacturing and service industries, a more flexible exchange rate regime is necessary in order to ensure sufficient competitiveness in the international market[153]. Furthermore, diversifying entails more recurrence in aggregate demand and supply shocks, hence the need for flexible exchange rate.

Also, the further integration of the GCC country members into the international markets (*e.g.* WTO, Free trade with Europe, US, and other regions) underline the need for maintaining international

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[152]However, a number of studies (*e.g.* Kumah, 2009, Iqbal, 2010) have suggested that the misalignment of exchange rates has not been an issue to the GCC countries as the real exchange rates (REERs) for most of these countries are found to be undervalued. Furthermore, according to Kumah (2009), the estimated undervaluation of REERs of the GCC economies remains low, averaging between 7 and 15%. The undervaluation in REERs is attributed to causes like temporary frictions and adjustment costs associated with continued depreciation of the US dollar and structural economic reforms such as improvement in the business climate, modernization of large segments of the economy, and flexibility in the supply of foreign labour (Iqbal, 2010).

[153] The need for further diversification is generally viewed to be required by all the GCC state members. For example Abed *et al.* (2003) and, recently, Sturm *et al.* (2008) claim diversification is necessary on basis of the need to expand the share of the non-oil sector in order to provide employment opportunities for the increasing number of new entrants into the labour force.

competitiveness in the non-oil sector (Abed *et al*., 2003). Moreover, the increasing integration of the financial sectors of the GCC countries with the global economies make such economies more vulnerable to exogenous shocks, thus necessitating greater flexibility in the exchange rates of the currencies of these countries (Iqbal, 2010).

Further to the issue of diversification in the GCC countries, the recent fluctuations in the US dollar in relationship to non-dollar currencies led to higher instability of non-oil exports and imports and that resulted in higher costs by increasing the exchange rate risk for trade and capital transactions as well as altering relative prices affecting production and investment decisions. Moreover, on account of the recent changes in the price of oil, it is believed that the US dollar-peg has placed a larger burden on fiscal policy of the GCC countries to sustain internal stability and growth. This scenario is particularly relevant to periods of low oil prices (*e.g.* late 1990s) during which the governments of the GCC countries are forced to draw upon their foreign assets, managed by sovereign wealth funds, in order to sustain economic growth, which on the other hand comes at the cost of higher vulnerability to future negative terms of trade shocks (Iqbal, 2010).

Another argument for an alternative exchange rate in the GCC economies is based on these economies' financial assets, which are mainly dollar dominated. It is assumed that these assets will get rid of the dominant influence of the dollar on account of globalization, growth prospects in emerging markets, and the rise of the Euro as a reserve currency. Finally, given the increased degree of capital flow, trade openness, and foreign direct investment in the GCC economies, the attractiveness of keeping the dollar peg could be decreased, particularly if increased openness leads to higher volatility (Khan, 2009).

Before we turn to discussing the suggested alternative exchange rate strategies for the GCC member states, we will first highlight the importance of studying the choice of exchange rate regimes for the GCC economies in section two. The outline of the reminder of this chapter is organized as follows. Section three presents a survey on the studies that have attempted to analyse the choice of exchange rate regimes for the GCC countries. The proposition for a dollar-euro basket peg as suggested by this chapter is illustrated in section four. Methodology of estimation, data and empirical estimation, and unit root tests are presented in sections five, six, and seven, respectively. Analysis of the results from the first part of estimation is given in section eight. The second part of estimation, co-integration analysis, is presented in section nine, and finally summery and conclusion are presented in section ten.

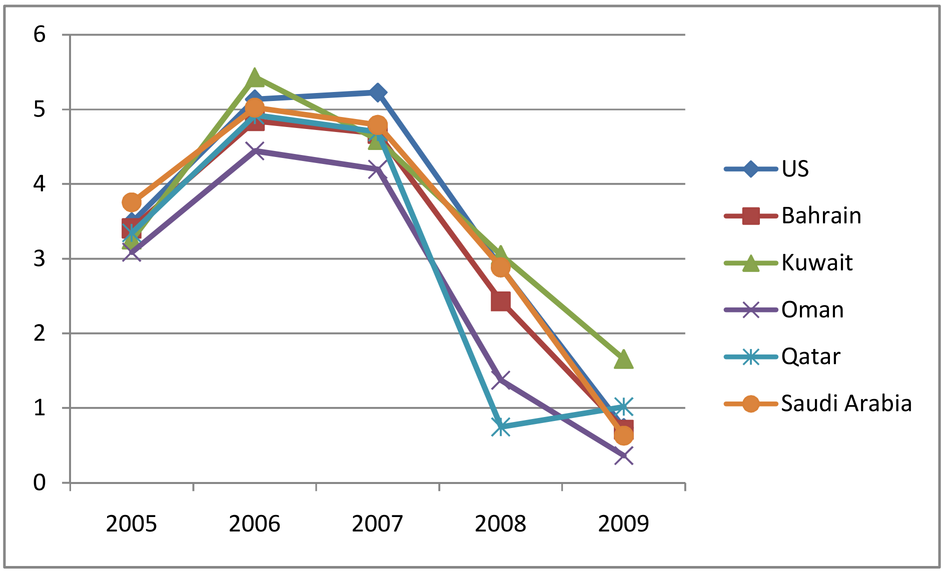
2. The Importance of Analysing the Choice of Exchange Rate Regimes of the GCC Economies

Basically, the importance of analysing the GCC economies in general stems from their recent increasing role as global investors and trade partners, in addition to playing a crucial role in the global energy markets. Furthermore, together with other oil-exporting countries, they have become part of the international policy debate on global imbalances (Sturm et al., 2008).

The GCC economies are major players in global energy markets in terms of their current production and the availability of spare oil capacity. The GCC countries collectively account for around 40% of the global oil reserves and 23% of natural gas reserves (figures 3, 4, and 5)[154]. According to the IEA report (2008), oil and gas are expected to continue dominating the global energy sector for the next 20-30 years. Furthermore, in view of the forecasted depletion of oil reserves in many countries, including the US and some European countries, the expected increasing demand of oil in emerging as well as developing countries, and the relatively low exploiting costs in the GCC countries, suggest that the GCC countries will continue to play a great role in the supply of energy around the world. That in turn implies any major policy changes in the GCC region, including in the macroeconomic environment, will most likely have some impact on oil prices, which in turn would impact economies all over the globe.

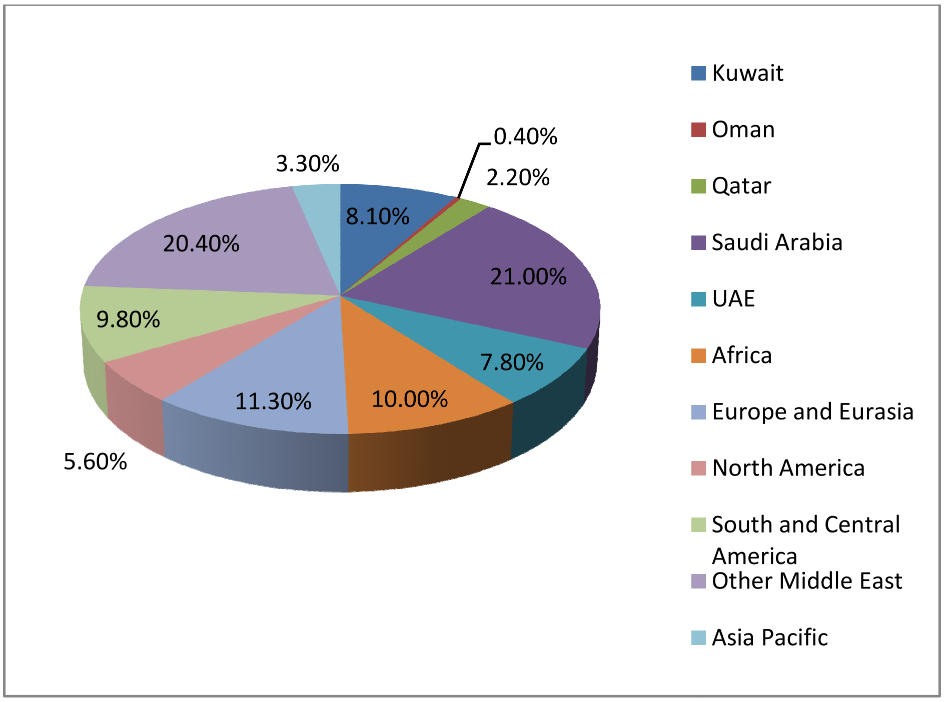
[154] Saudi Arabia is ranked the world's largest oil producer, alongside Russia, with an average of over 10 million barrels per day in 2008. It holds more than one fifth of global oil reserves and accounts for more than half of all oil reserves in the GCC region. According to IEA (2008), Saudi Arabia will remain the world's largest oil producer until 2030, with its production expected to climb from 10.2 mb/d to 15.6 mb/d. Kuwait and the UAE are listed among the top ten world net oil producers. On the other hand, Qatar sits on the third largest natural gas reserve after Russia and Iran. Bahrain and Oman have comparatively very limited oil and gas reserves (Sturm et al., 2008)

Figure: 2 (Three months inter-bank rates in US and the GCC countries)



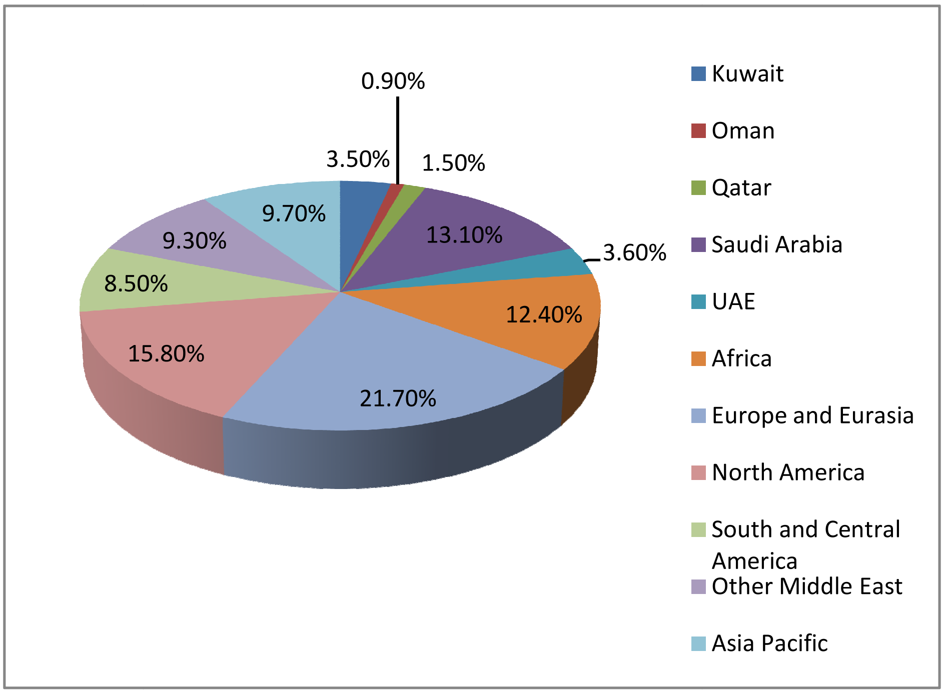
Source: Quarterly Statistical Bulletin (2010), Saudi Arabia Monetary Authority

Figure: 3 (Distribution of Oil Reserves in 2008)



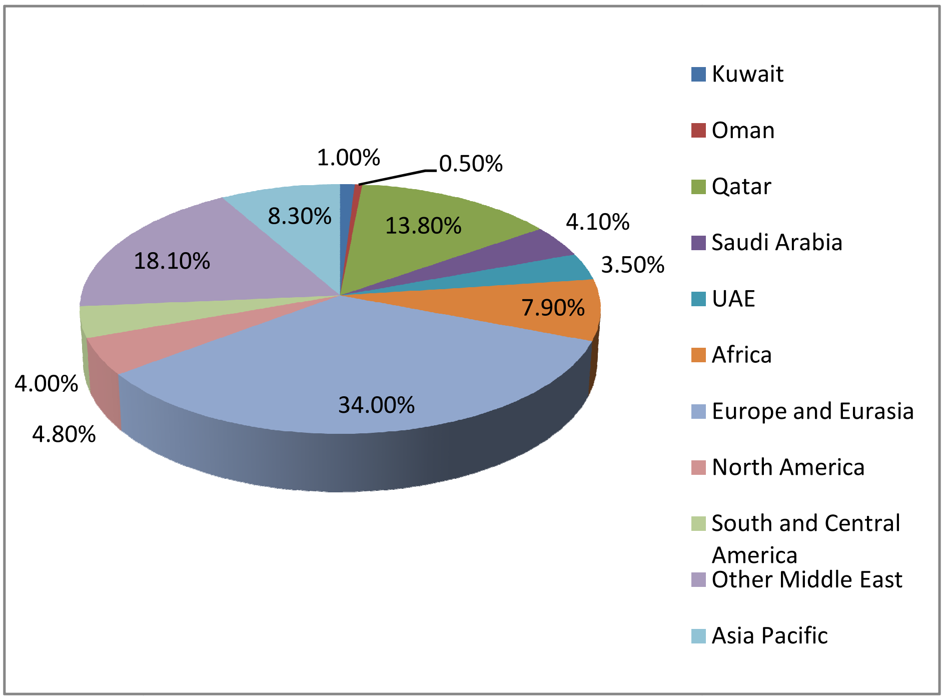
Source: BP Statistical Review of World Energy 2009.

Figure: 4 (Oil Production in 2008)



Source: BP Statistical Review of World Energy 2009

Figure: 5 (Gas Reserves)



Source: BP Statistical Review of World Energy 2009

Furthermore, over the past five years, the GCC countries have recorded impressive economic growth facilitated by higher oil revenues, which is primarily due to the persistent rise in international oil prices. The combined nominal GDP of the six GCC states have jumped from around USD 406 billion in 2003 to around USD 1,070 billion as of 2008, which represents a growth of more than 100% over five years (table 4). Saudi Arabia and the UAE account for the bulk of this growth, with an increase of around USD 261 billion and USD 172 billion, respectively, over the past five years. In real terms, the GCC countries have, on average, recorded an annual GDP growth of around 7.7% over the past five years, with growth in exports representing the main drivers of real GDP growth (table 3). Similarly, non-oil real GDP in the GCC economies have witnessed, over the past five years, significant growth that has exceeded in some cases the growth of oil real GDP (figure 6). The highest non-oil real GDP growth was registered by Qatar, the UAE, and Oman at 20%, 15%, and 12% per annum, respectively. The past five years have also witnessed an enhancement in GDP per capita, which surged from an average of 18,144 US dollars in 2003to an average of 43,251 US dollars as of 2008 (table 5), putting the GCC countries among the richest nations of the world.

Table: 3 (Real GDP Growth)

Time	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
2000	5.23	4.69	4.65	10.94	4.87	12.38
2001	4.62	0.22	5.56	6.32	0.55	1.70
2002	5.19	3.01	2.08	3.20	0.13	2.65
2003	7.25	17.33	0.34	6.32	7.66	11.89
2004	5.64	10.24	3.42	17.72	5.27	9.69
2005	7.85	10.62	4.89	9.24	5.55	8.19
2006	6.65	5.14	6.00	15.03	3.16	8.72
2007	8.07	2.51	7.74	13.69	2.02	6.06

2008	6.12	6.40	12.26	15.81	4.33	5.14

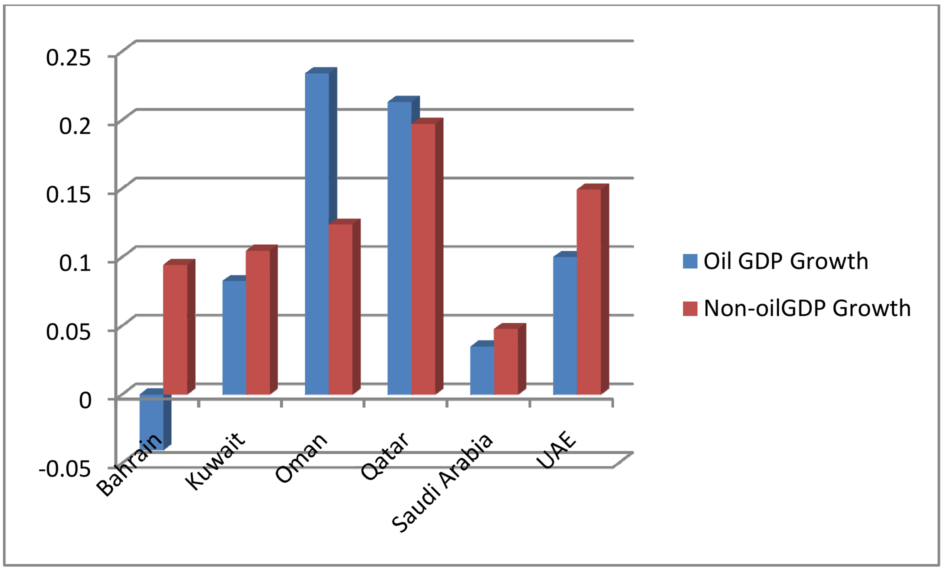
Source: World Economic Outlook, IMF

Table: 4 (Nominal GDP, Units: billions of US dollars)

Time	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
2000	7.97	37.72	19.45	17.76	188.69	70.22
2001	7.97	34.90	19.40	17.54	183.26	68.68
2002	8.49	38.14	20.05	19.36	188.80	75.89
2003	9.75	47.84	21.54	23.53	214.86	88.96
2004	11.23	59.44	24.67	31.73	250.67	106.75
2005	13.46	80.80	30.91	42.46	315.76	134.17
2006	15.85	101.56	36.81	56.92	356.63	163.72
2007	18.44	111.76	41.64	71.04	385.20	207.56
2008	21.24	158.15	59.95	100.41	475.73	261.35

Source: World Economic Outlook, IMF

Figure: 6 (Oil and non-oil real GDP growth rates)



Source: Annual Reports of the GCC countries' central banks

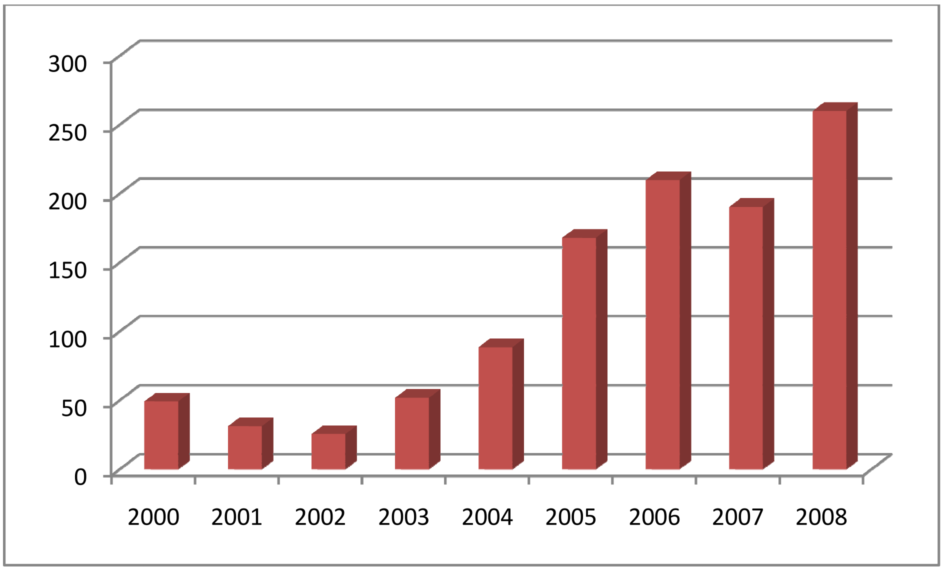
Table: 5 (GDP per capita, constant prices, Units: US dollars)

Time	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
2000	11,889.98	17,012.78	8,096.83	29,290.36	9,216.39	23,446.15
2001	11,719.42	15,114.33	7,994.03	27,030.27	8,736.41	21,685.14
2002	12,127.44	15,761.11	8,202.52	28,354.80	8,785.13	22,660.97
2003	13,725.67	18,783.06	8,759.85	32,787.55	9,758.02	25,051.74
2004	15,601.16	21,585.56	9,954.44	41,949.31	11,126.52	28,382.49
2005	18,322.67	27,012.51	12,317.68	53,332.91	13,657.95	32,677.09
2006	21,156.85	31,908.76	14,282.00	67,921.63	15,049.63	38,713.15
2007	24,137.60	33,759.99	15,180.31	76,373.73	15,858.75	46,248.63
2008	27,247.79	45,937.97	20,887.14	91,477.78	19,108.15	54,848.52

Source: World Economic Outlook, IMF

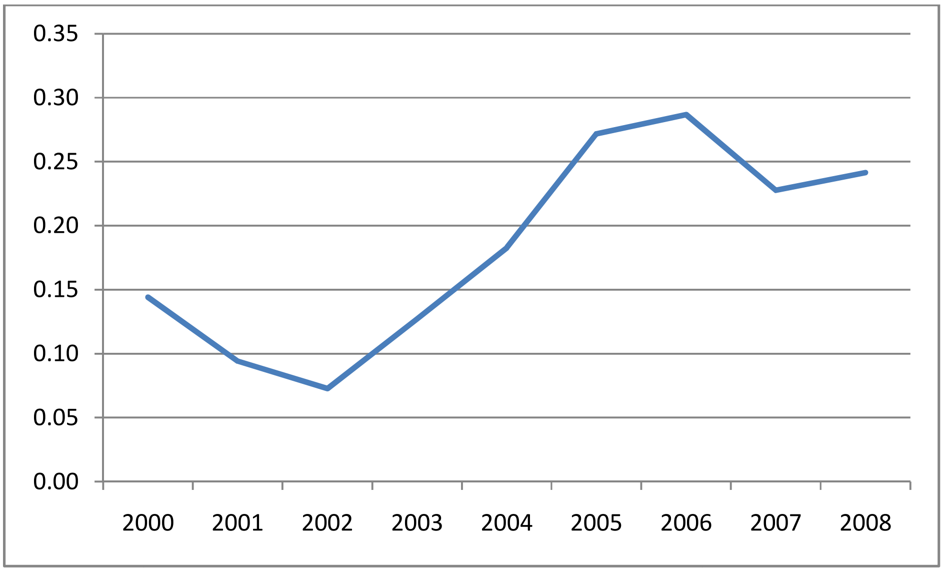
The substantial revenue from oil exports has led to a remarkable increase in the current account surplus of the GCC member countries. The current account of the GCC countries is primarily characterised by a very high trade surplus given the size of the hydrocarbon exports. As of 2008, the accumulated combined current account surpluses of the GCC economies stood at around USD 260 billion (figure 7), which accounted on average for about 25% of the region's total GDP (figure 8). The recent impressive surge in the account surpluses of the GCC economies is mainly attributed to increase in demand for and the prices of hydrocarbons. The recent current account surpluses of the GCC region forms almost half the joint account surplus of the OPEC member states, making the region a major net supplier of capital on a global scale, second to Asian countries (Sturm *et al*., 2008).

Figure: 7 (Current account surpluses, Units: billions US dollars)



Source: World Economic Outlook, IMF

Figure: 8 (Current account Surpluses as percentage of GDP)

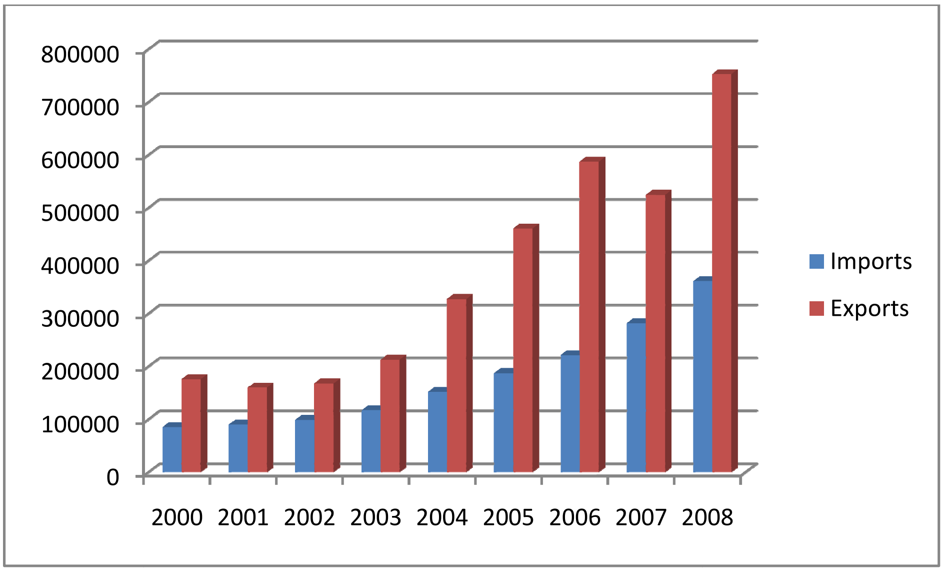


Source: World Economic Outlook, IMF

About half of the GCC regions' oil revenues are currently absorbed through the trade channel. In the wake of large revenues from a prolonged rise in oil prices, trade by the GCC economies has risen substantially. A retrospective analysis shows that the total export of goods of the GCC region has risen dramatically from USD 88 billion in 1990, to USD 175 billion in 2000, and grew to USD 752 billion in 2008 (figure 9). Around 70% of these exports are dominated by hydrocarbon products. Similarly, imports have risen from around USD 48 billion in 1990, to USD 85 billion in 2000, and reached around 361 billion in 2008. As of 2008, exports and imports formed, on average, around 70 and 40 percent of the nominal GDP, respectively, in the GCC countries; this highlights the significance of international trade in aggregate domestic output of the GCC economies (figure 10).

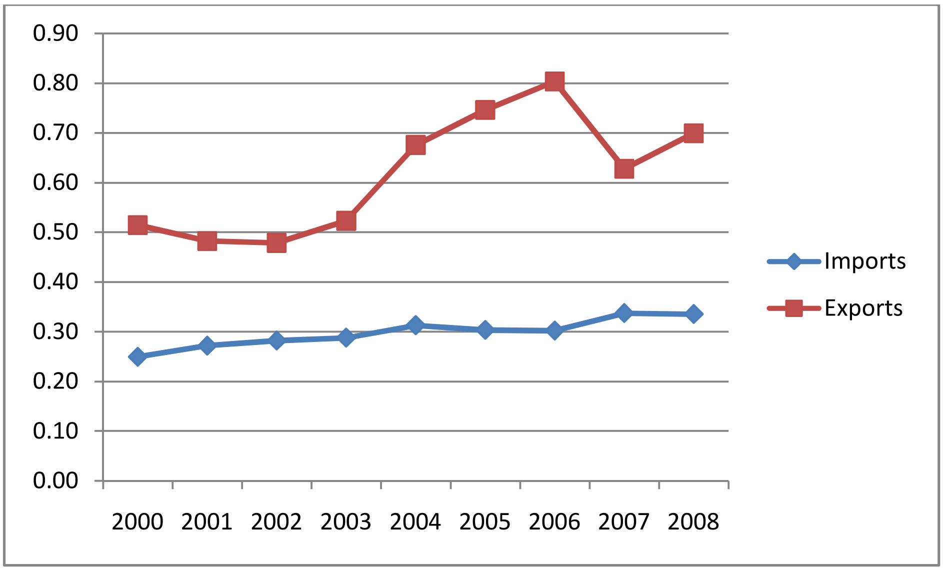
However, there is a clear difference between exports and imports with respect to the structure of the goods traded and the geographical pattern of trade. The bulk of the GCC exports consist of hydrocarbon goods (oil and oil derivatives), which are mainly oriented towards Japan and emerging Asian markets. For example, in 2008, exports to Asian countries constituted around 60% of GCC countries' aggregate exports. Furthermore, Japan alone accounted for about 20% of the GCC economies' total exports (figure 11). However, imports to the GCC countries are dominated by two regions, Asia and Europe, with around 40% and 30% shares from total GCC imports, respectively (figure 12). The European markets are among the main beneficiaries from the increases in oil revenue of the GCC economies. The European area is the only region that maintains a trade surplus with the GCC block (figure 13). Machinery and mechanical appliances, vehicles and parts, and electrical machinery and equipment formed the main imports to the GCC economies as of 2008. Intraregional trade between the GCC countries is very limited and formed around only 7% of total trade in 2008. The limited intra-GCC trade is primarily attributed to the dominance of hydrocarbon products in the external balance of these economies and to low diversification in their economic structure.

Figure: 9 (Imports and Exports of goods and services, Units: millions US dollars)



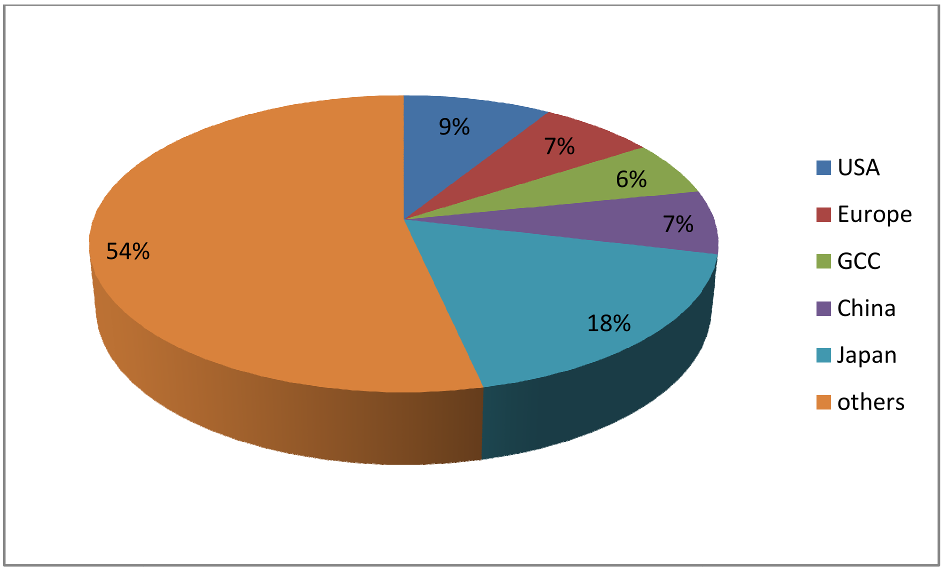
Source: International Financial Statistics, IMF

Figure: 10 (Exports and imports as share of GDP)



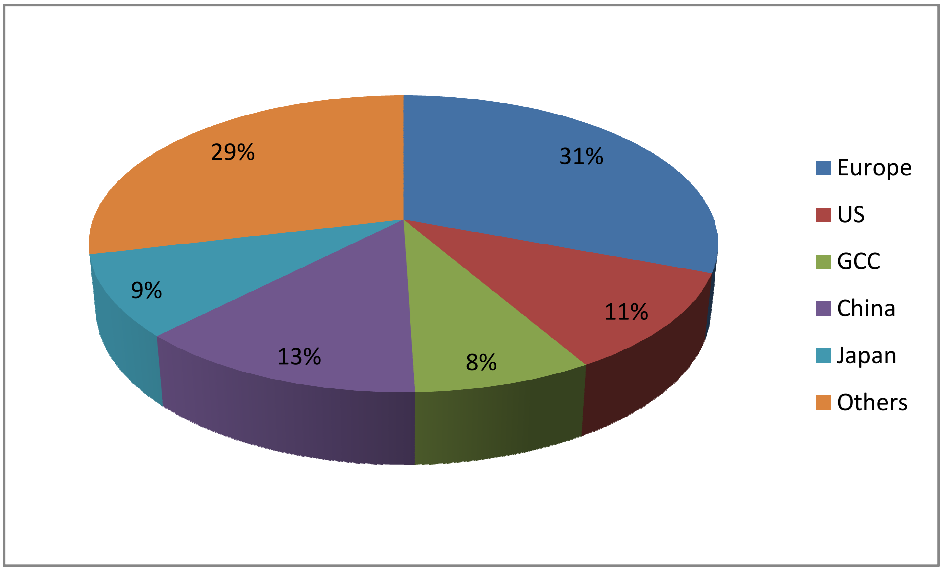
Source: International Financial Statistics, IMF

Figure: 11 (Direction of GCC exports in 2008)



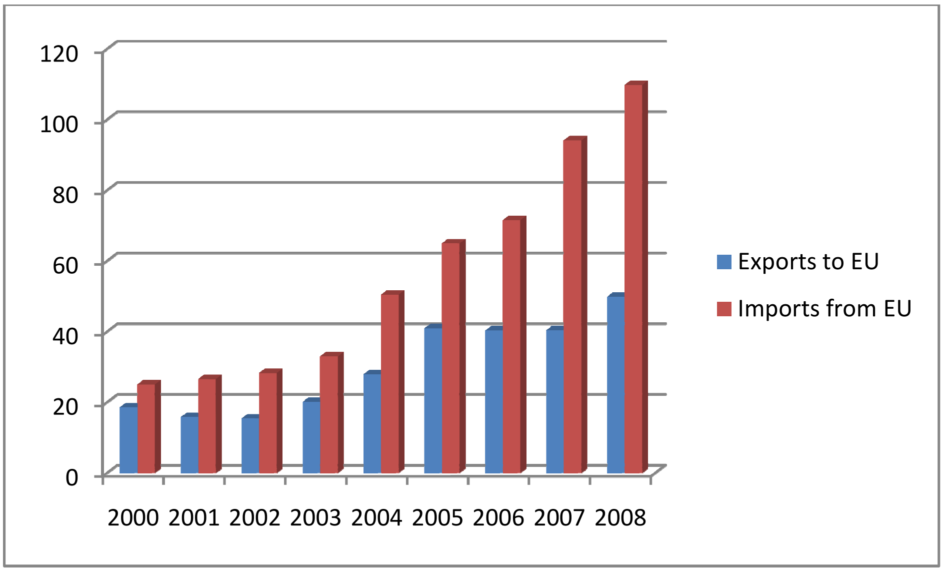
Source: DOTS (IMF), and the Annual Reports of GCC central banks.

Figure: 12 (Direction of GCC countries Imports in 2008)



Source: DOTS (IMF), and the Annual Reports of GCC central banks.

Figure: 13 (Trade between GCC and Europe)



Source: DOTS, IMF.

The remaining share of the petrodollar revenues are invested in financial assets around the globe, resulting in a sizable build-up of traditional foreign exchange reserves and, increasingly, stabilization and savings funds, which are also referred to as sovereign wealth funds (SWFs)[155]. These funds, which are normally of medium-term horizon, are primarily established for the purpose of smoothing short term volatility stemming from oil revenues in government expenditure so as to avoid boom and bust cycles (Sturm *et al.*, 2008)[156]. Accordingly, they are part of the general fiscal policy framework and are also meant to improve the conduct of fiscal policy. Furthermore, the SWFs are assumed to have played a large role in sterilizing the effect of oil revenues resulting from high demand for and price of hydrocarbon products.

[155] Early SWF was established in Kuwait during 1950s, however, they are found now in all of the GCC countries, with the exception of Saudi Arabia, where the monetary agency continues to manage the entire foreign wealth on behalf of the government (Sturm et al, 2008).

[156] SWFs are also regarded as long-term saving funds for future generations (Scherer, 2009).

Detailed figures for the total assets of these state-owned funds are not normally disclosed, which makes it difficult to have a full view of the financial petrodollar recycling of the GCC countries. Based on the recorded foreign exchange rate reserves and the recent current account surpluses of the GCC countries, it is believed that these economies have assets in the range of USD 1-1.5 trillion under sovereign management (Sturm *et al.*, 2008). On account of the great size of financial petrodollar recycling, the oil-exporting nations and the GCC states are assumed to play a significant role in the world capital market. Such influence on international capital markets is largely felt in the impact of the petrodollar investments on asset prices (particularly US dollar dominated assets), emerging market yield, and the US dollar exchange rate, thus suggesting some implications for global financial stability[157][158].

Given their recent remarkable amount of international trade and upswings in their combined current account surplus, the GCC economies and the oil-exporting countries in general are assumed to take part in the international agenda for addressing global imbalances (Kumah, 2009). One of the ways through which oil-exporting nations like the GCC economies can participate in addressing global imbalances is by trying to accelerate investment in oil production capacity and increasing economic diversification. That will result in stabilising global oil markets and more importantly mobilising part of the petrodollar inflow of the oil exporting countries back to the oil importing countries through the import of goods by the former (countries with current account surpluses) from the later (countries with current account deficits like the US), thus mitigating the negative effect of the ongoing increase in oil prices on the purchasing power of oil-importing countries[159].

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[157] It is believed that the major share of the petrodollar investments of the GCC countries is in US government securities.

[158] The shift toward viable investment in the emerging markets is part of portfolio diversification by the GCC economies. Other factors have also made the investments in the emerging markets more promising and attractive, like the recent dynamic development and improved fundamentals in these economies (Sturm et al., 2008).

[159] However, there are several caveats to the trade channel in addressing the global imbalances, at least with respect to the GCC economies. Given the structure of the trade pattern of GCC economies, it is believed that their impact in combating global imbalances through the trade channel will be limited. Since Europe and Asia absorb the largest share of imports by the GCC countries, it is highly likely that the trade channel will be of benefit to the Euro area and Asian countries, and then the US, which have the world's largest current account deficit.

Increasing the flexibility of the GCC exchange rates has been suggested as another way to rapidly and efficiently address global balances. However, this channel has been undermined as far as the GCC countries are concerned primarily because of the small share of their non-oil exports of goods and services, which can hardly compete with those of the industrialised economies. Furthermore, the low elasticities of exports (price inelastic of global demand for oil products) and imports of the GCC countries is another argument against the use of the exchange rate changes to correct current account balances (Mokhtar, 2004, Kumah, 2009). It is also argued that despite the flexibility of the exchange rates, the GCC economies is expected to continue investing in the US-dominated assets for reasons like the US deep capital markets, the US status of being a safe haven for many investments, and the fact oil is still dominantly priced in US dollars. Furthermore, the exchange rate flexibility channel is also weakened by the lack of empirical evidence on the effect of the petrodollar investments on the level of long-term US interest rates (Warnock and Warnock, 2009)[160].

The remarkable role of the GCC countries in the global context based on the above presented facts and characteristics (being a major producer and supplier of hydrocarbon products in global markets; a major net supplier of capital in the global market; the home of the world's largest sovereign funds; and a major trading partner with many regions in the world, particularly Europe and Asia, as well as their rising importance in addressing global imbalances) suggests that changes in the exchange rate regime policies of these economies might have a great impact in the global foreign exchange rate markets. Furthermore, given the empirical evidence on the non-linearity of regime choice in trade flows (Meissner and Oomes, 2009), the changes in the exchange rate regime polices of the GCC economies can have rapid effects on the geography of the international monetary system[161].

[160] That is more often attributed to factors like availability of data and the relatively broad diversification of the investment portfolios of oil-exporting countries, including the GCC economies.

[161] According to Meissner and Oomes (2009), a relatively small amount of regime change can have large effects on the geography of the global monetary system at certain levels. For example, once a few important economies, like the GCC countries, de-peg from the US dollar (for one or more of the reasons explained above; *e.g.* inflation, US deficit) their trading partners may be encouraged to do the same, leading to a rapid decline in the popularity of the US dollar.

3. Literature Review on the Alternative Choices of Exchange Rate Regimes for the GCC Economies

Based on the empirical literature, the most widely analysed exchange rate choice for the GCC economies is a corner solution in the form of currency union. The GCC countries are viewed as a homogenous group not only from an economic perspective (*e.g.* large share of oil production in total, dependency on oil exports, highly import-dependent due to low degree of commodity diversification, and similar trading partners' weights), but also share a common language, and cultural and political history. These economic and socio-political characteristics increase the region's eligibility for forming a monetary union. Despite the large amount of progress that has been made toward achieving the goal of a full-fledged monetary union[162], the GCC economies are generally viewed as not ready to abolish their national currencies and adopt a unified one.

Examples of the studies that have assessed the readiness of the GCC economies to form a single currency include Zaidi (1990), Dar and Presley (2001), Laabas and Limam (2002), Jadresic (2002), Darrat and al Shamsi (2005), Sturm and Siegfried (2005), Al-Barwani (2006), Abu-Qarn and Abu-Bader (2008), and El Hag (2009). Generally, the assessment of these studies have depended on analysing the applicability of the traditional OCA criteria to the GCC economies, as well as on the monetary and fiscal convergence. Despite the reported similarities in a number of economic and socio-political characteristics, the GCC economies were found to lack significance in intra-regional trade and capital mobility, as well as to show asymmetry in shocks and business cycles. Further insignificances were reported with regard to commodity diversification, price and wage flexibility, political

[162] For example, they now have virtually unrestricted intra-regional mobility of goods, national labour, and capital; they have also developed prudential regulations and supervision of the banking systems are being progressively harmonized. The US dollar-peg has been declared as the de-jure anchor by all members starting from January 2003, with the exception of Kuwait, which went back to a basket of currencies in May 2007. In 2005, the GCC economies adopted the European Union convergence criteria with respect to budget deficit, public debt, currency reserves, interest rates, and inflation. Most of these criteria have been met, with the exception of inflation, which poses a major challenge to all the GCC members given the late surge in global prices, declining US dollar, and the economic growth due to a prolonged hike in oil prices. In January 2008, the GCC countries launched a common market, the purpose of which is to provide equal treatment to all the GCC citizens in all economic activities including freedom of movement, work opportunities, pensions and social security, taxation, *etc.* (IMF, 2008).

integration, and slow implementation of some macroeconomic fundamentals. Other studies, like that carried out by the International Monetary Fund (IMF), have also pointed out some delays in establishing harmonized systems and in institution building; namely the harmonization of monetary policy framework, payment and settlement systems, regulatory and supervisory structures, macroeconomic statistics, and setting up a common accounting framework and adequate budgetary procedures.

Furthermore, the recent developments in the region have, to some extent, confirmed the findings of the above studies regarding the readiness of the GCC economies to form a monetary union. In May 2007 the State of Kuwait showed some divergence from the block by moving from the dollar peg, which was officially declared as the anchor currency for all the GCC currencies as an explicit step toward monetary union, to an undisclosed currency basket[163]. Moreover, Oman and the UAE declared their withdrawal from the planned monetary union in 2006 and 2009, respectively[164]. Also, during their regular annual summit meeting in December last year, the State leaders of the remaining four countries (Bahrain, Kuwait, Qatar, and Saudi Arabia) took a decision to put off the planned date, which is first of January 2010, for the single currency because some extra time was needed to complete the development of a common monetary and regulatory framework (Willett et al, 2009).

Other studies have suggested the efficacy of more flexible exchange rate regimes for the oil exporting economies like those of the GCC countries. For example Setser (2007) argued in favour of a more flexible exchange rate for the currencies of the oil exporting nations since the dollar-pegged exchange rate makes it harder for these economies to adjust to large swings in the price of oil and forces these economies to import monetary policy that may not suit their local needs. Furthermore, the dollar peg forces the adjustment in the real exchange rate to come from changes in the price level (inflation), which may lead to slower real term changes and may generate a price-wage spiral and a low level real interest rate, thus increasing the degree of risk associated with asset bubbles as investors shift toward real estate and equity assets. Accordingly, Setser (2007) called for a more flexible exchange rate regime in order to reduce the need for domestic prices to rise and fall along with the price of oil, to

[163] This was mainly due to the recent prolonged depreciation of the US dollar that led to high inflation through costlier imports.

[164] According to official statements by its Finance Minister, Oman had withdrawn due to its inability to meet the established convergence criteria. On other hand, the UAE withdrawal was mainly due to disagreement over certain issues, like the location of the central bank for the monetary union.

better pursue domestic goals of inflation and output through higher monetary policy independence, to easily absorb adverse real shock, and to dampen oil related swings in government revenue.

However, Khan (2009) countered this argument by arguing that the effectiveness and efficiency of an independent monetary policy is subject to the efficacy of the interest rate transmission mechanism channel. A lack in the sensitivity of the market interest rates to the interest rate policy will weaken the monetary policy transmission and render the independent monetary policy ineffective. Investment and spending decisions in the GCC economies depend greatly on actual and forecasted government spending, thus constraining the role of financial markets and interest rates. Khan's argument has been further confirmed by the works of Al Raisi *et al.* (2008) and Al Jasser- and Banafe (2007), who reported weak sensitivity for market interest rates to changes in authority rates in both Oman and Saudi Arabia, respectively.

The argument for a flexible exchange rate in the GCC economies is further weakened by the issue of the choice of nominal anchor under a float. Inflation targeting, on the one hand, must be established on a thorough understanding of the inflationary process and its determinants as well as the availability of some institutional and technical requirements, such as sophisticated market-based monetary operations, central bank independence, and transparency of policy to build accountability and credibility (Mishkin 2000, Khan 2009, and Coats 2010)[165]. On the other hand, monetary targeting requires a stable and predictable money demand function, the development of instruments, and adequate forecasting capabilities for efficient liquidity management (Khan 2009, Coat 2010). The lack of most of these requirements for either inflation targeting or monetary targeting in the individual GCC economies further confirm the weak case for the flexible exchange rate regimes for the currencies of these countries.

Under flexible exchange rates large swings in oil prices may lead to larger fluctuations in the nominal exchange rates of the GCC countries, which could result in higher fluctuations in non-oil sectors and higher and more volatile inflation (Cashin and McDermott, 2001). Given the thin foreign exchange rate

[165] Furthermore, according to MacDonald (2010), for commodity exporting countries like the GCC economies, an adverse shock in terms of trade would normally necessitate a counteracting policy in the form of currency depreciation, but rigid inflation targeting requires maintaining a strong currency by tightening the monetary policy. The resulting effect in non-oil sectors of the GCC countries would have important implications for the national output.

market that is characterised by a relatively small number of agents, it's highly likely that the individual GCC central banks would intervene to smooth the movements of the exchange rate, and to keep such movements consistent with macroeconomic fundamentals.

Also, according to Khan (2009), letting the exchange rate float would introduce a new and different kind of uncertainty and risk into the international transactions of the GCC economies. Furthermore, the case is further deteriorated by the absence of deep and well-functioning financial markets purporting to facilitate hedging at low transaction costs so as to minimize the additional risks that economic agents in the GCC economies would face under a floating regime.

Frankel (2003) has suggested pegging the currency of the country with the price of its main exported product. Frankel's (2003) proposition pertains particularly to small, open economies that are relatively specialized in the production and export of mineral and agricultural commodities. Based on Frankel's (2003) proposition, the GCC countries should peg their individual currencies to the price of the oil as it constitutes the major share of these economies' exports. Pegging to the price of oil will simultaneously deliver automatic accommodation in terms of trade shock, as flexible exchange rates are expected to do, while maintaining the credibility-enhancing advantages of a nominal anchor.

However, there are some reservations on pegging the exchange rate of the currency with the price of an export good. For example, as long as the price of oil remains volatile, pegging directly to the price of oil would entail excessive swings in the exchange rate and higher volatility in other sectors in the economy (Setser 2007, Khan 2009). For example, high oil prices will lead to real appreciation, which in turn will increase the cost of other non-oil exports (the Dutch disease), thus dampening the diversification efforts. Furthermore, when the price of oil declines, it is not guaranteed that such decline would be followed by sufficient depreciation in the currency to accommodate the adverse shock in terms of trade and to stabilize export earnings. Also, oil producing economies like the GCC countries are constrained by production capacity, extraction limits, and the OPEC quota system, which suggest that adjustment following real depreciation due to a decline in oil prices would have to come partly through expanding the share of non-oil exports or, alternatively, cutting imports.

MacDonald (2010), who focused on analysing the exchange rate regime of the UAE, viewed the current US dollar peg as inappropriate given the asymmetric nature of the US and UAE economies. The asymmetry between the two economies shows up in the fact that the US is a net-oil importing country and the UAE is a net-exporting country. Stated differently, the asymmetry implies increasing incompatibility of the UAE's economic interest and those of the US monetary policy, with further implications for the effectiveness of the existing exchange rate system even if the US dollar were to start appreciating (Iqbal, 2010). Accordingly, MacDonald (2010) has suggested shifting away from the current regime of pegging to the dollar to one in which the dirham (the UAE's currency) is fixed to an appropriate basket of currencies, thereby providing the non-oil sectors with the stability and credibility they need to flourish while at the same time allowing the price of oil to influence the external value of the currency. To achieve the latter, MacDonald (2010) has suggested either including the price of oil directly in the basket of currencies or adjusting the basket, along the lines of a crawling peg, as the price of oil changes.

Among the very few studies that have focused on empirically analysing the exchange rate regime in the individual GCC economies is Erbas *et al*. (2001), who examined pegging the currencies of the individual GCC countries to the SDR (German mark, Japanese yen, US dollar, French franc, and British pound sterling), instead only to the US dollar, in view of the large share of the other SDR zone countries in the external trade of the GCC countries. The argument for the SDR is that it is far more stable than its components, and thus might produce a more stable exchange rate and might further improve the stability of imports and exports. Furthermore, the SDR peg improves the stability of the exchange rate between the currencies of the GCC countries and the SDR currencies other than the US dollar; however, the volatility in the exchange rate between the GCC currencies and the US dollar is increased. The authors work was based on empirically comparing the elasticities of imports and exports to changes in the exchange rate under the US dollar peg and the SDR peg. The authors found that for most of the GCC countries and for most of the components of the trade account, the stability gains from maintaining the US dollar peg outweigh the stability gains from switching to the SDR peg.

Finally, an upward revaluation of the GCC countries' currencies against the US dollar was among the discussed alternatives in the literature of the GCC countries (Central Bank of Oman 2007, MacDonald, 2010). Despite the ability of revaluation to address the short-run concerns about imported inflation, the asymmetric consequences of revaluation for the economies of the GCC countries render such strategy ineffective and bear permanent detrimental effects. For example, at the macro level, a revaluation would raise the prices of non-dollar dominated exports in foreign markets, hence, eroding the competitiveness of the economy and dampening the diversification efforts. Also, with strong currencies, imported foreign goods become cheaper, hence, increasing the inflow of imports, which in turn could put high pressure on the balance of payment and consequently erode the current account surpluses of the GCC countries.

Further, a revaluation could also damage the credibility of the monetary policy and increase the uncertainty about the value and movement of exchange rate, which would, hurts investments (including deterrence of foreign investors) and ultimately economic performance. Moreover, a revaluation would not give rise to an independent monetary policy, and hence, the constraints on independent monetary policy under pegged exchange rate regime would continue. Any valuation would also entail a loss for the GCC countries in the form of a reduction in the value of foreign earnings and assets. That in turn might results into higher volatility in future fiscal revenue and government spending, particularly if revenues from oil decreased, since most of the current foreign assets are meant to be used in future for financing investment and growth in the GCC economies (Central bank of Oman, 2007).

4. A proposition for a dollar-euro basket peg

Given the strong evidence against the current viability of either one of the corner exchange rate options (monetary union or flexible exchange rate) for the GCC economies, and the scarcity of empirical studies on the viability of other alternative intermediate exchange rate regimes for these economies, this paper contributes by analysing the feasibility of a dollar-euro basket, as an alternative exchange rate regime for the currencies of the GCC countries. The above proposition has been suggested based on a number of factors.

First, the criteria of the Optimum Currency Area (OCA) confirms that the GCC countries are better off with a peg to an external anchor, since they are small, open economies with a flexible labour market[166]

[166] According to the Global Competitiveness Report of the World Economic Forum 2007-2008, the labour markets in the GCC countries are flexible given the relatively high rank of these countries in terms of labour market flexibility. The flexibility in the labour markets of the GCC countries is due to the heavy use of expatriate

and limited ability to run an independent monetary policy. Moreover, the choice of the euro and the US dollar for the basket peg is basically based on the OCA theory that suggests adopting the anchor currency that minimizes the sum of bilateral exchange rate fluctuations, weighted by the importance of each trade partner (Meissner and Oomes, 2009). Accordingly, we suggest a basket of the US dollar and the euro, as these two currencies account for a large share of the GCC economies' international trade and non-trade financial transactions. However, despite the fact that GCC countries have significant trade with other countries (notably Asia), the currencies of these countries are pegged or tightly tied to the US dollar, which weakens the idea of including these countries' currencies in the basket. Furthermore, the Asian countries mainly invoice their exports in US dollars (Habib and Strasky, 2008), and therefore, the term of trade of the GCC countries-on the imports' side- are affected by changes in their exchange rate against this currency. In addition to that, the role of the Japanese yen as an international currency is fading[167].

Second, looking into the current goal and challenge of all the GCC countries that have started to lower reliance on oil and create employment opportunities for the rapidly growing national workforce. The diversification of their economies and the development of non-oil sectors will, most probably, require, at least at some stage in the future, a more flexible exchange rate policy in order to enhance the international competitiveness of the GCC economies.

Third, fixing with a basket of the currencies most often used in financial and commercial transactions will ensure some ability to easily adapt to the adverse effects from fluctuations among the value of the major reserve currencies. This will lead to lower volatility in the nominal effective exchange rate, which in turn will result in higher external trade and balance stability. Furthermore, a basket peg will continue to retain the main properties of an exchange rate peg, such as credibility of the monetary policy.

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workers, who work primarily in the private sectors, and usually come from neighbouring Asian countries like India, Pakistan, Iran, the Philippines, Indonesia, other Middle Eastern nations or from Europe and the USA (Willett *et al*., 2009). Domestic labour are mainly employed in the public sector, which is characterized by wage rigidity, immobility, and inflexibility (Willett *et al*., 2009).

[167] Furthermore, according to some studies (e.g. Dominguez 1999, Faruqee 2006) the Japanese exporting firms predominantly engage in local currency pricing, a case which further weaken the potentiality of the yen to act as an international currency.

Fourth, beginning with a basket of two currencies is viewed to be simple to manage and a useful way to introduce more flexibility in the exchange rate in a gradual manner that will also allow economic agents to learn to manage and live with foreign exchange risks. Also, the initial and essential operational requirements for a basket peg are no different than those now in place (Coats, 2010).

Fifth, pegging with the dollar-euro basket is assumed to reduce the reliance of the GCC economies on the US Federal Reserve, cover most transaction costs in external trade and financial instruments (which are largely in US dollars and to lesser existent in euros), and further facilitate the use of both the dollar and euro hedging instruments to efficiently manage financial risks given the considerable depth in the euro financial instruments (Khan, 2009).

Six, the option to include the US dollar in the dual currency peg despite the recent uncertainty about the US economy (weakening of the dollar and rising deficit in the US economy) is due to a number of factors. In addition to the above mentioned factors for the long stable link between the GCC countries' currencies and US dollar, the US dollar continues to be used as the main invoicing currency around the world. Goldberg and Tille (2005) have reported that the US dollar is the currency choice in most transactions involving the United States. They have as well reported that the US dollar has been extensively used as a vehicle currency in trade of goods that do not directly involve the United States but that are traded on organized markets or that are referenced priced international trade flows. The US dollar enjoys network externality due to the large number of people and agents who accept it and use it (Cooper, 2009). The dollar enjoys a large market in low-risk and highly liquid securities (*e.g.* US Treasury bills). Furthermore, most of the foreign exchange transactions around the globe directly involve the US dollar. Even in the recent economic crisis, the US dollar was demanded by many troubled organizations and the US Fed made provided up to $600 billion in liquidity to non-US residents through swap lines (Ferry *et al.*, 2009).

In addition to the fact that the euro area forms the main trading partner of the GCC countries, other factors have further contributed to the selection of the euro in the suggested euro-dollar basket. For example, the euro represents the currency of around 16 countries in Europe, and it is increasingly used by the non-euroland members of the EU in their transactions with the euroland countries (for invoicing, payment, and holding international balances) (Cooper, 2009). Galati and Wooldridge (2006) have found that the liquidity and breadth of the euro financial markets have evolved greatly over the past decade and were fast approaching those of the dollar markets and as a consequence the euro is eroding some of the advantages that have historically supported the pre-eminence of the US dollar as a reserve. The stability of the euro and the great size and financial depth of the euro markets have qualified the euro as an international currency. The euro is also expected to increasingly compete with the US dollar in fulfilling the tasks of an international reserve, intervention currency (Masson & Turtleboom, 1997, Chinn and Frankel, 2005). Furthermore, the euro is also expected to continue capturing a large share of international trade and asset accumulation both as unit of account and as means of payment not only within the EU area, but also in other countries that are economically linked to Europe (*e.g.* Morocco, Tunisia, and non-EU European countries).

5. **Methodology of Estimation**

Drawing from the theory of the OCA, a Structural Vector Autoregression (SVAR) model will be used to investigate the influence of the external shocks to the economies of the individual GCC countries. Specifically, the model tends to investigate the extent to which the economies of the individual GCC countries, represented by real GDP, are affected by external factors such as changes in global oil prices, which represents trade shocks and the business cycles in the US and the European economies. The assumed impact from these two areas (US and Europe) will be assessed independently on the individual GCC countries. Technically speaking, for each of the six GCC countries, we will employ a VAR model with three variables, namely global output (GDP of the US or the EU), real oil price, and the domestic real GDP of the individual GCC country.

The SVAR technique has been used extensively in the economic studies and it build on Sims' approach (1980) but attempts to identify the impulse response by imposing a priori restrictions on the covariance matrix of the structural errors (as suggested for example by Bernanke 1986, Sim 1986) and/or on long-run impulse responses themselves (as suggested for example by Blanchard and Quah 1989 and Astley and Garratt 1996)[168]. In our system of three variables, the number of restrictions to identify the SVAR model is equal to n (n-1)/2, where n is the number of variables in the system. Accordingly, we use

[168] In contrast with the unrestricted VAR model, which is theory-free model, SVARs attempts explicitly to offer some economic rationale behind the covariance matrix used, and thus try to avoid the use of arbitrary identifying restrictions (Garrat et al, 1999). Nonetheless, the restrictions in the SVAR do not allow the identification of the long-run relationships among the variables, which make it in some sense misnomer to call them structural (Garrat et al, 1999).

three restrictions; 1) we assume that only oil prices have long-run effect on real oil prices; 2) Global output are only influenced by global shocks in the long-run; and 3) domestic shocks have no long-run impact on global output. The first restrictions in generally on line with many empirical studies that assume global shocks from the international oil markets are highly exogenous to most other microeconomic variables. Our second and third assumptions are basically based on the small-large country hypothesis of the basic Mundell-Fleming model[169]. Furthermore, domestic shocks are mainly related to volatility in oil prices and geopolitical events. The long-run effects can be summarized in the following matrix;

$$\begin{vmatrix} Dy^{o}_{t} \\ Dy^{g}_{t} \\ Dy^{r}_{t} \end{vmatrix} = \begin{vmatrix} a_{11}(1) & 0 & 0 \\ a_{21}(1) & a_{22}(1) & 0 \\ a_{31}(1) & a_{32}(1) & a_{33}(1) \end{vmatrix} \begin{vmatrix} e^{h}_{t} \\ e^{g}_{t} \\ e^{r}_{t} \end{vmatrix}$$

Where y^{o}_{t} represents change in real oil price or terms of trade, global output (US or EU) y^{g}_{t}, and domestic output y^{r}_{t}. e^{o}_{t}, e^{g}_{t}, e^{r}_{t} represents trade shocks, global shocks, and domestic shocks, respectively. The lower-triangular structure implies that the terms of trade shocks are the most exogenous variable, and that the domestic variable responds to shocks from both oil markets and global output. The impulse response functions and the variance decompositions analysis from the VAR results will be employed to describe the dynamic impact of the innovations.

The second part of the empirical work complements the first part by testing for the long-run business cycle synchronization (BCS). In testing for the synchronous long-run movements between the business cycles of the individual GCC countries and the US and or the EU, we will use the Johansen co-integration approach. The Johansen approach will allow us to examine and identify the number of co-integrating relationships between the non-stationary variables in the model using the maximum likelihood procedure. The presence of co-integration would indicate that the countries whose variables are studied share synchronous long-run movements in their economic activity, thus indicating a higher support for fixing their currencies with each other, or to form a monetary union.

[169] It is worth to mention here that generally speaking it is quite hard to find convincing identifying assumptions that enable us to exactly identify the causal links among the n variables on which we have data.

6. Data and Empirical Estimation

It is necessary to note at the outset that similar to many other developing countries, the GCC countries suffer from a data availability problem. In particular, high frequency time series are mainly available only from the beginning of the current decade onward. For our estimation of the SVAR model we use quarterly data spanning from Q1, 1991 to Q4, 2009 for all the countries in our sample. We used a lag length of 4, which was found to be supported by most the other information criteria across models. The main sources of the data are the International Financial Statistics, IFS Direction of Trade Statistics, World Economic Outlook, and the European Central Bank. Our data include the individual real GDP of the six GCC countries, the US, and the European Union; and the real price of oil, which is defined as the normal oil price deflated by the US consumer price index. Furthermore, with respect to the output of Europe, we used the aggregate quarterly real GDP data for the EU 27, for which a consistent time series is available only from Q1, 1995.

6.1Unit Root Tests

Our first step in the estimation process is to determine the order of integration of the variables. We have applied two unit root tests, namely the Augmented Dickey-Fuller (ADF) test and the Phillip-Perron (PP) test[170]. The general form for the ADF test including a constant and a linear trend is presented in equation 1. Optimal lags were selected using Schwarz Criterion (SIC). With respect to the PP test, we selected the truncation lag for the variance estimate test by the rule of thumb suggested by Newey-West. The summary for the unit root tests is given in Table 6. It is clear that none of the variables are stationary at their level, which means that the time series of our variables have a stochastic trend, or in other words the series do not have a constant mean and variance. However, the first difference of the time series of the variables is integrated of order zero I(0).

$$\Delta y_t = a + \alpha t + \beta y_{t-1} + \sum_{i=1}^{p} \delta_i \, \Delta y_{t-i} + u_t \qquad (1)$$

[170] The PP test is a modification of the ADF statistics that takes into account the less restrictive nature of the error terms (Asteriou and Hall, 2007).

Table (6)

Unit Root Tests

Country	**ADF**		**PP**		**Integration**
	Constant	Trend	Constant	Trend	
Bahrain					
LGDP	(0) 1.84	(0) -0.87	(4) 2.18	(2) -0.94	I(1)
DLGDP	(0) -4.38***	(0) -4.8***	(1) -4.34***	(6) -4.81***	I(0)
Kuwait					
LGDP	(0) -0.78	(0) -2.89	(2) -0.67	(3) -2.85	I(1)
DLGDP	(1) -5.44***	(1) -5.61***	(23) -6.62***	(26) -10.89***	I(0)
Oman					
LGDP	(0) 3.05**	(1) 3.03*	(1) -2.66	(4) 4.10**	I(1)
DLGDP	(0) -3.0**	(0) -2.57	(2) -2.99**	(1) -2.57	I(0)
Qatar					
LGDP	(0) 2.61	(0) -0.84	(1) 2.67	(0) -0.71	I(1)
DLGDP	(0) -3.90***	(0) -5.83***	(0) -3.91***	(4) -6.34***	I(0)
Saudi Arabia					
LGDP	(0) 0.93	(2) -4.46***	(2) 0.53	(2) -2.66	I(1)
DLGDP	(2) -3.96***	(0) -4.75***	(2) -3.96***	(3) -4.91***	I(0)
UAE					
LGDP	(0)1.12	(0) -1.88	(0) 1.12	(4) -1.80	I(1)
DLGDP	(0) -4.13***	(2) -3.27*	(0) -4.14***	(1) - 4.90***	I(0)
USA					

LGDP	(0) -0.76	(1) -2.70	(7) -0.89	(2) -2.05	I(1)
DLGDP	(0) -3.76***	(0) -3.74**	(3) -3.55**	(4) -3.48*	I(0)
LOP	(0) -1.38	(0) -0.76	(2) -1.51	(12) 0.12	I(1)
DLOP	(0) -4.75***	(1) -5.38***	(0) -4.75***	(26) -15.06***	I(0)
European Union					
LGDP	(0) 0.11	(5) -4.39**	(0) 0.11	(2) -2.40	I(1)
DLGDP	(0) -3.66**	(0) -3.52**	(3) -3.58**	(4) -3.41*	I(0)

Note: Figures in brackets next to statistics represent number of lags in the test, GDP = real gross domestic product, Op = real oil price, L = Log form, D = first difference, *, **, *** denotes significance at 10%, 5%, and 1% levels respectively.

6.2 Analysis of Impulse Response Functions and the Variance Decompositions

Appendix 10 provides the results of the impulse response functions for each of the six GCC countries' output to shocks in the US and Europe[171]. It can be seen that in both zones there is a positive and significant response by output in all the GCC countries to one standard deviation shock in terms of trade represented by real oil price. That reflects the weight of the hydrocarbon exports in the GDP of the GCC countries. The response of the GCC countries' output to global shocks emanating from the US and Europe is significant and positive and it is similar in pattern among all the GCC countries; a positive one standard deviation shock to global shocks led to a slight increase in the domestic output. However, responses to global shocks from both zones are much lower than to the terms of trade; furthermore, the magnitude of the response is relatively higher in the Euro zone. The lower impact from US output shock is quite surprising given the dominant role played by the US dollar in the economies of the GCC countries. Furthermore, the relatively higher impact from the Europe zone can be interpreted on the basis of a large and growing trade link, particularly the imports, and the geographic proximity between the GCC region and Europe as compared to US. Positive domestic shocks in the GCC countries are found to lead to high but short-lived responses in the output of these countries, as compared to the trade and global shocks.

[171] We are not interested in discussing the impulse responses of oil and the output of US and Europe.

Moreover, tables 7 and 8 present the results for the variance decomposition of forecast errors of the domestic output for only the individual GCC countries. In the US zone, variations in the output of the individual GCC countries seem to be mainly explained by term of trade shocks followed by domestic shocks in most cases. There is a relatively modest role for the US GDP shock in explaining the variations in the output of the GCC countries. Shocks from the US output account for only about 10% of the variations in the output of the individual GCC countries output. This result is consistent with the previous results from the impulse response functions. With respect to the Europe zone, shocks to the output of the EU area seem to account for a significant share in variations of the individual GCC countries' output. For example, in Bahrain, global shocks are found to account for as much as 35% and 30% of the variations in the output in the short-run and the long-run, respectively. For the rest of the GCC countries, shocks to the EU output is found to account for, on average, between a minimum of 10% to a maximum of nearly 20%, throughout the short and the long-run, of the variations of their output. However, as is the case in the dollar zone, trade shocks appear to explain the bulk of the variations of the output in the economies of the GCC countries. In fact, cross correlation, in table 9, of output growth between the GCC countries and the US and Europe lend support to the findings of the impulse response functions and the results of the variance decomposition.

Table (7)

(Variance Decomposition, US Zone)

	Oil	**Global Output**	**Domestic Output**
Bahrain			
6	17	10	73
12	19	10	72
18	19	10	71
Kuwait			
6	62	10	28
12	64	10	26
18	64	10	26
Oman			
6	50	8	42

12	51	8	41
18	51	8	41
Qatar			
6	40	6	54
12	43	5	52
18	43	5	52
Saudi Arabia			
6	76	5	19
12	77	5	18
18	77	5	18
UAE			
6	69	7	24
12	70	7	22
18	71	7	22

Table (8)

(Variance Decomposition, Euro Zone)

	Oil	**Global Output**	**Domestic Output**
Bahrain			
6	38	28	34

12	38	27	35
18	39	28	33
Kuwait			
6	67	8	25
12	65	10	25
18	64	10	26
Oman			
6	49	12	39
12	50	13	37
18	50	13	37
Qatar			
6	37	18	45
12	38	19	43
18	38	19	43
Saudi Arabia			
6	75	7	18
12	73	9	18
18	73	9	18
UAE			
6	62	13	25
12	61	15	24
18	62	15	23

Table (9)

(Cross correlation test between the real GDP growth of the GCC countries and US and Europe, 1990-2009)

	US	EU
BAHRAIN	0.29	0.38
KUWAIT	0.28	0.50
OMAN	0.19	0.37
QATAR	0.20	0.51
SAUDI	0.31	0.48
UAE	0.34	0.56

The above results have a number of implications, particularly in the framework of our above suggested Euro-dollar basket. With respect to global shocks, the results indicate that the business cycles of the individual GCC countries respond more to the movements in the output of Europe than to the output of the US. The relatively stronger impact of the Europe GDP shock on the individual output of the GCC countries reflects the importance of the macroeconomic development in Europe on the economies of the GCC countries. That in turn can imply that the monetary policies of the GCC countries should be adjusted to the economic development in Europe, particularly given the growing significant share of the GCC imports that originate from Europe. Completely neglecting the European macroeconomic conditions and continuing to fully account for the US dollar in the form of a dollar pegged exchange rate regime will be costly and can lead to destabilising economic conditions, like what has happened recently. Accordingly, if the GCC countries opted to move toward a more flexible exchange rate regime, to promote the competitiveness of their exports, in the form of a basket-based exchange rate regime it is strongly suggested that they should include the dollar as well as the euro. Such a multilateral based exchange rate arrangement should not only provide higher flexibility but should also help to address other issues like imported inflation.

7. Co-integration Tests

According to the literature, if two or more variables, which are non-stationary in levels and have individually stochastic trends, share a long-run equilibrium relationship, these variables are said to be co-integrated. Co-integrated variables are less likely to permanently drift from each other as some common stabilization forces (called error correction terms) in the system will tend to bring the variables back to equilibrium. We will use the Johansen-Juselius (1990) efficient approach to test for the presence of a long-term economic link between the economies of the GCC countries and the economies of the US and/or Europe. We used the real GDP and inflation rates (represented by the consumer price index) to proxy the macro economies of the countries in question.

Furthermore, according to Hakkio and Rush (1991), when investigating a co-integrating relationship, the time span should be long enough; the length of the time span is much more important than the number of observations used. Therefore, for this test we used a sample period that consists of annual data spanning almost three decades (1981-2008), which should be long enough to provide credible co-integration results. The optimal lag length in the tests was determined by relying on the different available information criterion, in conjunction with the necessary requirement that the resulting errors should also be serially uncorrelated (Kim, 1998). In order to avoid any contamination in the tests due to some possible structural shifts, we included a dummy variable that captured the Iraqi war (1990) in the region in 1990.

The results of the co-integration tests for both the real GDPs and the inflation rates between the individual GCC countries and US and/or Europe are presented in tables 10-13. The null hypothesis of no long-run common trend with respect to the real GDPs and inflation rates of the individual GCC countries and the US and/or Europe have been rejected in most of the tests. The results show some synchronized trends between inflation rates in the GCC economies and those in either US or Europe. Similar synchronized trends were observed between the real GDP of each of the GCC countries and that of either the US and Europe.

Such results indicate that generally the macro economies of the individual GCC countries and the US and/or Europe are linked together over the long run. That as well can be taken to mean or to suggest that the monetary policy which works for the output and inflation in the US and/or Europe may also work in each of the GCC countries. Significant business synchronization also indicates smaller differences in optimal discretionary monetary policies; hence, the constraint for fixing the exchange rate to a dollar-euro basket would be less costly.

This of course does not mean that the economies **o**f the GCC countries and the US and/or Europe do not differ over time. Rather, the results suggest that individual GCC countries and the US and/or Europe do share a common trend; however, when the short-run departure occurs, there will be some internal common forces that will correct the misalignment and push these economies back to their long-run equilibrium. Moreover, our results are further supported and confirmed by the presence of several non-zero co-integrations in some cases, in both the real GDPs tests and the inflation rates tests[172].

Table (10)

Testing for co-integration between real GDP of the US and the GCC countries								
Co-integration based on trace statistics test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	1	15.49	19.25**	17.26**	43.72***	27.31***	16.39**	17.01**
1	2	3.84	0.18	4.56**	7.17	0.04	0.56	0.02
Co-integration based on maximum eigenvalue test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	r≥1	14.26	19.06**	12.70*	36.55***	27.27***	15.84**	16.99**
1	r≥2	3.84	0.18	4.56**	7.17	0.04	0.56	0.02

[172] According to Dickey *et al.* (1991), the presence of multiple co-integrating vectors suggest that these co-integrating relations are robust and stable in more than one direction.

Notes: r donates the order of the co-integration rank. The optimal lag length was chosen by using the different information criteria. Maximum lag allowed is 4. *, **, *** indicate rejection of the null at 10%, 5%, 1%, respectively.

Table (11)

Testing for co-integration between real GDP of Europe and the GCC countries								
Co-integration based on trace statistics test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	1	15.49	39.72***	16.24**	17.77**	19.63**	18.61**	22.47***
1	2	3.84	5.59**	0.01	0.01	1.72	0.58	6.56**
Co-integration based on eigenvalue test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	r≥1	14.26	34.13***	16.23**	17.76**	17.92**	18.02**	15.91**
1	r≥2	3.84	5.59**	0.01	0.01	1.72	0.58	6.56**

Notes: r donates the order of the co-integration rank. The optimal lag length was chosen by using the different information criterion. Maximum lag allowed is 4. *, **, *** indicate rejection of the null at 10%, 5%, 1%, respectively.

Table (12)

Testing for co-integration between inflation rates of US and the GCC countries								
Co-integration based on trace statistics test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	1	15.49	19.49**	26.16***	28.32***	11.24	15.95**	32.01***
1	2	3.84	2.67	4.04**	2.29	1.68	4.77**	8.04

Co-integration based on eigenvalue test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	r≥1	14.26	16.82**	22.12***	26.04***	9.56	11.18	23.97**
1	r≥2	3.84	2.67	4.04***	2.29	1.68	4.77	8.04

Notes: r donates the order of the co-integration rank. The optimal lag length was chosen by using the different information criterion. Maximum lag allowed is 4. *, **, *** indicate rejection of the null at 10%, 5%, 1%, respectively.

Table (13)

Testing for co-integration between inflation rates of Europe and the GCC countries								
Co-integration based on trace statistics test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	1	15.49	22.46	30.85***	43.65***	16.65**	10.20	23.83***
1	2	3.84	2.15	4.27**	9.39	4.04**	1.95	1.74
Co-integration based on eigenvalue test								
Null	Alter	95%	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
0	r≥1	14.26	20.30**	26.57***	34.26***	12.61*	8.25	22.09***
1	r≥2	3.84	2.15	4.27**	9.39	4.04**	1.95	1.74

Notes: r donates the order of the co-integration rank. The optimal lag length was chosen by using the different information criterion. Maximum lag allowed is 4. *, **, *** indicate rejection of the null at 10%, 5%, 1%, respectively.

8. Summary and Conclusion

In the wake of the recent economic development in the GCC region, such as high oil prices, lower exchange rate value of the currencies of the GCC countries due to depreciating US dollar, and the rising inflation rates in these economies, this chapter attempted to empirically test the suitability of an alternative fixed exchange rate regime against the recent US-dollar peg of the GCC countries. Specifically, in this chapter we have attempted to investigate the feasibility of pegging the currencies of the individual GCC countries to dollar-euro baskets. Basically, our tests included two empirical estimations, namely a structural vector autoregression model (SVAR) and a co-integration test. In the SVAR we estimated the response of the output of the individual GCC countries to external shocks from the US and Europe, as well as from terms of trade (oil prices) and domestic shocks. In the co-integration tests we attempted to investigate if there is any integration between the business cycles of the GCC countries and the US or Europe.

The results of the variance decomposition and impulse response functions from the estimated SVAR models showed that output in the GCC countries are dominantly influenced by terms of trade shocks, which can be justified on the basis of the large share of oil revenues in the GDP of these countries. Furthermore, the results have also shown that shocks from Europe have a larger impact on the GCC economies than shocks emanating from the US. That in fact reflects the growing trade between the GCC countries and the Europe zone. From the results of the co-integration tests we found that there is a significant common long-run trend between output and inflation of the GCC countries and those of the US and Europe.

Generally, from the above results we could infer that individual economies of the GCC countries are influenced by the macroeconomic conditions in the Europe area and that in turn suggests that the monetary policies of the GCC countries should be adjusted to take into account the economic development in Europe, particularly given the growing significant share of the GCC imports that originate from Europe. The lower impact from the US side on the GDP of the GCC countries implies that pegging to only the US dollar can be costly and can destabilize the economies of these countries; thus, lending further support to our suggested proposal of pegging the individual currencies of the GCC countries to a dollar-euro basket. Such an exchange rate arrangement is deemed necessary under the evolving national objectives of the GCC countries, including increasing attention to economic and export diversification, low inflation, and regional integration.

Pegging to dollar-euro baskets will guarantee the credibility of the existing unilateral peg as well as some flexibility for the non-oil sectors in the GCC economies to grow and flourish. It will also minimize the likelihood of importing the wrong monetary policy at the wrong time and it will minimize the burden on the fiscal policy for sustaining internal stability and growth. The dollar-euro baskets can also be seen to serve as a gradual step toward a more flexible exchange rate regime in the future, when necessary requirements to build up credibility in the market are in place, thus, avoiding the need for an abrupt change that would disturb the current existing market credibility.

Finally, it should be understood that exchange rate regime is only one element in the general macroeconomic framework of a country, which means that exchange rate stability alone cannot deliver or guarantee overall internal and external stability. A prerequisite for any exchange rate arrangement to function effectively are sound fiscal and monetary policies (Iqbal, 2010). Therefore, the choice of exchange rate regime also includes the determination of a regime that in combination with other macroeconomic policies, best attains its internal and external goals. The move toward an alternative exchange rate regime including dollar-euro baskets depends on the policy objectives and common preferences of the local authority of the GCC countries. Changing objectives from say increased attention on price stability to international competitiveness and growth would entails changing the decision about the choice of exchange rate regime and the corresponding macroeconomic policies.

All in all, being attached for such number of decades with the single dollar peg suggests that the rational for the GCC countries to change/de peg should be more based on structural economic basis, not only on movements in foreign exchange markets.

Chapter Eight

Summary and Conclusions

1. Introduction

This chapter summarises the work, results and implications of the empirical sections in chapters three, four, five, and seven. It also presents the author's conclusions and recommendations with respect to the exchange rate regime policies of the GCC countries. The final section of this chapter discusses the limitations of the research and offers further areas for future research within the context of the GCC economies.

Nominal exchange rate stability has long been considered as a policy choice for many oil-exporting economies, including the GCC countries (Sturm et al, 2008). The main motives behind such policy choices in oil-exporting countries include the desire to confer credibility on domestic currencies, stabilize oil revenues, and in turn government revenues (given their role in the fiscal budget of these economies), and to avoid Dutch disease, particularly for those countries which have been trying to promote their non-oil exports. Recently, however, with respect to the GCC countries, the advantages of the exchange rate stability/peg have been overshadowed by some adverse domestic and global developments.

Since the beginning of the century, and following the rapid economic growth facilitated by higher oil revenue, some inflation pressure has emerged in all the GCC countries, with average inflation measured by consumer price index increasing from around 0.2% between 1998 and 2002 to around 10% in 2008, with some individual countries running at higher rates. On the other hand, real interest rates have become very low, and even negative in some cases. Against this backdrop, some estate members like Kuwait have revalued their currency against the US dollar by de-pegging from the single US dollar peg to a currency basket of undeclared composition. Subsequently, calls for an upward revaluation of the domestic currency or even de-pegging from the current exchange rate regime policy has started to gain some ground in the rest of the GCC countries.

Against this background, this thesis was put forth in order to comment on the relevancy of the existing pegged exchange rate systems of the Gulf Cooperation Council countries (GCC), with a special focus on the link between changes in the effective exchange rates of these countries' currencies and their domestic inflation. In particular, we attempt to test if there had been some large significant inflationary effects from the recent depreciation of the GCC countries' currencies by quantifying the pass-through from changes in exchange rates into domestic consumer prices inflation. Along a somewhat different line, we attempt to further analyze the viability of the existing exchange rate regimes of the GCC countries by considering an alternative pegging in the form of a dollar-euro basket instead of the unilateral US dollar peg.

2. Summery and implications of the results for chapters three, four, and five

2.1 Estimation and Results

Exchange rate pass-through to domestic prices has important consequences on transmission of shocks across countries, and for the ensuing macroeconomic policies. This importance is even greater for small open economies like the GCC countries that are highly import-dependent for most kinds of their goods, and have been working hard to promote their non-oil sectors. Accordingly, for the purpose of evaluating the viability of the current single US dollar peg for the GCC economies, we focused on the pass-through from nominal effective exchange rate to domestic CPI inflation, and followed the relevant empirical literature by employing some econometrical techniques to measure/quantify the extent of pass-through in these economies. More specifically, we used two different econometric methods, namely a single equation method and a co-integrated VAR method to estimate the impact from changes in the exchange rate to domestic CPI inflation in the GCC economies. The estimation was based on monthly data to comply with a sampling that is more relevant to exchange rate variability, and covered the period from January 2000 to December 2008. Furthermore, we based our analysis and implications on the results of the long-run pass-through, as most evidence in the literature had indicated the failure of the PPP theory in the short-run, and suggested its applicability in the long-run.

In the single equation method we regressed domestic CPI inflation against the nominal effective exchange rate plus other hypothesized determinants of prices like foreign inflation and oil prices. Furthermore, the model was estimated in first difference, in order to avoid spurious results due to the non-stationarity of the variables. The estimated long-run pass-through ranged between a minimum of 10% (Saudi Arabia) to a maximum of 69% (Oman), with an average of around 27%, clearly indicating the failure of the PPP theory in the context of the GCC economies, as the pass-through is incomplete.

In the second attempt, which is in two parts, we re-estimated the model of the price level using a VEC model, in which the information contained in the non-stationary data is exploited fully. In the first part, as in chapter four, we re-estimated exactly the same model of the price level that was estimated using the single equation method in chapter four, however, this time by applying a co-integrated VAR method. According to the results of the estimated VECM, the estimates of the long-run pass-through from exchange rate to domestic prices are significant. However, the extent of these estimates were less than one for all the countries in the sample, with an average of around 57%. A 10% depreciation of exchange rate in the GCC countries will increase inflation in the long-run by 5.7%.

Furthermore, the estimated significant magnitude of pass-through using VECM was further confirmed by utilizing the results of the impulse response functions and the variance decompositions of the VAR model. The analysis of the impulse response functions illustrated low persistent inflationary effects from changes in the nominal exchange rates of the GCC countries. On the other hand, the analysis of the variance decompositions showed that variations in the consumer price index are, in the main, explained by its own innovations, in all four countries, followed by changes in exchange rates that explain around one quarter during the first year and increase to around one third percent in two years[173].

In the second part, as in chapter five, the VEC technique was used again to estimate an augmented version of the price level model that was estimated in the previous two attempts. Basically, we have added variables that represent the role of demand policies in general and fiscal policy, in particular, in effecting the extent of pass-through following changes in the exchange rate. Based on the work of Parsley and Popper (1998), the recent inflationary effect of exchange rate depreciation in the GCC countries during the period of our review (2000-2008) is believed to have been reinforced or sustained through higher money growth, that in turn was triggered by expansionary fiscal policies because of higher oil wealth, and to some extent, by the pegged exchange rate system.

[173] This result is comparable to the one reported by McCarthy (1999), who used the VAR model in investigating the pass-through of exchange rate in a set of nine industrial countries. From his variance decomposition analysis, McCarthy found changes in exchange rate to account for about 5 to 30 percent of the variations in consumer prices.

After taking into account the actions of the fiscal and monetary policies, the estimated coefficients of exchange rate are significantly lower in all the sampled GCC countries, than the estimated ones in the second attempts using the same technique, co-integrated VAR. Average ERPT in the log-run is now around 23%, which is more or less similar to the average amount (27%) that we estimated in chapter three based on the single equation method. Moreover, the variance decomposition analysis indicated that variations in the price level index are explained by its owned lags, followed by variables representing demand policies, respectively, with a negligible role for changes in exchange rates.

2.2 Implications

Based on the estimated results of chapter five, which included a more or less complete model for the price level compared to the model of chapter three and four, an average exchange rate pass-through of around 23% indicates that depreciation in nominal effective exchange rates have a significant impact on inflation in the GCC economies in the long-run. Depreciation of 10% in exchange rate will results in an average of around 2.3% increase in the price level of the GCC countries in the long-run. Moreover, the fact that in absolute terms, the extent of pass-through is far less than one, suggests the rejection of the PPP theory in these countries' . Furthermore, an average long-run pass-through of around 23% is considered moderate, and does not signify high risk from fluctuations in the foreign exchange market for domestic prices. In other words, the volatility of exchange rates of the currencies of GCC countries does not necessitate the adjustment of the money supply in these economies, hence indicating the viability of the existing pegged regime. The results of the pass-through also indicate more freedom for monetary authorities in the GCC countries to pursue their main macroeconomic goals, without external disturbances like fluctuations in the exchange rate of their currencies.

Further, the results of chapter five also suggest how important it is to account for the actions of economic policies when studying the relationship between economic variables in oil exporting nations. The important role of fiscal policies in the GCC countries can mainly be attributed to the level of their economic development, and to the pegged exchange rate regime that paralyses their ability to use independent monetary policy to sustain internal stability and growth. Moreover, the recent impact of inflationary depreciation of the exchange rate in the GCC countries was mainly influenced by the actions of expansionary fiscal policies in their economies. Accordingly, to the extent that changes in macroeconomic policies are not properly taken into account, the apparent relationship between exchange rate and inflation rate may be spurious.

3. Summary and implications of the results for chapter seven

3.1 Estimation and Results

The second part of our empirical work forms grounds to test the viability of moving from the single dollar peg to a multilateral basket peg, with regard to the currencies of the GCC countries. The choice of the euro and the US dollar for the basket peg has been based on the OCA theory, that suggests adopting the anchor currency that minimize the sum of bilateral exchange rate fluctuations, weighted by the importance of each trading partner. Accordingly, we suggested a basket of the euro and the US dollar, as these two currencies account for a large share of the GCC economies' international trade and non-trade financial transactions.

The tests in this part of the empirical work were two fold. First we used a structured VAR model to investigate the influence of external shocks like the business cycles in the US and Europe on the economies of the GCC countries. In the second test we examined the likelihood for a long-run business cycle synchronization between the economies of the GCC countries and the US and Europe. With regard to the first test, the analysis of the results of impulse response functions and variance decompositions from the estimated structured VAR model indicated that output in the GCC countries is dominantly influenced by trade shocks, which reflects the large weight of hydrocarbon exports in the GDP of these countries. The results also showed that the GCC countries' output is significantly influenced by shocks from the US and Europe. However, the changes in European output were found to have a higher impact on the GCC economies compared to the impact from changes in output of the US. That in fact reflects the growing trade link between the GCC countries and European countries, and the geographic proximity between the GCC region and Europe, compared to the US.

The tests for the synchronization of business cycles presented some evidence for long-run association between the GCC countries' economies, and those of the US and Europe. Real GDPs and inflation rates in the GCC countries were found to share some significant long-term trends with their counterparts in the US and Europe, indicating that the macro economies of the individual GCC countries and US and Europe are linked over the long-run, lending further support to the proposition of using a dollar-euro basket peg for the currencies of the GCC countries.

3.2 Implications

With regard to global shocks, the results indicate that the business cycles of the individual GCC countries respond more to movements in the output of Europe than to US output . The relatively stronger impact of the European GDP shock on the individual output of the GCC countries reflects the importance of macroeconomic development in Europe on their economies. That in turn can imply that the monetary policies of the GCC countries should be adjusted to economic development in Europe, particularly given the growing significant share of the GCC imports that originate from Europe. Completely neglecting European macroeconomic conditions and continuing to fully account for the US dollar in the form of a dollar pegged exchange rate regime will be costly, and could lead to destabilising economic conditions, as has happened recently. Accordingly, if the GCC countries opted to move toward a more flexible exchange rate regime, to promote the competitiveness of their exports in the form of a basket-based exchange rate regime, it is strongly suggested that they should include the dollar as well as the euro. Such a multilateral based exchange rate arrangement should not only provide higher flexibility but should also help to address other issues like imported inflation.

With respect to business synchronizations tests, the results imply that generally the macro economies of the individual GCC countries and the US and/or Europe are linked together over the long run. That can be taken to suggest that the monetary policy which works for output and inflation in the US may also work in each of the GCC countries. Likewise, a similar implication applies to monetary policy in Europe, in terms of inflation and real GDP and the economies of the GCC countries. This of course does not mean that the economies of the GCC countries and the US and/or Europe do not differ over time. Rather, the results suggest that individual GCC countries and the US and/or Europe do share common trends; however, when the short-run departure occurs, internal common forces will correct the misalignment and push these economies back to their long-run equilibrium.

4. Conclusion and Recommendations

Generally, the results of the pass-through relationship suggest that for the GCC countries importing monetary policy from the United States via the dollar peg to ensure stable domestic inflation is found viable. This is further substantiated by the results from the second part of the empirical work in chapter seven, that presented evidence for synchronized movement (common long-term trends) between the inflation rates in each of the GCC countries and the US. Furthermore, the estimated moderate long-run pass-through of around 23% from exchange rate to domestic CPI inflation of the GCC countries does not reflect a high risk from the existing US dollar peg. In fact it is viewed as indicating or suggesting significant freedom for local monetary authorities in the GCC economies to pursue macroeconomic goals. The moderate estimated amount of pass-through of around 23% suggests that imported inflation has not been the major factor behind recent rising domestic prices. It further confirms the influence of other factors like rising global commodity prices and local bottlenecks due to rapid economic growth form the major causes, a fact that has been also confirmed by the reports of most GCC countries' central banks.

Furthermore, based on the fact that the appropriateness of an exchange rate regime should be based on how it performs over time and not only on how it performs under stress, the single dollar peg will still be viewed as viable. A retrospective analysis shows that macroeconomic conditions in the GCC countries have been stable over the past two decades, even during the periods of dollar fluctuations. Average inflation rates over the past two decades remained on average low and stable in most of these economies, with average inflation ranging between a minimum of around 0.65 in Bahrain to maximum of around 4.77 in Qatar, further signifying the success of the existing monetary policy/regime in maintaining price stability. The pegged regime is also viewed to have helped the GCC countries avoid nominal shocks from geopolitical risks feeding into their economies. Also, during the past two decades, the GCC countries continued to register continuing economic growth, in terms of nominal GDP, from an average of around US 251.3 billion during 1991-2000 to an average of around US 604 billion during 2001-2008, further confirming that the existing pegged exchange rate regime has served its purpose and supported economic performance.

In addition to this more than 50% of the GCC's countries imports and exports are priced in US dollar, which further suggest that it is still worth keeping a stable exchange rate with the US dollar for all the GCC countries. This can be substantiated by the case of Kuwait, which despite its recent movement from the single US dollar peg to a weighted basket of undeclared currencies, continued to maintain a stable link with the US dollar, which reflects that the US dollar has a significant weight in the basket. All in all, the results suggest that continuing to have a strong link with the US dollar in the form of the existing pegged regime is still viewed as a viable choice to ensure credibility of monetary policy and stability of trade, as well as to protect the value of the financial wealth of the GCC countries.

However, from the diversification or growth of non-oil sectors perspective, there might be some adjustment costs or losses for the GCC economies in continuing to peg their currencies with the US dollar. As of 2008, average share of non-oil GDP of total output stood at around 64%, which indicates the success of the diversification effort. However, increasing stable growth (as judged by the standard deviation) in the share of non-oil output to GDP suggests the continuing validity of the existing dollar peg to these economies. On the other hand, the significant share of non-oil sector gives further emphasis on continuing to maintain and carry on policies that ensure the stability and growth of these sectors. The higher influence on GCC countries' output from changes in European output as per the empirical results in chapter seven, suggest that their macroeconomic policies should factor in the monetary policy of the euro area, lending partial support to the proposition of a dollar-euro basket peg as an optimal peg. The case for a dollar-euro basket peg is further recommended if the US dollar continues to depreciate and the GCC economies increase their concern over the stability of non-oil sectors.

Further, it is generally suggested that if the rest of the five GCC countries opted to move toward a more flexible exchange rate regime, they should consider going gradually in this regard, in order to avoid an abrupt change that would disturb the existing market credibility. More specifically, a gradual step by step approach would be recommended, that provides initially a move toward a currency basket, as proposed in chapter seven, to allow for some flexibility. Furthermore, during this phase of flexibility, some steps could be taken to establish the necessary institutional infrastructure to prepare the economy for the subsequent phases (*e.g.* widening of margins) that accompany complete market determination of exchange rate. Preparatory steps could include a deep and liquid foreign exchange rate, the availability of mechanisms to ensure effective management of exchange rate risk, policy for central bank intervention, and strengthened regulations (Iqbal, 2010).

Finally, it should be understood that the exchange rate regime is only one element in the general macroeconomic framework of a country, which means that exchange rate stability alone cannot deliver or guarantee overall internal and external stability. Prerequisite for any exchange rate arrangement to function effectively are sound fiscal and monetary policies (Iqbal, 2010). Therefore, the choice of exchange rate regime also includes the determination of a regime that in combination with other macroeconomic policies, best attains its internal and external goals. The move toward an alternative exchange rate regime including dollar-euro baskets depends on the policy objectives and common preferences of the local authorities of GCC countries. Changing objectives from, for example increased attention to price stability to international competitiveness and growth would entail changing the decision about the choice of exchange rate regime and corresponding macroeconomic policies.

All in all, being attached for decades to the single dollar peg suggests that the rational for the GCC countries to change/de peg should be based on the structural economic basis, not only on movements in foreign exchange markets. Also, an up-ward revaluation is not recommended, given the fact that the remedy from such a strategy is short-lived, and if the same set of circumstances continued into the future, then the process would have to be repeated again, triggering the possibility of speculation attack. An additional reason for not favouring an up-ward revaluation is because the adverse effects from such strategy could be severe and permanent. Revaluation would raise the prices of non-dollar dominated exports in foreign markets, eroding the competitiveness of the economy and dampening the diversification efforts. Also, with strong currencies, imported foreign goods become cheaper, increasing the inflow of imports, which in turn could put high pressure on the balance of payment, and consequently erode the current account surpluses of the GCC countries (Central Bank of Oman 2007, MacDonald, 2010).

Furthermore, a revaluation could also damage the credibility of the monetary policy and increase uncertainty about the value and movement of exchange rate, which would harm investment (including deterrence of foreign investors) and ultimately economic performance. Moreover, a revaluation would not give rise to an independent monetary policy, hence the constraints on independent monetary policy under a pegged exchange rate regime would continue. Any valuation would also entail a loss for the GCC countries in the form of reduction in the value of foreign earnings and assets. That in turn might result in higher volatility in future fiscal revenue and government spending, particularly if revenues from oil decreased, since most current foreign assets are intended to be used in future for financing investment and growth in the GCC economies (Central Bank of Oman, 2007).

Finally, the significant role of fiscal policies indicates that these policies form the key macroeconomic tool in the hands of policy makers in the GCC countries to pursue macroeconomic goals, including the maintenance of a low inflation rate. Furthermore, among suggested solutions for lowering the influence of fiscal policies on the extent of ERPT to domestic prices and inflation in general, is to pursue gradual steps toward domestic development in the economy, since such development is mainly dependant on government spending, the main source of money growth in these economies. Gradual development is particularly stressed during periods of perceived continuous depreciation of currency, like the case of our sample period, in order to avoid any monetary accommodation to depreciation in the exchange rate[174]. Fiscal expansion in the GCC countries also needs to take into account the absorptive capacity of the respective economies, and to avoid triggering supply bottleneck, which will eventually trigger inflationary pressures. This includes attempting to address supply bottlenecks, in order to maintain a low impact from the external sector in general. Addressing a supply bottleneck can be achieved through directing public and private resources towards easing binding capacity constraints, and capitalizing on the generated revenues of oil resources.

[174]Others may argue that this recommendation might be difficult in practice, in particular where oil price is on the rise to offset the effect of depreciation, and the urgency to build and expend physical and social infrastructure, keeping in mind that the GCC countries are still not fully developed in many areas. The concept of opportunity cost comes to mind here.

5. Limitations and Future work

Generally, our work has been constrained by limitations in data. For example, we had to confine our estimation of exchange rate pass-through to only four GCC countries, and neglect the other two, where consistent time series data for the variables of our model were not available. Moreover, our estimation in the first part of the empirical work was focused on the pass-through of exchange rate at aggregate prices. However, consistent time series data on import price indices were not available, and indices for producer prices were only available for one or two countries. Also, we could not extend our aggregate analysis of the pass-through to include different industries in the sampled countries, due to problems of data availability.

Accordingly, future work in the context of the GCC economies could be extended to include analysis of exchange rate pass-through in different industries, an analysis which is deemed important not only for the local authorities but also for firms in the markets. Firms in the market are assumed to utilize information on the extent of exchange rate pass-through to forecast future cash flows and profits, in developing pricing strategies, and in the management of their exchange rate risk (Dobrynskaya and Levando, 2005). Exchange rate risk is considered high in markets/industries with low pass-through of exchange rate at the level of consumer prices. In such industries, the costs of imported goods to the GCC countries' firms, expressed in domestic currencies, will normally rise more in the case of exchange rate depreciation, than the revenue generated from selling the goods in domestic GCC countries' markets, as it is difficult to pass-through the entire change in the exchange rate onto consumer prices. As a result, importers in the GCC countries will lose some of their profits, and be in a situation where they will face difficulties in repaying their outstanding debt, dominated in foreign currency, to the foreign exporter.

Furthermore, the need to analyse pass-through in different industries in the economy also rises, because the government needs, as part of their price stability strategy, to isolate those industries most relevant in protecting the consumption of the poor from fluctuations in exchange rate. Accordingly, in order for the monetary authority to shield the purchasing power of people on a low income from fluctuations in the exchange rate, an idea of the extent of pass-through in the industries most relevant to these people need to be formed.

Also, we focused on studying and analysing the effect and the transmission mechanism of mainly one determinant of exchange rate pass-through, the demand policies. However, given the fact that the literature has identified numerous determinants that may affect the link between exchange rate and domestic CPI inflation, future research in the context of the GCC countries can be extended to include further analysis of other determinants, particularly when data is available. Future work may include analysing whether the pass-through of exchange rate into domestic prices is asymmetric, as suggested by the literature.

The availability of data in the future can also help in improving the empirical work as in chapter seven. For example, availability of consistent time series data for variables like unemployment can further extend our grasp of the full effect of monetary policy imported from the US and Europe, by the form of a suggested common basket peg in the economies of the GCC countries.

Further work could also include the use of simulation methods, based on available data from previous years to further test the behaviour of the exchange rate of the currencies of the GCC countries under a hypothetical US dollar-euro basket peg of currencies, or any other suggested basket of currencies.

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Appendix: 1

A. Common Variables

The four examined GCC countries lack the availability of comparable continuous monthly data on variables like import price index and wholesale price index. Accordingly, we use the import unit values for emerging and developing economies as a proxy for import prices in modelling the pass-through to import prices for all the four members. The monthly time series are provided by the IFS of the IMF, March/2009 (2000 = 100). We also used the wholesale price index of Kuwait (2000 = 100) as a proxy variable for the three examined GCC members.

Price of Oil: Price of the UK Brent is taken as price of oil of the examined GCC members. The monthly time series is taken from the IFS, March/2009. Seasonality is adjusted using the Census X12 program.

Trading Partner CPI: World CPI. Monthly series were obtained from the IFS, 2009, (2000 = 100). Seasonality is adjusted using the Census X12 program.

B. Country-Specific Variables

B1. Bahrain

Nominal Effective Exchange Rate (NEER): The monthly series is obtained from the IFS, March/2009, (2000 = 100). Seasonality is adjusted using the Census X12 program.

*CPI***:** The monthly time series had been estimated by the author by using the PPP formula for the real exchange rate: $REER = (NEER) * P / P*$, where REER stands for the real effective exchange rate (2000 = 100), P^* is the foreign price index, for which World CPI is used as a proxy.

B2. Kuwait

Nominal Effective Exchange Rate (NEER): The monthly series is obtained from the IMF through Mr. Maher Hasan and Mr. Ribeiro Da Silva, who based their measurement on the weight of the Kuwait's trading partners for the period between 2000 and 2007. Seasonality is adjusted using the Census X12 program.

*CPI***:** The monthly series is obtained from the IFS, March/2009, (2000 = 100). Seasonality is adjusted using the Census X12 program.

Wholesale Price Index (WPI): The monthly series is obtained from the IMF March/2009, (2005= 100). Seasonality is adjusted using the Census X12 program.

B3. Oman

Nominal Effective Exchange Rate (NEER): The monthly series is obtained from the IFS, March/2009, (2000 = 100). Seasonality is adjusted using the Census X12 program.

*CPI***:** The monthly series is obtained from the IFS, March/2009, (2000 = 100). Seasonality is adjusted using the Census X12 program.

B4. Saudi Arabia

Nominal Effective Exchange Rate (NEER): The monthly series is obtained from the IFS, March/2009, (2000 = 100). Seasonality is adjusted using the Census X12 program.

*CPI***:** The monthly series is obtained from the IFS, March/2009, (1999 = 100). Seasonality is adjusted using the Census X12 program.

Appendix (2)

Table: 1

Bahrain (2000: 10 2008: 12), Effects of Exchange Rate Changes on Consumer Price Inflation, 99 observations (after adjustment).

Dependent Variable: DLOG(CPI)				
Method: Least Squares				
Sample (adjusted): 2000M10 2008M12				
Included observations: 99 after adjustments				
Newey-West HAC Standard Errors & Covariance (lag truncation=3)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.00	0.00	0.08	0.94
DLOG(CPI), -1	-0.11	0.16	-0.70	0.49
DLOG(CPI), -2	0.26	0.10	2.65	0.01
DLOG(CPI), -3	0.18	0.19	0.93	0.36
DLOG(CPI), -4	0.31	0.12	2.67	0.01
DLOG(CPI), -5	0.34	0.09	3.57	0.00
DLOG(CPI), -6	-0.08	0.12	-0.68	0.50
DLOG(CPI), -7	-0.14	0.09	-1.50	0.14
DLOG(CPI), -8	0.06	0.08	0.78	0.44
DLOG(NEER)	0.01	0.02	0.37	0.71
DLOG(NEER), -1	0.00	0.02	0.26	0.79
DLOG(NEER), -2	0.01	0.01	0.58	0.56
DLOG(NEER), -3	0.02	0.02	0.73	0.47
DLOG(NEER), -4	-0.04	0.03	-1.45	0.15
DLOG(NEER), -5	0.00	0.02	0.02	0.99
DLOG(NEER), -6	0.03	0.02	1.53	0.13
DLOG(NEER), -7	-0.05	0.03	-1.87	0.07
DLOG(NEER), -8	0.05	0.02	2.26	0.03

DLOG(FCPI)	0.17	0.25	0.68	0.50
DLOG(FCPI), -1	-0.28	0.20	-1.37	0.18
DLOG(FCPI), -2	0.09	0.16	0.59	0.55
DLOG(FCPI), -3	-0.11	0.16	-0.67	0.51
DLOG(FCPI), -4	0.36	0.27	1.34	0.19
DLOG(FCPI), -5	0.58	0.27	2.16	0.03
DLOG(FCPI), -6	0.01	0.19	0.06	0.95
DLOG(FCPI), -7	-0.39	0.31	-1.25	0.21
DLOG(FCPI), -8	-0.32	0.25	-1.29	0.20
DLOG(OP)	0.00	0.00	-0.32	0.75
DLOG(OP), -1	0.00	0.00	0.89	0.38
DLOG(OP), -2	0.00	0.00	-0.40	0.69
DLOG(OP), -3	0.00	0.00	1.10	0.28
DLOG(OP), -4	0.00	0.00	-0.39	0.70
DLOG(OP), -5	0.00	0.00	-0.76	0.45
DLOG(OP), -6	-0.01	0.01	-1.47	0.15
DLOG(OP), -7	0.00	0.00	-1.05	0.30
DLOG(OP), -8	0.00	0.00	-0.94	0.35
R-squared	0.60	**Mean dependent var**		0.00
Adjusted R-squared	0.40	**S.D. dependent var**		0.00
S.E. of regression	0.00	**Akaike info criterion**		-9.91
Sum squared resid	0.00	**Schwarz criterion**		-8.96
LM test	0.33	**Prob(F-statistic)**		0.00

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference.

Table: 2

Kuwait (2000: 07 2008: 12), Effects of Exchange Rate Changes on Consumer Price Inflation, 106 observations (after adjustment).

Dependent Variable: DLOG(CPI)				
Method: Least Squares				
Sample (adjusted): 2000M07 2008M09				
Included observations: 99 after adjustments				
Newey-West HAC Standard Errors & Covariance (lag truncation=3)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.00	0.00	-1.66	0.10
DLOG(CPI), -1	0.00	0.10	0.04	0.97
DLOG(CPI), -2	0.05	0.10	0.51	0.61
DLOG(CPI), -3	0.16	0.09	1.75	0.08
DLOG(CPI), -4	0.04	0.12	0.34	0.74
DLOG(CPI), -5	0.11	0.13	0.81	0.42
DLOG(NEER)	0.00	0.05	0.03	0.97
DLOG(NEER), -1	-0.06	0.05	-1.06	0.29
DLOG(NEER), -2	-0.04	0.04	-1.05	0.30
DLOG(NEER), -3	-0.13	0.08	-1.61	0.11
DLOG(NEER), -4	-0.05	0.07	-0.62	0.54
DLOG(NEER), -5	0.07	0.06	1.09	0.28
DLOG(FCPI)	0.01	0.55	0.03	0.98
DLOG(FCPI), -1	1.40	0.69	2.02	0.05
DLOG(FCPI), -2	-0.13	0.52	-0.25	0.80
DLOG(FCPI), -3	0.84	0.50	1.66	0.10
DLOG(FCPI), -4	-1.02	0.65	-1.56	0.12
DLOG(FCPI), -5	0.94	0.56	1.67	0.10
DLOG(OP)	0.00	0.01	0.19	0.85
DLOG(OP), -1	0.00	0.01	-0.64	0.52

DLOG(OP), -2	0.00	0.01	0.39	0.70
DLOG(OP), -3	-0.02	0.01	-1.49	0.14
DLOG(OP), -4	0.01	0.01	0.85	0.40
DLOG(OP), -5	-0.01	0.01	-0.74	0.46
R-squared	0.55	**Mean dependent var**		0.00
Adjusted R-squared	0.45	**S.D. dependent var**		0.01
S.E. of regression	0.00	**Akaike info criterion**		-7.58
Sum squared resid	0.00	**Schwarz criterion**		-6.95
LM test	0.51	**Prob(F-statistic)**		0.13

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference.

Table: 3

Oman (2001: 08 2008: 12), Effects of Exchange Rate Changes on Consumer Price Inflation, 88 observations (after adjustment).

Dependent Variable: DLOG(CPI)				
Method: Least Squares				
Sample (adjusted): 2001M08 2008M11				
Included observations: 88 after adjustments				
Newey-West HAC Standard Errors & Covariance (lag truncation=3)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.00	0.00	0.67	0.50
DLOG(CPI), -1	0.15	0.14	1.07	0.29
DLOG(CPI), -2	0.06	0.13	0.43	0.67
DLOG(CPI), -3	0.27	0.08	3.29	0.00
DLOG(CPI), -4	0.26	0.10	2.55	0.01
DLOG(CPI), -5	0.08	0.11	0.69	0.49
DLOG(CPI), -6	0.24	0.11	2.28	0.03
DLOG(NEER)	-0.06	0.04	-1.29	0.20
DLOG(NEER), -1	0.11	0.03	3.35	0.00
DLOG(NEER), -2	-0.11	0.04	-2.60	0.01
DLOG(NEER), -3	0.03	0.05	0.57	0.57
DLOG(NEER), -4	0.05	0.03	1.43	0.16
DLOG(NEER), -5	-0.16	0.03	-5.11	0.00
DLOG(NEER), -6	0.05	0.04	1.21	0.23
DLOG(FCPI)	0.53	0.32	1.66	0.10
DLOG(FCPI), -1	-0.65	0.26	-2.50	0.02
DLOG(FCPI), -2	-0.02	0.41	-0.05	0.96
DLOG(FCPI), -3	-0.88	0.34	-2.62	0.01
DLOG(FCPI), -4	0.33	0.35	0.96	0.34
DLOG(FCPI), -5	-0.31	0.28	-1.09	0.28
DLOG(FCPI), -6	0.44	0.28	1.60	0.12

DLOG(OP)	0.00	0.00	-0.67	0.51
DLOG(OP), -1	0.00	0.01	0.34	0.74
DLOG(OP), -2	-0.01	0.01	-1.48	0.15
DLOG(OP), -3	0.03	0.01	4.22	0.00
DLOG(OP), -4	0.00	0.01	0.37	0.71
DLOG(OP), -5	0.00	0.00	-0.19	0.85
DLOG(OP), -6	0.00	0.01	-0.95	0.35
R-squared	0.76	**Mean dependent var**		0.00
Adjusted R-squared	0.66	**S.D. dependent var**		0.00
S.E. of regression	0.00	**Akaike info criterion**		-8.77
Sum squared resid	0.00	**Schwarz criterion**		-7.98
LM test	0.30	**Prob(F-statistic)**		0.00

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference.

Table: 4

Saudi Arabia (2000: 08 2008: 12), Effects of Exchange Rate Changes on Consumer Price Inflation, 100 observations (after adjustment).

Dependent Variable: DLOG(CPI)				
Method: Least Squares				
Sample (adjusted): 2000M08 2008M11				
Included observations: 100 after adjustments				
Newey-West HAC Standard Errors & Covariance (lag truncation=4)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.00	0.00	-1.29	0.20
DLOG(CPI), -1	0.19	0.14	1.35	0.18
DLOG(CPI), -2	0.18	0.09	2.11	0.04
DLOG(CPI), -3	0.23	0.16	1.49	0.14
DLOG(CPI), -4	-0.08	0.16	-0.51	0.61
DLOG(CPI), -5	-0.23	0.14	-1.61	0.11
DLOG(CPI), -6	0.41	0.16	2.62	0.01

DLOG(NEER)	-0.02	0.02	-0.83	0.41
DLOG(NEER), -1	-0.02	0.02	-0.72	0.47
DLOG(NEER), -2	0.00	0.03	-0.10	0.92
DLOG(NEER), -3	0.00	0.02	0.02	0.99
DLOG(NEER), -4	-0.04	0.02	-1.66	0.10
DLOG(NEER), -5	0.00	0.03	-0.11	0.91
DLOG(NEER), -6	-0.01	0.02	-0.36	0.72
DLOG(FCPI)	0.08	0.29	0.28	0.78
DLOG(FCPI), -1	0.48	0.22	2.15	0.03
DLOG(FCPI), -2	0.09	0.27	0.32	0.75
DLOG(FCPI), -3	0.01	0.29	0.04	0.97
DLOG(FCPI), -4	-0.29	0.29	-1.01	0.32
DLOG(FCPI), -5	0.45	0.25	1.81	0.08
DLOG(FCPI), -6	0.01	0.33	0.04	0.97
DLOG(OP)	0.00	0.01	-0.24	0.81
DLOG(OP), -1	0.00	0.00	-0.53	0.60
DLOG(OP), -2	0.00	0.00	0.38	0.70
DLOG(OP), -3	0.00	0.00	-0.79	0.43
DLOG(OP), -4	0.00	0.00	0.46	0.65
DLOG(OP), -5	0.00	0.00	0.31	0.76
DLOG(OP), -6	0.00	0.00	-1.22	0.22
R-squared	0.62	**Mean dependent var**		0.00
Adjusted R-squared	0.52	**S.D. dependent var**		0.00
S.E. of regression	0.00	**Akaike info criterion**		-8.78
Sum squared resid	0.00	**Schwarz criterion**		-8.05
LM test	0.21	**Prob(F-statistic)**		0.00

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference.

Appendix (3)

Table: 1

Bahrain: VECM

Vector Error Correction Estimates Sample (adjusted): 2000M10 2008M12 Included observations: 105 after adjustments t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1			
LOG(NEER(-1))	0.54			
	[3.34418]			
LOG(FCPI(-1))	0.21			
	[1.11432]			
LOG(OP(-1))	-0.10			
	[-2.88365]			
C	-7.77			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.02	-0.06	-0.01	0.67
	[3.16510]	[-1.56538]	[-1.12440]	[1.91585]
D(LOG(CPI(-1)))	-0.13	-0.96	-0.02	-6.45
	[-1.33335]	[-1.64898]	[-0.28643]	[-1.25492]
D(LOG(CPI(-2)))	0.22	0.63	0.09	-5.55
	[2.24739]	[1.09521]	[1.16532]	[-1.09833]
D(LOG(NEER(-1)))	-0.02	0.38	-0.01	-1.50
	[-0.87269]	[3.53909]	[-0.69271]	[-1.59413]
D(LOG(NEER(-2)))	0.00	-0.17	0.00	-0.45
	[0.27739]	[-1.67214]	[-0.30558]	[-0.49113]
D(LOG(FCPI(-1)))	-0.23	-0.34	0.22	1.03

	[-1.24825]	[-0.30593]	[1.51360]	[0.10627]
D(LOG(FCPI(-2)))	0.39	0.29	0.08	7.45
	[2.28394]	[0.28973]	[0.63663]	[0.84656]
D(LOG(OP(-1)))	0.00	-0.01	0.01	0.16
	[1.03930]	[-0.36008]	[3.99952]	[1.13288]
D(LOG(OP(-2)))	0.00	-0.01	0.00	-0.08
	[-0.50474]	[-0.87348]	[0.49762]	[-0.62389]
C	0.00	0.00	0.00	0.00
	[1.35420]	[0.07060]	[3.79190]	[-0.04938]
WD	0.00	0.00	0.00	-0.03
	[-0.41145]	[-0.83691]	[-0.37501]	[-0.95377]
R-squared	0.31	0.26	0.46	0.11
Adj. R-squared	0.23	0.18	0.40	0.01
Sum sq. resids	0.00	0.01	0.00	0.80
S.E. equation	0.00	0.01	0.00	0.09
F-statistic	4.14	3.34	7.85	1.13
Akaike AIC	-9.72	-6.19	-10.23	-1.83
Schwarz SC	-9.44	-5.91	-9.96	-1.55
Mean dependent	0.00	0.00	0.00	0.00
S.D. dependent	0.00	0.01	0.00	0.09

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 2

Kuwait: VECM

Vector Error Correction Estimates				
Sample (adjusted): 2000M07 2008M09				
Included observations: 99 after adjustments				
t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1.00			
LOG(NEER(-1))	-0.57			
	[-3.27524]			
LOG(FCPI(-1))	-0.78			
	[-4.52561]			
LOG(OP(-1))	-0.01			
	[-0.20080]			
C	1.68			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.06	0.09	0.01	0.40
	[2.87220]	[2.45218]	[2.87679]	[1.24311]
D(LOG(CP(-1)))	-0.14	0.27	-0.01	-0.97
	[-1.36864]	[1.38905]	[-0.36201]	[-0.57904]
D(LOG(NEER(-1)))	-0.02	0.07	0.01	0.58
	[-0.48262]	[0.67212]	[0.89267]	[0.67847]
D(LOG(FCPI(-1)))	0.82	-1.09	0.13	-17.27
	[1.96451]	[-1.38115]	[1.30093]	[-2.50697]
D(LOG(OP(-1)))	0.00	0.00	0.01	0.09
	[0.02498]	[-0.25744]	[4.06203]	[0.78877]
	0.00	0.00	0.00	0.07
C	[0.60584]	[1.26795]	[7.65191]	[2.99228]

WD	0.00	0.00	0.00	-0.01
	[-0.87305]	[-1.53823]	[-0.39350]	[-0.45049]
R-squared	0.35	0.18	0.33	0.07
Adj. R-squared	0.26	0.13	0.29	0.02
Sum sq. resids	0.00	0.01	0.00	0.63
S.E. equation	0.00	0.01	0.00	0.08
F-statistic	3.86	3.46	7.99	1.29
Akaike AIC	-7.74	-6.46	-10.52	-2.12
Schwarz SC	-7.56	-6.28	-10.34	-1.95
Mean dependent	0.00	0.00	0.00	0.01
S.D. dependent	0.01	0.01	0.00	0.08

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 3

Oman VECM

Vector Error Correction Estimates				
Sample (adjusted): 2001M08 2008M11				
Included observations: 99 after adjustments				
t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1			
LOG(NEER(-1))	0.54			
	[1.78231]			
LOG(FCPI(-1))	1.47			
	[3.12265]			
LOG(OP(-1))	-0.05			
	[-0.89034]			
C	-13.92			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.02	0.01	-0.01	-1.00
	[1.59238]	[0.21286]	[-3.55695]	[-3.24899]
D(LOG(CPI(-1)))	-0.04	-0.57	0.18	9.55
	[-0.29131]	[-1.45953]	[3.98733]	[2.81775]
D(LOG(CPI(-2)))	0.04	-0.73	0.22	11.59
	[0.33979]	[-1.83380]	[4.65521]	[3.37700]
D(LOG(CPI(-3)))	0.27	-0.38	0.15	8.29
	[1.82243]	[-0.84216]	[2.84077]	[2.11511]
D(LOG(CPI(-4)))	0.01	-0.21	0.09	4.65
	[0.06690]	[-0.44441]	[1.54850]	[1.13638]
D(LOG(CPI(-5)))	0.03	0.48	0.06	4.89
	[0.20621]	[1.02999]	[1.06745]	[1.22005]

D(LOG(CPI(-6)))	-0.10	0.63	-0.09	-0.36
	[-0.71258]	[1.45207]	[-1.76362]	[-0.09480]
D(LOG(CPI(-7)))	-0.14	0.15	0.08	8.26
	[-1.02655]	[0.36666]	[1.52071]	[2.26400]
D(LOG(NEER(-1)))	0.05	0.23	0.00	0.00
	[1.26321]	[1.89211]	[-0.23319]	[-0.00303]
D(LOG(NEER(-2)))	-0.08	-0.02	0.00	-0.31
	[-1.98416]	[-0.17127]	[0.07076]	[-0.28487]
D(LOG(NEER(-3)))	0.00	-0.13	-0.01	0.00
	[0.11441]	[-1.02761]	[-0.52269]	[0.00184]
D(LOG(NEER(-4)))	-0.05	0.11	-0.02	-0.51
	[-1.26280]	[1.00166]	[-1.78670]	[-0.51507]
D(LOG(NEER(-5)))	-0.05	-0.01	0.01	0.04
	[-1.39812]	[-0.09450]	[0.61063]	[0.04374]
D(LOG(NEER(-6)))	-0.03	-0.09	0.01	0.62
	[-0.75769]	[-0.76877]	[0.70671]	[0.62882]
D(LOG(NEER(-7)))	0.00	-0.17	0.00	-2.12
	[0.00958]	[-1.56146]	[0.01328]	[-2.22071]
D(LOG(FCPI(-1)))	-0.19	0.51	0.07	-6.69
	[-0.45988]	[0.40922]	[0.49900]	[-0.62024]
D(LOG(FCPI(-2)))	0.18	2.00	-0.01	0.73
	[0.46016]	[1.66250]	[-0.10627]	[0.06994]
D(LOG(FCPI(-3)))	-0.17	0.35	-0.03	-25.09
	[-0.43506]	[0.30268]	[-0.19695]	[-2.47602]
D(LOG(FCPI(-4)))	0.03	-1.00	0.01	2.36
	[0.08857]	[-0.86145]	[0.10615]	[0.23403]
D(LOG(FCPI(-5)))	0.02	0.29	-0.29	-27.66
	[0.05947]	[0.25834]	[-2.18957]	[-2.81406]
D(LOG(FCPI(-6)))	0.88	0.52	0.18	-2.33
	[2.45448]	[0.47662]	[1.38755]	[-0.24804]
D(LOG(FCPI(-7)))	0.06	0.94	-0.12	-18.79
	[0.16810]	[0.89081]	[-0.96418]	[-2.05085]

D(LOG(OP(-1)))	0.00	0.00	0.01	0.03
	[0.68918]	[0.09087]	[4.42274]	[0.24194]
D(LOG(OP(-2)))	0.00	-0.04	0.00	-0.21
	[0.31860]	[-1.94694]	[0.95531]	[-1.36556]
D(LOG(OP(-3)))	0.01	-0.04	0.00	0.22
	[2.33101]	[-2.32528]	[0.69684]	[1.41423]
D(LOG(OP(-4)))	0.01	-0.03	0.00	-0.04
	[1.20766]	[-1.49087]	[-0.21439]	[-0.27418]
D(LOG(OP(-5)))	0.00	0.02	0.00	0.13
	[0.49725]	[1.14604]	[-0.55350]	[0.81529]
D(LOG(OP(-6)))	-0.02	0.02	0.00	-0.10
	[-3.18354]	[0.92795]	[-1.51995]	[-0.65266]
D(LOG(OP(-7)))	0.00	0.00	0.00	0.22
	[-0.73922]	[-0.26434]	[0.96691]	[1.45329]
C	0.00	-0.01	0.00	0.14
	[-0.21537]	[-1.47826]	[2.79917]	[2.73229]
WD	0.00	-0.01	0.00	-0.03
	[-1.15740]	[-2.18861]	[-0.87475]	[-1.13939]
R-squared	0.71	0.41	0.73	0.48
Adj. R-squared	0.59	0.15	0.61	0.26
Sum sq. resids	0.00	0.01	0.00	0.40
S.E. equation	0.00	0.01	0.00	0.08
F-statistic	5.61	1.58	6.10	2.13
Akaike AIC	-8.59	-6.36	-10.65	-2.04
Schwarz SC	-7.77	-5.55	-9.83	-1.23
Mean dependent	0.00	0.00	0.00	0.01
S.D. dependent	0.00	0.01	0.00	0.09

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 4

Saudi Arabia: VECM

Vector Error Correction Estimates				
Sample (adjusted): 2000M08 2008M11				
Included observations: 103 after adjustments				
t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1.00			
LOG(NEER(-1))	0.65			
	[3.97921]			
LOG(FCPI(-1))	0.58			
	[2.86467]			
LOG(OP(-1))	0.02			
	[0.51508]			
C	-10.40			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.02	0.02	-0.02	-1.54
	[1.84397]	[0.58367]	[-4.93025]	[-5.53679]
D(LOG(CPI(-1)))	0.03	-0.06	0.10	6.88
	[0.25170]	[-0.13561]	[2.06870]	[2.07184]
D(LOG(CPI(-2)))	0.10	-0.04	0.12	10.77
	[0.84476]	[-0.07082]	[2.24367]	[3.08142]
D(LOG(CPI(-3)))	0.19	-0.42	0.20	12.07
	[1.51216]	[-0.81253]	[3.60311]	[3.33256]
D(LOG(NEER(-1)))	-0.04	0.29	-0.01	-0.63
	[-1.48784]	[2.68883]	[-0.64340]	[-0.82335]
D(LOG(NEER(-2)))	-0.03	-0.06	0.02	0.83
	[-0.97830]	[-0.53959]	[1.34592]	[1.05298]
D(LOG(NEER(-3)))	-0.01	0.01	-0.01	-0.04

	[-0.40335]	[0.12827]	[-0.70353]	[-0.04722]
D(LOG(FCPI(-1)))	0.43	-0.65	0.24	-6.56
	[1.49503]	[-0.56378]	[1.96975]	[-0.80656]
D(LOG(FCPI(-2)))	-0.04	2.82	0.06	2.23
	[-0.15148]	[2.36766]	[0.45199]	[0.26761]
D(LOG(FCPI(-3)))	0.29	-0.91	0.20	-1.55
	[1.09003]	[-0.84595]	[1.78584]	[-0.20558]
D(LOG(OP(-1)))	0.00	-0.01	0.01	-0.04
	[0.51564]	[-0.59125]	[3.10633]	[-0.33353]
D(LOG(OP(-2)))	0.00	-0.03	0.00	-0.12
	[-0.55986]	[-1.54181]	[0.57162]	[-0.89793]
D(LOG(OP(-3)))	0.00	-0.03	0.00	0.06
	[-0.45551]	[-1.68110]	[-0.41819]	[0.50110]
C	0.00	0.00	0.00	-0.02
	[-0.75683]	[-0.46392]	[1.61354]	[-0.48905]
WD	0.00	-0.01	0.00	-0.04
	[-0.46546]	[-1.43080]	[-1.59113]	[-1.56119]
R-squared	0.52	0.23	0.54	0.32
Adj. R-squared	0.45	0.11	0.47	0.21
Sum sq. resids	0.00	0.01	0.00	0.55
S.E. equation	0.00	0.01	0.00	0.08
F-statistic	6.85	1.88	7.50	2.90
Akaike AIC	-8.79	-6.00	-10.50	-2.11
Schwarz SC	-8.41	-5.62	-10.11	-1.72
Mean dependent	0.00	0.00	0.00	0.01
S.D. dependent	0.00	0.01	0.00	0.09

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 5

Residual Serial Correlation LM Tests

Lags	**Country**							
	Bahrain		**Kuwait**		**Oman**		**Saudi Arabia**	
	LM-Statistics	P-Value	LM-Statistics	P-Value	LM-Statistics	P-Value	LM-Statistics	P-Value
1	21.71	0.15	14.23	0.58	23.00	0.11	22.79	0.12
2	22.87	0.12	19.76	0.23	13.71	0.62	24.48	0.08
3	16.21	0.44	14.09	0.59	8.83	0.92	18.11	0.32
4	15.00	0.52	23.74	0.10	19.99	0.22	21.17	0.17
5	18.01	0.32	11.82	0.76	14.91	0.53	21.46	0.16
6	13.05	0.67	12.20	0.73	20.90	0.18	13.89	0.61
7	26.04	0.05	21.46	0.16	18.85	0.28	25.22	0.07
8	12.45	0.71	12.13	0.73	18.76	0.28	13.27	0.65
9	12.09	0.74	11.95	0.75	22.79	0.12	15.80	0.47
10	15.98	0.45	17.55	0.35	14.01	0.60	18.01	0.32
11	19.65	0.24	12.73	0.69	17.35	0.36	11.32	0.79
12	24.50	0.08	19.43	0.25	23.74	0.10	17.63	0.35

Table: 6

Normality Test Joint (Jarque-Bera)

Country							
Bahrain		Kuwait		Oman		Saudi Arabia	
Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value
192.95	0.00	71.58	0.07	62.65	0.22	52.12	0.59

Table: 7

Heteroscedasticity Tests

Country							
Bahrain		Kuwait		Oman		Saudi Arabia	
Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value
500	0.40	132.51	0.07	595.12	0.43	299.66	0.10

Appendix: (4)

Table: 1

Unit Root Tests

Country	**ADF**		**PP**		**Integration**
	Constant	Trend	Constant	Trend	
Bahrain					
LCPI	(0) -2.89**	(0) -0.02	(6) -2.39	(6) -0.29	I(1)
DLCPI	(4) -1.92	(0) -12.36***	(7) -11.98***	(6) -12.34***	I(0)
LNEER	(1) -1.02	(1) -2.67	(4) -0.87	(4) -2.41	I(1)
DLNEER	(0) -7.07***	(0) -7.04***	(0) -7.08***	(0) -7.04***	I(0)
LDC	(0) -2.05	(0) -2.98	(0) -2.05	(0) -2.98	I(1)
DLDC	(1) -2.76**	(1) -2.29	(0) -1.12	(0) -0.71	I(1)
LEXP	(2) 0.47	(2)-2.05	(5) -0.54	(5) -4.14	I(1)
DLEXP	(1) -11.12***	(1) -11.21***	(2) -18.7***	(4) -19.33***	I(0)
Kuwait					
LCPI	(0) 4.35	(0) 1.23	(6) 5.34	(5) 1.76	I(1)
DLCPI	(0) -9.80	(0) -11.13***	(6) -10.17***	(2) -11.08***	I(0)
LNEER	(0) -1.30	(1) -2.46	(3) -1.38	(3) -2.28	I(1)
DLNEER	(0) -8.02***	(0) -7.98***	(2) -7.96***	(2) -7.62***	I(0)
LDC	(2) 0.62	(4) -3.19*	(7) 1.34	(7) -2.02	I(1)
DLDC	(1) -4.28***	(1) -4.46***	(8) -10.19***	(1) -10.33***	I(0)
LGV	(2) 0.59	(0) -4.07	(5) -1.93	(13) -1.12	I(1)
DLGV	(1) -12.05***	(1) -12.02***	(43) -41.19***	(38) -48.60***	I(0)
Oman					

LCPI	(0) 9.33	(0) 2.94	(3) 8.82	(2) 3.05	I(1)
DLCPI	(4) -1.02	(0) -8.60***	(5) -5.65***	(5) -8.90***	I(0)
LNEER	(1) -0.97	(1) -2.57	(4) -0.87	(4) -2.56	I(1)
DLNEER	(0) -7.83***	(0) -7.80***	(2) -7.82***	(2) -7.79***	I(0)
LDC	(1) -3.55***	(2) -3.63**	(1) -2.71*	(2) -2.35	I(0)
LGV	(0) -1.95	(0) -1.37	(2) -1.89	(2) -1.33	I(1)
DLGV	(0) -5.76***	(0) -5.77***	(2) -5.85***	(3) -6.11***	I(0)
Saudi Arabia					
LCPI	(0) 8.17	(0) 2.70	(6) 6.09	(5) 2.16	I(1)
DLCPI	(5) -1.39	(5) -2.09	(7) -6.65***	(7) -9.42***	I(0)
LNEER	(1) -0.98	(1) -2.77	(4) -0.90	(4) -2.66	I(1)
DLNEER	(0) -7.48***	(0) -7.44***	(1) -7.48***	(1) -7.46***	I(0)
LDC	(3) 1.38	(1) 5.65	(1) 3.38	(6) 5.35	I(1)
DLDC	(2) -1.44	(2) -2.45	(7) -22.63***	(7) -20.95***	I(0)
LEXP	(0) -0.56	(0) -2.23	(4) -0.54	(5) -2.29	I(1)
DLEXP	(0) -12.47***	(0) -12.42***	(5) -12.26***	(5) -12.21***	I(0)
Common Var.					
LFCPI	(1) -0.51	(1) -2.96	(5) -0.13	(5) -2.21	I(1)
DLFCPI	(0) -4.57***	(0) -4.52***	(4) -4.71***	(4) -4.66***	I(0)
LOP	(1) -1.26	(1) -1.84	(4) -1.29	(4) -1.86	I(1)
DLOP	(0) -8.26***	(0) -8.25***	(3) -8.31***	(3) -8.30***	I(0)

Note: Figures in brackets next to statistics represent number of lags in the test, CPI = Consumer Price Index, NEER = Nominal Effective Exchange rate, DC = Domestic Credit, EXP = oil Exports, GV = Government Expenditure, Op = Oil Price, FCPI = Trading partner consumer price index, L = Log form, D = first difference, *, **, *** denotes significance at 10%, 5%, and 1% levels respectively.

Appendix (5)

Co-integration

We started to test for co-integration in model (5) without variables for demand policies using Johansen procedure[175]. This test suggest a maximum likelihood estimation procedure that provides two test statistics (maximal eigenvalue statistic and trace statistic) for determining the number of cointegrating vectors as well as estimate of all cointegrating vectors that could exit among a group of variables. Furthermore, the Johansen test specifies three models; 1) non-trended variables, which presume that there is no linear trend in the level and the underlying data generating process;2) trended variables, no trend in the data generating process, which presume that all level variables have deterministic trend; 3) trended variables, trend in the underlying data generating process, which presume that variables as well as the underlying data generating process have deterministic trend (Asteriou and Hall, 2007). Nonetheless, giving the fact that our variables show rising trends, the relevant models are 2 and 3. Johansen (1992) suggest the use of the so-called Pantula principle to decide on one of the models to use for testing for cointegration.

We relied on several information criterion for deciding on the optimal lag length for the explanatory variables. The primary objective from selecting an optimal lag length in order to come up with a model that features good diagnostic results in terms of *e.g.* autocorrelation, heteroscedasticity, and normality. By taking into account the above information, the optimal lag length for the countries of our sample ranged between one (for Kuwait) to seven lags (Oman).

The optimal error correction model is linear with intercept and no trend for all the four countries in our sample (model 5). The results for the cointegration test for the models of the four countries are

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[175] Another method for testing for co-integration was introduced by Engle and Granger (1987). This approach relies on looking for cointegration by testing weather the residuals from the long run relationship is stationary. However, despite its simplicity, this way is found to suffer from number of weakness. For example, this approach does not say anything about which of the variables can be used as regressor and why. Another weakness is that in the case of more than two variables in the system, E&G approach does not give the number of cointegrating vectors. One last weakness is that it basically relies on two-step estimator, so if any error was made in the first step it will be carried out into the second step (Asteriou and Hall, 2007).

presented in table (A1). The table shows the LR test based on trace statistics and maximal eigenvalue statistic. Both tests generally suggest the rejection of no co-integration in all models for the four countries. Specifically, the trace statistics indicates the rejection of the null hypothesis of zero co-integration for Bahrain, Oman, Kuwait, and Saudi Arabia. However, the maximal eigenvalue statistics indicated the rejection of zero co-integration only in Bahrain and Saudi Arabia, but it failed to report any co-integration in case of Kuwait and Oman. Based on both test we could conclude that there appear to be one co-integration for all the countries and that testing for more than one co-integration is highly rejected by both tests.

Table: 1

Co-integration Tests

Johansen Maximum Likelihood Procedure (Trended case, No trend in DGP)					
Cointegration LR Test Based on Trace Statistic					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	67.46* (47.86)	57.87* (47.86)	61.16* (47.86)	78.19* (47.86)
1	2	21.25 (29.80)	23.77 (29.80)	24.80 (29.80)	29.0 (29.80)
2	3	10.98 (15.50)	12.61 (15.50)	14.46 (15.50)	14.57 (15.50)
3	4	0.01 (3.84)	2.97 (3.84)	4.60 (3.84)	2.16 (3.84)
Cointegration LR Test Based on Maximal Eigenvalue Statistic					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	36.20* (27.58)	24.10 (27.58)	26.36 (27.58)	39.01* (27.58)
1	2	20.27 (21.13)	21.16 (21.13)	18.34 (21.13)	19.72 (21.12)

2	3	10.98 (14.26)	9.64 (14.26)	11.90 (14.26)	13.42 (14.26)
3	4	0.01 (3.84)	2.97 (3.84)	4.58 (3.84)	2.16 (3.84)

Note: * donates the rejection of the null hypothesis of no cointegration between the variables under 5% level of significance. Critical values are in brackets.

The Johansen procedure was repeated for model (5), however this time by including variables representing monetary policy, namely domestic credit. The optimal lag length is one for Bahrain, nine for Kuwait, six for Oman, and four for Saudi Arabia. The optimal model is linear with intercept for Bahrain and Kuwait, and linear with intercept and trend for Oman and Saudi Arabia. The results for the co-integration tests are presented in table A2. The trace statistics have rejected the null of no co-integration and have revealed the presence of two co-integrations for Bahrain, Kuwait and Saudi Arabia. However, based on the maximal eigenvalue statistics there appear to be only one co-integrating vector for each countries.

Table: 2

Co-integration Tests

Johansen Maximum Likelihood Procedure **Co-integration LR Test Based on Trace Statistic**					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	115.46*	112.32*	128.04*	125.10*
		(69.82)	(69.82)	(88.80)	(88.80)
1	2	66.21*	62.52*	57.54	83.71*
		(47.86)	(47.86)	(63.88)	(63.88)
2	3	25.02	22.19	51.81	40.72
		(29.80)	(29.80)	(42.92)	(42.92)

3	4	9.89	11.10	27.33	23.82
		(15.49)	(15.49)	(25.87)	(25.87)
4	5	0.00	1.80	13.56	5.83
		(3.84)	(3.84)	(12.52)	(12.52)
Co-integration LR Test Based on Maximal Eigenvalue Statistic					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	49.25*	49.81*	50.51*	41.39*
		(33.88)	(33.88)	(38.33)	(38.33)
1	2	21.19	20.32	25.72	28.99
		(27.58)	(27.58)	(32.12)	(32.12)
2	3	25.14	21.09	24.48	20.90
		(21.13)	(21.13)	(25.82)	(25.82)
3	4	9.88	9.30	13.77	17.99
		(14.26)	(14.26)	(19.39)	(19.39)
4	5	0.00	1.80	13.56	5.83
		(3.84)	(3.84)	(12.52)	(12.52)

Note: * donates the rejection of the null hypothesis of no cointegration between the variables under 5% level of significance. Critical values are in brackets.

Again we repeated the co-integration tests but this time by replacing domestic credit variable for monetary policy with the government spending variable for fiscal policy. The optimal lag length is found to be two for Bahrain and Oman, three for Kuwait, and five for Saudi Arabia. The optimal model is linear with intercept for Bahrain, Oman, and Saudi Arabia, and linear with intercept and trend for Kuwait. Table A3 summarizes the results of the co-integration tests. Based on the trace statistics, there appear to exist two co-integrating vectors in Bahrain, Oman, and Saudi Arabia, and only one co-integration in Kuwait. On the other hand, based on the maximal eigenvalue statistics there appear to be no co-integration between the variables in Kuwait and only one co-integration in the rest of countries

Table: 3

Co-integration Tests

Johansen Maximum Likelihood Procedure Co-integration LR Test Based on Trace Statistic					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	103.22*	108.33*	129.35*	121.33*
		(69.82)	(88.80)	(69.82)	(69.82)
1	2	60.04*	60.48	67.88*	65.89*
		(47.86)	63.87	(47.86)	(47.86)
2	3	28.63	34.76	23.17	24.10
		(29.80)	42.62	(29.80)	(29.80)
3	4	16.14	15.36	10.03	14.13
		(15.49)	25.87	(15.49)	(15.49)
4	5	6.11	6.69	0.68	6.73
		(3.84)	12.52	(3.84)	(3.84)
Co-integration LR Test Based on Maximal Eigenvalue Statistic					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	43.18*	31.85	61.46*	55.45*
		(33.88)	(38.33)	(33.88)	(33.88)
1	2	21.40	31.72	24.71	21.79
		(27.58)	(32.12)	(27.58)	(27.58)
2	3	12.49	19.40	23.14	19.98
		(21.13)	(25.82)	(21.13)	(21.13)
3	4	10.03	8.67	9.35	7.39
		(14.26)	(19.39)	(14.26)	(14.26)
4	5	6.11	6.69	0.68	6.73
		(3.84)	(12.52)	(3.84)	(3.84)

Note: * donates the rejection of the null hypothesis of no cointegration between the variables under 5% level of significance. Critical values are in brackets.

Finally, the co-integration tests were carried out by including both domestic credit variable and government spending variable in model (5). The optimal lag length is two for Bahrain, three for Kuwait, six for Oman, and five for Saudi Arabia. The optimal Johansen model is linear with intercept for Kuwait, and linear with intercept and trend for the rest of the sample. The results for the co-integrating tests are given in table A4. The results from both the co-integration tests are more or less identical. Both tests (trace statistics and maximal eigenvalue statistics) have identified only one co-integrating vector for Bahrain, Kuwait, and Oman. However, in the case of Saudi Arabia, the trace statistics has revealed two co-integrating vectors, but the maximal eigenvalue statistics has identified only one co-integration.

Table: 4

Co-integration Tests

Johansen Maximum Likelihood Procedure Cointegration LR Test Based on Trace Statistic					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	151.59*	117.61*	152.61*	159.21*
		(117.71)	(95.75)	(117.71)	(117.71)
1	2	83.04	68.40	70.07	104.70*
		(88.80)	(69.82)	(88.80)	(88.80)
2	3	58.84	35.72	59.24	60.65
		(63.88)	(47.86)	(63.88)	(63.88)
3	4	34.82	20.57	42.77	37.25
		(42.92)	(29.80)	(42.92)	(42.92)
4	5	19.88	9.80	25.03	19.07
		(25.87)	(15.49)	(25.87)	(25.87)
5	6	6.86	2.02	10.82	6.70

		(12.52)	(3.84)	(12.52)	(12.52)
Co-integration LR Test Based on Maximal Eigenvalue Statistic					
Null	**Alter**	**Bahrain**	**Kuwait**	**Oman**	**Saudi Arabia**
0	1	58.55*	49.21*	52.54*	54.50*
		(44.50)	(40.08)	(44.50)	(44.50)
1	2	34.21	32.69	30.83	34.05
		(38.33)	(33.88)	(38.33)	(38.33)
2	3	24.02	15.15	26.48	23.41
		(32.12)	(27.58)	(32.12)	(32.12)
3	4	14.93	10.77	17.73	18.18
		(25.82)	(21.13)	(25.82)	(25.82)
4	5	13.03	7.78	14.21	12.37
		(19.39)	(14.26)	(19.39)	(19.39)
5	6	6.86	2.02	10.82	6.70
		(12.52)	(3.84)	(12.52)	(12.52)

Note: * donates the rejection of the null hypothesis of no cointegration between the variables under 5% level of significance. Critical values are in brackets.

Appendix (6)

Table: 1

Bahrain: VECM

Vector Error Correction Estimates				
Sample (adjusted): 2000M10 2008M12				
Included observations: 105 after adjustments				
t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1			
LOG(NEER(-1))	0.54			
	[3.34418]			
LOG(FCPI(-1))	0.21			
	[1.11432]			
LOG(OP(-1))	-0.10			
	[-2.88365]			
C	-7.77			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.02	-0.06	-0.01	0.67
	[3.16510]	[-1.56538]	[-1.12440]	[1.91585]
D(LOG(CPI(-1)))	-0.13	-0.96	-0.02	-6.45
	[-1.33335]	[-1.64898]	[-0.28643]	[-1.25492]
D(LOG(CPI(-2)))	0.22	0.63	0.09	-5.55
	[2.24739]	[1.09521]	[1.16532]	[-1.09833]
D(LOG(NEER(-1)))	-0.02	0.38	-0.01	-1.50
	[-0.87269]	[3.53909]	[-0.69271]	[-1.59413]
D(LOG(NEER(-2)))	0.00	-0.17	0.00	-0.45

	[0.27739]	[-1.67214]	[-0.30558]	[-0.49113]
D(LOG(FCPI(-1)))	-0.23	-0.34	0.22	1.03
	[-1.24825]	[-0.30593]	[1.51360]	[0.10627]
D(LOG(FCPI(-2)))	0.39	0.29	0.08	7.45
	[2.28394]	[0.28973]	[0.63663]	[0.84656]
D(LOG(OP(-1)))	0.00	-0.01	0.01	0.16
	[1.03930]	[-0.36008]	[3.99952]	[1.13288]
D(LOG(OP(-2)))	0.00	-0.01	0.00	-0.08
	[-0.50474]	[-0.87348]	[0.49762]	[-0.62389]
C	0.00	0.00	0.00	0.00
	[1.35420]	[0.07060]	[3.79190]	[-0.04938]
WD	0.00	0.00	0.00	-0.03
	[-0.41145]	[-0.83691]	[-0.37501]	[-0.95377]
R-squared	0.31	0.26	0.46	0.11
Adj. R-squared	0.23	0.18	0.40	0.01
Sum sq. resids	0.00	0.01	0.00	0.80
S.E. equation	0.00	0.01	0.00	0.09
F-statistic	4.14	3.34	7.85	1.13
Akaike AIC	-9.72	-6.19	-10.23	-1.83
Schwarz SC	-9.44	-5.91	-9.96	-1.55
Mean dependent	0.00	0.00	0.00	0.00
S.D. dependent	0.00	0.01	0.00	0.09

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 2

Kuwait: VECM

Vector Error Correction Estimates				
Sample (adjusted): 2000M07 2008M09				
Included observations: 99 after adjustments				
t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1.00			
LOG(NEER(-1))	-0.57			
	[-3.27524]			
LOG(FCPI(-1))	-0.78			
	[-4.52561]			
LOG(OP(-1))	-0.01			
	[-0.20080]			
C	1.68			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.06	0.09	0.01	0.40
	[2.87220]	[2.45218]	[2.87679]	[1.24311]
D(LOG(CP(-1)))	-0.14	0.27	-0.01	-0.97
	[-1.36864]	[1.38905]	[-0.36201]	[-0.57904]
D(LOG(NEER(-1)))	-0.02	0.07	0.01	0.58
	[-0.48262]	[0.67212]	[0.89267]	[0.67847]
D(LOG(FCPI(-1)))	0.82	-1.09	0.13	-17.27
	[1.96451]	[-1.38115]	[1.30093]	[-2.50697]
D(LOG(OP(-1)))	0.00	0.00	0.01	0.09
	[0.02498]	[-0.25744]	[4.06203]	[0.78877]
	0.00	0.00	0.00	0.07
C	[0.60584]	[1.26795]	[7.65191]	[2.99228]
WD	0.00	0.00	0.00	-0.01
	[-0.87305]	[-1.53823]	[-0.39350]	[-0.45049]
R-squared	0.35	0.18	0.33	0.07
Adj. R-squared	0.26	0.13	0.29	0.02
Sum sq. resids	0.00	0.01	0.00	0.63

S.E. equation	0.00	0.01	0.00	0.08
F-statistic	3.86	3.46	7.99	1.29
Akaike AIC	-7.74	-6.46	-10.52	-2.12
Schwarz SC	-7.56	-6.28	-10.34	-1.95
Mean dependent	0.00	0.00	0.00	0.01
S.D. dependent	0.01	0.01	0.00	0.08

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 3

Oman VECM

Vector Error Correction Estimates **Sample (adjusted): 2001M08 2008M11** **Included observations: 99 after adjustments** **t-statistics in [ ]**				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1			
LOG(NEER(-1))	0.54			
	[1.78231]			
LOG(FCPI(-1))	1.47			
	[3.12265]			
LOG(OP(-1))	-0.05			
	[-0.89034]			
C	-13.92			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.02	0.01	-0.01	-1.00
	[1.59238]	[0.21286]	[-3.55695]	[-3.24899]

D(LOG(CPI(-1)))	-0.04	-0.57	0.18	9.55
	[-0.29131]	[-1.45953]	[3.98733]	[2.81775]
D(LOG(CPI(-2)))	0.04	-0.73	0.22	11.59
	[0.33979]	[-1.83380]	[4.65521]	[3.37700]
D(LOG(CPI(-3)))	0.27	-0.38	0.15	8.29
	[1.82243]	[-0.84216]	[2.84077]	[2.11511]
D(LOG(CPI(-4)))	0.01	-0.21	0.09	4.65
	[0.06690]	[-0.44441]	[1.54850]	[1.13638]
D(LOG(CPI(-5)))	0.03	0.48	0.06	4.89
	[0.20621]	[1.02999]	[1.06745]	[1.22005]
D(LOG(CPI(-6)))	-0.10	0.63	-0.09	-0.36
	[-0.71258]	[1.45207]	[-1.76362]	[-0.09480]
D(LOG(CPI(-7)))	-0.14	0.15	0.08	8.26
	[-1.02655]	[0.36666]	[1.52071]	[2.26400]
D(LOG(NEER(-1)))	0.05	0.23	0.00	0.00
	[1.26321]	[1.89211]	[-0.23319]	[-0.00303]
D(LOG(NEER(-2)))	-0.08	-0.02	0.00	-0.31
	[-1.98416]	[-0.17127]	[0.07076]	[-0.28487]
D(LOG(NEER(-3)))	0.00	-0.13	-0.01	0.00
	[0.11441]	[-1.02761]	[-0.52269]	[0.00184]
D(LOG(NEER(-4)))	-0.05	0.11	-0.02	-0.51
	[-1.26280]	[1.00166]	[-1.78670]	[-0.51507]
D(LOG(NEER(-5)))	-0.05	-0.01	0.01	0.04
	[-1.39812]	[-0.09450]	[0.61063]	[0.04374]
D(LOG(NEER(-6)))	-0.03	-0.09	0.01	0.62
	[-0.75769]	[-0.76877]	[0.70671]	[0.62882]
D(LOG(NEER(-7)))	0.00	-0.17	0.00	-2.12
	[0.00958]	[-1.56146]	[0.01328]	[-2.22071]
D(LOG(FCPI(-1)))	-0.19	0.51	0.07	-6.69
	[-0.45988]	[0.40922]	[0.49900]	[-0.62024]
D(LOG(FCPI(-2)))	0.18	2.00	-0.01	0.73
	[0.46016]	[1.66250]	[-0.10627]	[0.06994]

D(LOG(FCPI(-3)))	-0.17	0.35	-0.03	-25.09
	[-0.43506]	[0.30268]	[-0.19695]	[-2.47602]
D(LOG(FCPI(-4)))	0.03	-1.00	0.01	2.36
	[0.08857]	[-0.86145]	[0.10615]	[0.23403]
D(LOG(FCPI(-5)))	0.02	0.29	-0.29	-27.66
	[0.05947]	[0.25834]	[-2.18957]	[-2.81406]
D(LOG(FCPI(-6)))	0.88	0.52	0.18	-2.33
	[2.45448]	[0.47662]	[1.38755]	[-0.24804]
D(LOG(FCPI(-7)))	0.06	0.94	-0.12	-18.79
	[0.16810]	[0.89081]	[-0.96418]	[-2.05085]
D(LOG(OP(-1)))	0.00	0.00	0.01	0.03
	[0.68918]	[0.09087]	[4.42274]	[0.24194]
D(LOG(OP(-2)))	0.00	-0.04	0.00	-0.21
	[0.31860]	[-1.94694]	[0.95531]	[-1.36556]
D(LOG(OP(-3)))	0.01	-0.04	0.00	0.22
	[2.33101]	[-2.32528]	[0.69684]	[1.41423]
D(LOG(OP(-4)))	0.01	-0.03	0.00	-0.04
	[1.20766]	[-1.49087]	[-0.21439]	[-0.27418]
D(LOG(OP(-5)))	0.00	0.02	0.00	0.13
	[0.49725]	[1.14604]	[-0.55350]	[0.81529]
D(LOG(OP(-6)))	-0.02	0.02	0.00	-0.10
	[-3.18354]	[0.92795]	[-1.51995]	[-0.65266]
D(LOG(OP(-7)))	0.00	0.00	0.00	0.22
	[-0.73922]	[-0.26434]	[0.96691]	[1.45329]
C	0.00	-0.01	0.00	0.14
	[-0.21537]	[-1.47826]	[2.79917]	[2.73229]
WD	0.00	-0.01	0.00	-0.03
	[-1.15740]	[-2.18861]	[-0.87475]	[-1.13939]
R-squared	0.71	0.41	0.73	0.48
Adj. R-squared	0.59	0.15	0.61	0.26
Sum sq. resids	0.00	0.01	0.00	0.40

S.E. equation	0.00	0.01	0.00	0.08
F-statistic	5.61	1.58	6.10	2.13
Akaike AIC	-8.59	-6.36	-10.65	-2.04
Schwarz SC	-7.77	-5.55	-9.83	-1.23
Mean dependent	0.00	0.00	0.00	0.01
S.D. dependent	0.00	0.01	0.00	0.09

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 4

Saudi Arabia: VECM

Vector Error Correction Estimates **Sample (adjusted): 2000M08 2008M11** **Included observations: 103 after adjustments** **t-statistics in [ ]**				
Cointegrating Eq:	CointEq1			
LOG(CPI(-1))	1.00			
LOG(NEER(-1))	0.65			

	[3.97921]			
LOG(FCPI(-1))	0.58			
	[2.86467]			
LOG(OP(-1))	0.02			
	[0.51508]			
C	-10.40			
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))
CointEq1	0.02	0.02	-0.02	-1.54
	[1.84397]	[0.58367]	[-4.93025]	[-5.53679]
D(LOG(CPI(-1)))	0.03	-0.06	0.10	6.88
	[0.25170]	[-0.13561]	[2.06870]	[2.07184]
D(LOG(CPI(-2)))	0.10	-0.04	0.12	10.77
	[0.84476]	[-0.07082]	[2.24367]	[3.08142]
D(LOG(CPI(-3)))	0.19	-0.42	0.20	12.07
	[1.51216]	[-0.81253]	[3.60311]	[3.33256]
D(LOG(NEER(-1)))	-0.04	0.29	-0.01	-0.63
	[-1.48784]	[2.68883]	[-0.64340]	[-0.82335]
D(LOG(NEER(-2)))	-0.03	-0.06	0.02	0.83
	[-0.97830]	[-0.53959]	[1.34592]	[1.05298]
D(LOG(NEER(-3)))	-0.01	0.01	-0.01	-0.04
	[-0.40335]	[0.12827]	[-0.70353]	[-0.04722]
D(LOG(FCPI(-1)))	0.43	-0.65	0.24	-6.56
	[1.49503]	[-0.56378]	[1.96975]	[-0.80656]
D(LOG(FCPI(-2)))	-0.04	2.82	0.06	2.23
	[-0.15148]	[2.36766]	[0.45199]	[0.26761]
D(LOG(FCPI(-3)))	0.29	-0.91	0.20	-1.55
	[1.09003]	[-0.84595]	[1.78584]	[-0.20558]
D(LOG(OP(-1)))	0.00	-0.01	0.01	-0.04
	[0.51564]	[-0.59125]	[3.10633]	[-0.33353]
D(LOG(OP(-2)))	0.00	-0.03	0.00	-0.12
	[-0.55986]	[-1.54181]	[0.57162]	[-0.89793]

D(LOG(OP(-3)))	0.00	-0.03	0.00	0.06
	[-0.45551]	[-1.68110]	[-0.41819]	[0.50110]
C	0.00	0.00	0.00	-0.02
	[-0.75683]	[-0.46392]	[1.61354]	[-0.48905]
WD	0.00	-0.01	0.00	-0.04
	[-0.46546]	[-1.43080]	[-1.59113]	[-1.56119]
R-squared	0.52	0.23	0.54	0.32
Adj. R-squared	0.45	0.11	0.47	0.21
Sum sq. resids	0.00	0.01	0.00	0.55
S.E. equation	0.00	0.01	0.00	0.08
F-statistic	6.85	1.88	7.50	2.90
Akaike AIC	-8.79	-6.00	-10.50	-2.11
Schwarz SC	-8.41	-5.62	-10.11	-1.72
Mean dependent	0.00	0.00	0.00	0.01
S.D. dependent	0.00	0.01	0.00	0.09

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, D = first difference, WD = War Dummy (Iraqi War). Lags are selected based on the information criterion.

Table: 5

Residual Serial Correlation LM Tests

	Country							
Lags	**Bahrain**		**Kuwait**		**Oman**		**Saudi Arabia**	
	LM-Statistics	P-Value	LM-Statistics	P-Value	LM-Statistics	P-Value	LM-Statistics	P-Value
1	21.71	0.15	14.23	0.58	23.00	0.11	22.79	0.12
2	22.87	0.12	19.76	0.23	13.71	0.62	24.48	0.08
3	16.21	0.44	14.09	0.59	8.83	0.92	18.11	0.32

4	15.00	0.52	23.74	0.10	19.99	0.22	21.17	0.17
5	18.01	0.32	11.82	0.76	14.91	0.53	21.46	0.16
6	13.05	0.67	12.20	0.73	20.90	0.18	13.89	0.61
7	26.04	0.05	21.46	0.16	18.85	0.28	25.22	0.07
8	12.45	0.71	12.13	0.73	18.76	0.28	13.27	0.65
9	12.09	0.74	11.95	0.75	22.79	0.12	15.80	0.47
10	15.98	0.45	17.55	0.35	14.01	0.60	18.01	0.32
11	19.65	0.24	12.73	0.69	17.35	0.36	11.32	0.79
12	24.50	0.08	19.43	0.25	23.74	0.10	17.63	0.35

Table: 6

Normality Test Joint (Jarque-Bera)

Country			
Bahrain	**Kuwait**	**Oman**	**Saudi Arabia**

Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value
192.95	0.00	71.58	0.07	62.65	0.22	52.12	0.59

Table: 7

Heteroscedasticity Tests

Country							
Bahrain		**Kuwait**		**Oman**		**Saudi Arabia**	
Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value	Chi-square Statistics	P-Value
500	0.40	132.51	0.07	595.12	0.43	299.66	0.10

Appendix (7)

Table: 1

Bahrain (VECM)

Vector Error Correction Estimates Sample (adjusted): 2000M03 2008M12 Included observations: 106 after adjustments t-statistics in [ ]						
Cointegrating Eq:	CointEq1					
LOG(CPI(-1))	1.00					
LOG(NEER(-1))	0.25					
	[3.98621]					
LOG(FCPI(1))	-1.97					
	[-12.8384]					
LOG(OP(-1))	-0.04					
	[-2.41691]					
LOG(DC(-1))	0.38					
	[10.1761]					
C	0.36					

Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))
CointEq1	-0.05	-0.09	0.00	-0.27	-12.15
	[-3.56947]	[-1.21543]	[-0.11445]	[-0.42364]	[-6.82034]
D(LOG(CPI(-1)))	-0.13	-1.53	-0.09	-2.54	-17.54
	[-1.46809]	[-3.07449]	[-1.42457]	[-0.58987]	[-1.46390]
D(LOG(NEER(-1)))	-0.01	0.38	-0.01	-1.34	3.52
	[-0.29785]	[3.66213]	[-0.74068]	[-1.47846]	[1.39919]
D(LOG(FCPI(-1)))	-0.49	-0.07	0.39	-3.24	34.83
	[-3.29158]	[-0.08544]	[3.83345]	[-0.46588]	[1.80083]
D(LOG(OP(-1)))	0.00	-0.01	0.01	0.13	0.19
	[0.06162]	[-0.65967]	[3.77667]	[1.10854]	[0.57610]
D(LOG(DC(-1)))	0.00	0.04	-0.01	-0.25	2.71
	[0.51258]	[1.09722]	[-1.42651]	[-0.70653]	[2.74928]
C	0.00	0.00	0.00	0.02	-0.14
	[6.47401]	[0.46629]	[5.79572]	[0.86399]	[-2.11343]
R-squared	0.20	0.21	0.45	0.08	0.49
Adj. R-squared	0.15	0.16	0.42	0.02	0.46
Sum sq. resids	0.00	0.01	0.00	0.83	6.40
S.E. equation	0.00	0.01	0.00	0.09	0.25
F-statistic	4.10	4.36	13.55	1.37	15.62
Akaike AIC	-9.59	-6.20	-10.31	-1.88	0.16
Schwarz SC	-9.41	-6.03	-10.13	-1.71	0.34
Mean dependent	0.00	0.00	0.00	0.00	-0.02
S.D. dependent	0.00	0.01	0.00	0.09	0.34

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic Credit, D = first difference. Lags are selected based on the information criterion.

Table: 2

Kuwait (VECM)

Vector Error Correction Estimates Sample (adjusted): 2000M11 2008M09 Included observations: 95 after adjustments t-statistics in [ ]					
Cointegrating Eq:	CointEq1				
LOG(CPI(-1))	1.00				
LOG(NEER(-1))	-0.38				
	[-7.92470]				
LOG(FCPI(-1))	-0.26				
	[-2.87519]				
LOG(OP(-1))	-0.03				
	[-3.48706]				
LOG(DC(-1))	-0.11				
	[-3.77068]				
C	-0.40				
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))
CointEq1	-0.25	0.62	0.10	2.09	0.88
	[-1.76618]	[2.54375]	[3.32241]	[0.98384]	[1.68700]
D(LOG(CPI(-1)))	0.23	0.18	-0.06	-4.76	-0.15
	[1.38023]	[0.62812]	[-1.68605]	[-1.91824]	[-0.25296]
D(LOG(CPI(-2)))	0.13	-0.28	-0.08	1.01	-0.67
	[0.82295]	[-0.97647]	[-2.15201]	[0.40857]	[-1.10050]
D(LOG(CPI(-3)))	0.18	-0.27	-0.05	-4.47	-0.16
	[1.15776]	[-0.98732]	[-1.41029]	[-1.86265]	[-0.26779]
D(LOG(CPI(-4)))	0.21	-0.56	-0.06	1.56	-0.80

	[1.27341]	[-1.91306]	[-1.65545]	[0.60901]	[-1.26797]
D(LOG(CPI(-5)))	0.30	-0.52	0.00	0.65	-0.29
	[1.76807]	[-1.73103]	[-0.11483]	[0.24986]	[-0.45546]
D(LOG(CPI(-6)))	0.28	-0.62	-0.07	0.03	-0.05
	[1.58800]	[-1.98502]	[-1.77912]	[0.01051]	[-0.06960]
D(LOG(CPI(-7)))	0.24	-0.35	-0.15	-6.82	-0.58
	[1.36461]	[-1.15357]	[-3.85970]	[-2.57536]	[-0.89608]
D(LOG(CPI(-8)))	0.23	-0.18	-0.10	-2.36	-0.96
	[1.26282]	[-0.58646]	[-2.56610]	[-0.86295]	[-1.42307]
D(LOG(CPI(-9)))	0.21	0.25	-0.10	-2.48	-0.08
	[1.29773]	[0.88061]	[-2.72492]	[-1.02020]	[-0.13504]
D(LOG(NEER(-1)))	-0.04	0.21	0.03	1.32	0.11
	[-0.43807]	[1.44010]	[1.65248]	[1.05115]	[0.34954]
D(LOG(NEER(-2)))	-0.15	-0.02	0.05	2.41	-0.11
	[-1.76021]	[-0.11792]	[2.76455]	[1.91256]	[-0.36097]
D(LOG(NEER(-3)))	-0.10	0.13	0.04	0.58	0.43
	[-1.20642]	[0.88841]	[2.25286]	[0.45840]	[1.38591]
D(LOG(NEER(-4)))	-0.19	0.33	-0.02	-0.17	-0.04
	[-2.22959]	[2.20090]	[-0.98205]	[-0.13060]	[-0.13391]
D(LOG(NEER(-5)))	0.03	0.17	0.06	1.35	0.27
	[0.33978]	[1.00491]	[2.98112]	[0.93403]	[0.76449]
D(LOG(NEER(-6)))	-0.10	0.12	0.04	2.14	0.12
	[-1.17777]	[0.84080]	[2.48163]	[1.70865]	[0.38902]
D(LOG(NEER(-7)))	-0.04	-0.06	0.02	-1.54	0.22
	[-0.42224]	[-0.38219]	[1.09954]	[-1.19503]	[0.70142]
D(LOG(NEER(-8)))	0.05	0.04	0.02	1.36	-0.11
	[0.71278]	[0.30722]	[1.25652]	[1.19944]	[-0.40059]
D(LOG(NEER(-9)))	-0.02	0.00	-0.02	-0.22	-0.27
	[-0.24214]	[-0.01510]	[-1.11572]	[-0.20466]	[-1.02006]
D(LOG(FCPI(-1)))	1.68	-0.69	0.15	-19.08	0.23
	[2.24541]	[-0.52595]	[0.88660]	[-1.67484]	[0.08211]
D(LOG(FCPI(-2)))	0.45	-0.55	-0.18	13.60	-3.48

	[0.54586]	[-0.37870]	[-0.98016]	[1.07948]	[-1.12593]
D(LOG(FCPI(-3)))	1.25	-0.33	-0.02	-24.42	-0.26
	[1.67004]	[-0.24803]	[-0.09194]	[-2.13518]	[-0.09118]
D(LOG(FCPA(-4)))	-0.54	-2.05	-0.15	15.68	-0.25
	[-0.69210]	[-1.51522]	[-0.90659]	[1.33204]	[-0.08784]
D(LOG(FCPI(-5)))	1.03	0.79	-0.43	-36.59	0.00
	[1.30145]	[0.56968]	[-2.48928]	[-3.03569]	[0.00107]
D(LOG(FCPA(-6)))	0.03	-0.97	-0.04	-2.47	-1.69
	[0.04379]	[-0.70205]	[-0.24990]	[-0.20503]	[-0.57064]
D(LOG(FCPI(-7)))	0.12	-0.40	0.04	-16.68	-3.16
	[0.16990]	[-0.32054]	[0.26697]	[-1.52686]	[-1.17964]
D(LOG(FCPA(-8)))	-0.01	0.73	0.08	13.67	-2.05
	[-0.01028]	[0.58126]	[0.49111]	[1.24292]	[-0.76042]
D(LOG(FCPI(-9)))	-0.74	0.47	0.27	10.02	0.69
	[-1.09031]	[0.39236]	[1.83654]	[0.97116]	[0.27313]
D(LOG(OP(-1)))	-0.01	0.02	0.01	0.12	-0.02
	[-0.70501]	[1.16380]	[3.10272]	[0.67873]	[-0.39008]
D(LOG(OP(-2)))	-0.01	0.01	0.01	-0.01	0.00
	[-0.99538]	[0.31032]	[2.39758]	[-0.06046]	[-0.10246]
D(LOG(OP(-3)))	-0.03	0.01	0.01	0.28	0.01
	[-2.09503]	[0.31351]	[1.88607]	[1.50099]	[0.16386]
D(LOG(OP(-4)))	-0.01	0.00	0.00	-0.02	0.04
	[-0.47295]	[-0.13471]	[1.45628]	[-0.08593]	[0.90623]
D(LOG(OP(-5)))	0.00	0.02	0.01	0.48	0.02
	[-0.23191]	[1.20777]	[2.93753]	[3.00458]	[0.42025]
D(LOG(OP(-6)))	-0.01	0.03	0.01	0.13	0.02
	[-1.25907]	[1.40744]	[2.00871]	[0.75586]	[0.43253]
D(LOG(OP(-7)))	0.01	0.03	0.01	0.29	0.02
	[0.93476]	[1.36772]	[1.99571]	[1.60041]	[0.52245]
D(LOG(OP(-8)))	-0.01	0.03	0.00	0.11	0.05
	[-1.12889]	[1.44502]	[0.17097]	[0.64003]	[1.27033]
D(LOG(OP(-9)))	0.00	0.03	0.00	-0.09	0.04

	[-0.05377]	[1.91691]	[0.26191]	[-0.61170]	[1.18411]
D(LOG(DC(-1)))	0.03	-0.07	0.02	1.19	-0.10
	[0.79519]	[-1.10200]	[2.10317]	[2.03017]	[-0.66733]
D(LOG(DC(-2)))	0.01	-0.04	0.02	1.77	0.35
	[0.32295]	[-0.58868]	[1.75153]	[2.94835]	[2.35776]
D(LOG(DC(-3)))	-0.04	0.02	0.02	0.42	0.14
	[-0.87057]	[0.20535]	[1.67736]	[0.63429]	[0.85194]
D(LOG(DC(-4)))	0.01	0.05	0.00	-0.02	0.43
	[0.16838]	[0.74278]	[0.40434]	[-0.02716]	[2.70885]
D(LOG(DC(-5)))	0.02	0.03	-0.01	-0.94	0.22
	[0.35364]	[0.43728]	[-1.39510]	[-1.41568]	[1.36253]
D(LOG(DC(-6)))	-0.04	-0.02	0.01	-0.21	-0.14
	[-1.01828]	[-0.26681]	[0.92288]	[-0.31496]	[-0.89747]
D(LOG(DC(-7)))	0.02	-0.03	0.01	0.84	-0.16
	[0.53961]	[-0.40513]	[1.10794]	[1.24651]	[-0.95881]
D(LOG(DC(-8)))	-0.04	0.01	0.01	0.54	-0.03
	[-0.84276]	[0.16489]	[0.86128]	[0.80276]	[-0.15400]
D(LOG(DC(-9)))	-0.07	0.00	0.01	0.67	-0.04
	[-1.62279]	[-0.05730]	[1.06855]	[1.05921]	[-0.28194]
C	-0.01	0.01	0.00	0.14	0.04
	[-1.99867]	[1.46572]	[3.66542]	[1.65668]	[2.08628]
R-squared	0.56	0.61	0.72	0.58	0.53
Adj. R-squared	0.35	0.23	0.44	0.17	0.08
Sum sq. resids	0.00	0.00	0.00	0.26	0.02
S.E. equation	0.00	0.01	0.00	0.07	0.02
F-statistic	1.34	1.60	2.62	1.42	1.17
Akaike AIC	-7.52	-6.40	-10.55	-2.07	-4.88
Schwarz SC	-6.25	-5.13	-9.29	-0.81	-3.62
Mean dependent	0.00	0.00	0.00	0.01	0.01
S.D. dependent	0.01	0.01	0.00	0.08	0.02

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic Credit, D = first difference. Lags are selected based on the information criterion.

Table: 3

Oman (VECM)

Vector Error Correction Estimates Sample (adjusted): 2000M08 2008M11 Included observations: 100 after adjustments t-statistics in [ ]					
Cointegrating Eq:	CointEq1				
LOG(CPI(-1))	1.00				
LOG(NEER(-1))	0.21				
	[2.03267]				
LOG(FCPI(-1))	-2.79				
	[-2.95527]				
LOG(OP(-1))	-0.11				
	[-5.35494]				
LOG(DC(-1))	-0.40				
	[-8.40546]				
@TREND(00M01)	0.01				
	[3.95208]				
C	11.09				
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))
CointEq1	0.08	-0.20	0.01	1.51	0.39
	[3.98033]	[-2.91716]	[1.46913]	[2.39565]	[2.48317]
D(LOG(CPI(-1)))	-0.14	0.21	0.11	4.20	1.67
	[-1.24980]	[0.57928]	[2.39510]	[1.21897]	[1.92733]
D(LOG(CPI(-2)))	-0.05	-0.13	0.13	8.94	0.29
	[-0.50715]	[-0.37319]	[3.11383]	[2.75638]	[0.34891]
D(LOG(CPI(-3)))	0.33	-0.03	0.05	3.62	0.83
	[3.22922]	[-0.09567]	[1.17075]	[1.15353]	[1.04562]
D(LOG(CPI(-4)))	0.19	-0.13	-0.04	-1.23	-0.30

	[1.89617]	[-0.39886]	[-0.92927]	[-0.39201]	[-0.37383]
D(LOG(CPI(-5)))	0.35	0.19	-0.04	-1.69	1.61
	[3.52317]	[0.56018]	[-1.05554]	[-0.53901]	[2.03867]
D(LOG(CPI(-6)))	0.18	0.11	-0.19	-7.25	0.05
	[1.65742]	[0.31369]	[-4.40189]	[-2.16328]	[0.05879]
D(LOG(NEER(-1)))	0.08	0.27	-0.01	-0.02	0.02
	[2.42011]	[2.36754]	[-0.61667]	[-0.01681]	[0.08176]
D(LOG(NEER(-2)))	-0.06	-0.08	0.00	-0.07	-0.44
	[-1.76451]	[-0.64692]	[0.21867]	[-0.06026]	[-1.53301]
D(LOG(NEER(-3)))	0.03	-0.04	-0.01	-0.42	-0.33
	[0.97182]	[-0.33811]	[-0.97460]	[-0.40293]	[-1.27137]
D(LOG(NEER(-4)))	-0.04	0.15	-0.02	-0.24	-0.08
	[-1.26491]	[1.30332]	[-1.33492]	[-0.22704]	[-0.28937]
D(LOG(NEER(-5)))	-0.05	0.04	0.01	-0.51	-0.12
	[-1.56371]	[0.39174]	[0.57962]	[-0.49239]	[-0.46763]
D(LOG(NEER(-6)))	-0.05	0.06	0.00	-0.03	0.22
	[-1.63140]	[0.53236]	[0.14693]	[-0.02689]	[0.87736]
D(LOG(FCPI(-1)))	0.13	-0.62	0.26	0.54	-0.22
	[0.38673]	[-0.56917]	[2.00691]	[0.05317]	[-0.08664]
D(LOG(FCPI(-2)))	0.33	1.02	0.24	16.05	6.40
	[1.01890]	[0.94352]	[1.82377]	[1.58527]	[2.51033]
D(LOG(FCPI(-3)))	-0.23	0.25	0.09	-7.26	4.85
	[-0.68864]	[0.22391]	[0.67053]	[-0.69001]	[1.82898]
D(LOG(FCPI(-4)))	0.19	-1.95	0.11	12.68	3.93
	[0.56607]	[-1.71929]	[0.83164]	[1.19432]	[1.46768]
D(LOG(FCPI(-5)))	0.14	-0.25	-0.17	-11.92	4.05
	[0.42422]	[-0.22695]	[-1.31485]	[-1.15288]	[1.55693]
D(LOG(FCPI(-6)))	1.21	-0.58	0.37	11.54	1.19
	[3.88073]	[-0.55849]	[2.97892]	[1.19230]	[0.48696]
D(LOG(OP(-1)))	0.01	-0.01	0.01	0.16	0.06
	[1.41896]	[-0.80773]	[4.84150]	[1.08281]	[1.74352]
D(LOG(OP(-2)))	0.00	-0.04	0.00	-0.08	-0.03

	[0.44556]	[-2.41326]	[0.80542]	[-0.50690]	[-0.71120]
D(LOG(OP(-3)))	0.02	-0.04	0.00	0.20	-0.05
	[3.64506]	[-2.36221]	[0.29513]	[1.26346]	[-1.32059]
D(LOG(OP(-4)))	0.01	-0.04	0.00	-0.02	-0.11
	[2.50781]	[-2.40577]	[-0.02205]	[-0.09591]	[-2.60681]
D(LOG(OP(-5)))	0.01	0.01	0.00	0.10	-0.04
	[2.15763]	[0.29013]	[-0.13491]	[0.57479]	[-0.86643]
D(LOG(OP(-6)))	-0.01	0.00	0.00	-0.21	-0.08
	[-2.83553]	[0.27583]	[-2.28241]	[-1.35832]	[-2.14006]
D(LOG(DC(-1)))	0.03	-0.04	0.01	0.44	0.15
	[1.97573]	[-0.72633]	[1.73374]	[0.93831]	[1.27027]
D(LOG(DC(-2)))	0.04	-0.08	0.00	0.25	-0.14
	[2.84280]	[-1.57376]	[0.56464]	[0.52997]	[-1.16656]
D(LOG(DC(-3)))	0.02	-0.07	0.00	-0.15	0.05
	[1.07008]	[-1.25142]	[0.17559]	[-0.30509]	[0.44145]
D(LOG(DC(-4)))	0.03	-0.07	-0.01	-0.14	-0.01
	[1.76661]	[-1.42266]	[-0.85356]	[-0.29038]	[-0.11980]
D(LOG(DC(-5)))	0.01	-0.07	0.00	-0.05	-0.10
	[0.73904]	[-1.35831]	[-0.44898]	[-0.10815]	[-0.87846]
D(LOG(DC(-6)))	0.04	-0.13	0.01	0.65	-0.06
	[2.77120]	[-2.60502]	[2.44172]	[1.43822]	[-0.56391]
C	-0.01	0.01	0.00	-0.10	-0.06
	[-2.69869]	[1.33096]	[-0.19324]	[-1.16609]	[-3.07034]
R-squared	0.77	0.45	0.73	0.43	0.49
Adj. R-squared	0.67	0.21	0.61	0.17	0.26
Sum sq. resids	0.00	0.01	0.00	0.45	0.03
S.E. equation	0.00	0.01	0.00	0.08	0.02
F-statistic	7.38	1.83	5.89	1.64	2.12
Akaike AIC	-8.81	-6.41	-10.64	-1.93	-4.69
Schwarz SC	-7.97	-5.57	-9.81	-1.10	-3.86
Mean dependent	0.00	0.00	0.00	0.01	0.01

S.D. dependent	0.00	0.01	0.00	0.09	0.02

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic Credit, D = first difference. Lags are selected based on the information criterion.

Table: 4

Saudi Arabia (VECM)

Vector Error Correction Estimates Sample (adjusted): 2000M06 2008M08 Included observations: 99 after adjustments t-statistics in [ ]					
Cointegrating Eq:	CointEq1				
LOG(CPI(-1))	1.00				
LOG(NEER(-1))	0.22				
	[7.24273]				
LOG(FCPI(-1))	-1.35				
	[-3.68360]				
LOG(OP(-1))	-0.02				
	[-2.78829]				
LOG(DC(-1))	0.08				
	[10.5649]				
@TREND(00M01)	0.00				
	[3.72520]				
C	-0.22				
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))
CointEq1	0.16	-0.74	0.00	4.12	-1.18

	[2.87367]	[-3.73385]	[0.07140]	[2.58658]	[-0.38101]
D(LOG(CPI(-1)))	-0.03	0.94	0.07	-3.64	-2.60
	[-0.20031]	[1.81578]	[1.19090]	[-0.87388]	[-0.32223]
D(LOG(CPI(-2)))	-0.02	0.95	-0.02	-3.46	-7.48
	[-0.13350]	[1.92264]	[-0.40014]	[-0.87404]	[-0.97235]
D(LOG(CPI(-3)))	-0.05	0.79	0.13	3.51	5.41
	[-0.39894]	[1.58439]	[2.27704]	[0.87970]	[0.69754]
D(LOG(CPI(-4)))	-0.02	0.51	-0.06	-10.38	-10.22
	[-0.13987]	[1.08642]	[-1.12693]	[-2.75062]	[-1.39551]
D(LOG(NEER(-1)))	-0.03	0.20	-0.01	-0.85	-2.31
	[-1.01736]	[2.06524]	[-1.03159]	[-1.07268]	[-1.50359]
D(LOG(NEER(-2)))	-0.04	-0.08	0.03	1.26	3.17
	[-1.45275]	[-0.75081]	[2.98763]	[1.57143]	[2.03027]
D(LOG(NEER(-3)))	0.03	-0.08	-0.02	-0.76	-2.05
	[0.96466]	[-0.85992]	[-1.59494]	[-0.97969]	[-1.35583]
D(LOG(NEER(-4)))	-0.05	0.02	0.00	0.45	-0.42
	[-2.07035]	[0.20984]	[0.21111]	[0.60447]	[-0.29379]
D(LOG(FCPI(-1)))	0.47	0.08	0.27	-0.32	3.59
	[1.50808]	[0.07414]	[2.14568]	[-0.03483]	[0.20422]
D(LOG(FCPI(-2)))	0.13	2.13	-0.09	0.23	-37.80
	[0.44468]	[1.95069]	[-0.72207]	[0.02640]	[-2.21589]
D(LOG(FCPI(-3)))	0.42	-0.70	0.31	3.42	19.97
	[1.33482]	[-0.61930]	[2.41664]	[0.37450]	[1.12687]
D(LOG(FCPI(-4)))	0.06	-1.15	-0.19	-0.94	-38.69
	[0.20121]	[-1.13653]	[-1.68268]	[-0.11617]	[-2.46049]
D(LOG(OP(-1)))	0.00	0.00	0.01	-0.01	0.35
	[-0.50707]	[0.11840]	[3.58037]	[-0.09972]	[1.51798]
D(LOG(OP(-2)))	0.00	-0.03	0.00	-0.16	0.16
	[-0.75266]	[-1.69656]	[0.53284]	[-1.22663]	[0.64659]
D(LOG(OP(-3)))	-0.01	-0.03	0.00	0.02	-0.01
	[-1.24401]	[-2.07194]	[-0.60479]	[0.19188]	[-0.03594]
D(LOG(OP(-4)))	0.00	-0.03	0.00	-0.19	-0.09

	[-0.22194]	[-2.04708]	[-1.18124]	[-1.58011]	[-0.38861]
D(LOG(DC(-1)))	-0.01	0.07	0.00	-0.36	-2.60
	[-2.52730]	[3.58572]	[-2.06860]	[-2.45240]	[-9.00984]
D(LOG(DC(-2)))	0.00	0.01	0.00	-0.16	0.70
	[-0.37292]	[0.36626]	[0.14128]	[-0.74841]	[1.67957]
D(LOG(DC(-3)))	0.00	0.05	-0.01	-0.40	0.59
	[-0.70180]	[1.91923]	[-2.51250]	[-1.93427]	[1.47713]
D(LOG(DC(-4)))	-0.02	0.05	0.01	0.23	0.42
	[-3.02457]	[1.76218]	[2.43650]	[1.09974]	[1.00934]
C	0.00	-0.01	0.00	0.03	0.16
	[-1.24972]	[-1.10553]	[3.80366]	[0.76245]	[2.13208]
WD	0.00	-0.01	0.00	0.00	0.02
	[-0.34883]	[-2.71889]	[-0.29129]	[0.10518]	[0.44109]
R-squared	0.63	0.43	0.58	0.35	0.77
Adj. R-squared	0.52	0.27	0.46	0.16	0.70
Sum sq. resids	0.00	0.01	0.00	0.40	1.51
S.E. equation	0.00	0.01	0.00	0.07	0.14
F-statistic	5.80	2.61	4.72	1.87	11.51
Akaike AIC	-8.94	-6.37	-10.73	-2.21	-0.88
Schwarz SC	-8.34	-5.77	-10.12	-1.60	-0.28
Mean dependent	0.00	0.00	0.00	0.01	-0.03
S.D. dependent	0.00	0.01	0.00	0.08	0.26

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic Credit, D = first difference, WD = War Dummy (Iraqi War) . Lags are selected based on the information criterion.

Table: 5

Residual Serial Correlation LM Tests

Country								
Lags	Bahrain		Kuwait		Oman		Saudi ArabiA	
	LM Statistics	P-Value	LM Statistics	P-Value	LM Statistics	P-Value	LM Statistics	P-Value
1	22.80	0.59	16.56	0.90	35.22	0.08	34.53	0.10
2	33.06	0.13	16.04	0.91	23.02	0.58	31.69	0.17
3	30.39	0.21	28.53	0.28	16.98	0.88	32.44	0.15
4	32.35	0.15	21.29	0.68	25.14	0.45	28.63	0.28
5	36.94	0.06	35.53	0.08	17.88	0.85	19.58	0.77
6	24.41	0.50	29.08	0.26	18.32	0.83	31.54	0.17
7	24.48	0.08	28.44	0.29	26.53	0.38	34.82	0.09
8	27.79	0.32	24.48	0.08	26.01	0.41	22.02	0.63
9	24.78	0.47	28.02	0.31	25.22	0.07	24.94	0.47
10	31.96	0.16	14.36	0.96	24.66	0.48	29.98	0.22
11	29.29	0.25	23.45	0.55	36.97	0.06	29.65	0.24
12	29.83	0.23	13.80	0.97	36.94	0.06	26.04	0.05

Table: 6

Normality Test Joint (Jarque-Bera)

Country			
Bahrain	Kuwait	Oman	Saudi Arabia

Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value
2899.23	0	229.13	0	141.82	0.01	113.35	0.27

Table: 7

Heteroscedasticity Tests

Country							
Bahrain		**Kuwait**		**Oman**		**Saudi Arabia**	
Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value
299.66	0.10	1394.72	0.39	931.34	0.48	684.93	0.13

Appendix (8)

Table: 1

Bahrain (VECM)

Vector Error Correction Estimates Sample (adjusted): 2000M04 2008M09 Included observations: 102 after adjustments t-statistics in [ ]					
Cointegrating Eq:	CointEq1				
LOG(CPI_SA(-1))	1				
LOG(NEER_SA(-1))	0.105688				
	[0.66052]				
LOG(FCPI(-1))	-0.006227				
	[-0.02978]				
LOG(OP(-1))	0.289539				
	[4.73678]				
LOG(GV(-1))	-0.463132				
	[-5.57890]				
C	-3.199423				
Error Correction:	D(LOG(CP))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(GV))
CointEq1	-0.01	-0.05	-0.01	-0.11	1.24
	[-1.69729]	[-1.36014]	[-3.00419]	[-0.40755]	[4.15222]
D(LOG(CPI(-1)))	0.02	-1.19	-0.11	-4.39	-3.91
	[0.18398]	[-2.23838]	[-1.70875]	[-0.99574]	[-0.82879]
D(LOG(CPI(-2)))	0.31	-0.16	0.00	-4.07	3.02
	[3.29356]	[-0.31019]	[0.03903]	[-0.93656]	[0.64972]
D(LOG(NEER(-1)))	-0.03	0.31	0.00	-0.59	-0.27
	[-1.35711]	[2.91305]	[-0.09713]	[-0.66231]	[-0.27798]
D(LOG(NEER(-2)))	0.02	-0.18	0.00	0.79	0.26
	[0.91307]	[-1.70836]	[0.38479]	[0.91082]	[0.28377]
D(LOG(FCPI(-1)))	-0.56	-0.55	0.14	-10.89	30.72
	[-2.94619]	[-0.52264]	[1.09019]	[-1.24585]	[3.28194]
D(LOG(FCPI(-2)))	0.04	1.01	-0.08	-6.00	8.58
	[0.23872]	[0.97036]	[-0.58869]	[-0.69652]	[0.92994]
D(LOG(OP(-1)))	0.00	0.02	0.01	0.00	-0.20

	[0.68089]	[0.84279]	[4.11409]	[0.03082]	[-1.19246]
D(LOG(OP(-2)))	0.00	0.00	0.00	-0.03	-0.29
	[0.74007]	[-0.02851]	[1.65464]	[-0.23676]	[-1.88897]
D(LOG(GV(-1)))	0.00	-0.03	0.00	0.03	-0.29
	[0.45679]	[-1.79446]	[-2.17713]	[0.22747]	[-2.17414]
D(LOG(GV(-2)))	0.00	-0.02	0.00	-0.02	-0.13
	[-0.25378]	[-1.90920]	[-1.45554]	[-0.16587]	[-1.27961]
C	0.00	0.00	0.00	0.08	-0.10
	[3.38369]	[-0.05459]	[5.81365]	[2.30659]	[-2.67040]
R-squared	0.31	0.23	0.35	0.09	0.46
Adj. R-squared	0.22	0.14	0.27	-0.02	0.40
Sum sq. resids	0.00	0.01	0.00	0.62	0.71
S.E. equation	0.00	0.01	0.00	0.08	0.09
F-statistic	3.64	2.45	4.44	0.80	7.02
Akaike AIC	-9.69	-6.26	-10.44	-2.04	-1.90
Schwarz SC	-9.38	-5.95	-10.14	-1.73	-1.59
Mean dependent	0.00	0.00	0.00	0.01	0.01
S.D. dependent	0.00	0.01	0.00	0.08	0.11

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 2

Kuwait (VECM)

Vector Error Correction Estimates
Sample (adjusted): 2000M05 2008M09

Included observations: 101 after adjustments

t-statistics in [ ]

Cointegrating Eq:	CointEq1				
LOG(CPI(-1))	1.00				
LOG(NEER(-1))	-0.36				
	[-2.47270]				
LOG(FCPI(-1))	-1.65				
	[-1.52947]				
LOG(OP(-1))	-0.12				
	[-4.48942]				
LOG(GV(-1))	-0.15				
	[-6.96190]				
@TREND(00M01)	0.01				
	[1.87691]				
C	6.08				
Error Correction:	D(LOG(CP))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(GV))
CointEq1	-0.03	-0.01	0.01	1.33	5.64
	[-1.63722]	[-0.24730]	[1.33582]	[4.05234]	[4.57484]
D(LOG(CPI(-1)))	0.01	0.47	0.03	-0.77	-6.02
	[0.08982]	[2.20899]	[1.31639]	[-0.47337]	[-0.98277]
D(LOG(CPI(-2)))	0.14	0.14	0.00	1.43	7.48
	[1.32424]	[0.65867]	[0.17465]	[0.89347]	[1.24092]
D(LOG(CPI(-3)))	0.14	-0.12	0.00	-1.26	-3.06
	[1.40818]	[-0.59052]	[0.05437]	[-0.81034]	[-0.52402]
D(LOG(NEER(-1)))	-0.06	0.13	0.01	0.86	-1.12
	[-1.10542]	[1.19681]	[0.58731]	[1.02748]	[-0.35597]
D(LOG(NEER(-2)))	-0.07	-0.06	0.03	1.80	2.35
	[-1.37417]	[-0.59531]	[2.37214]	[2.18285]	[0.75957]
D(LOG(NEER(-3)))	-0.10	0.02	0.00	0.05	0.41
	[-1.95776]	[0.14510]	[0.15833]	[0.06293]	[0.13088]
D(LOG(FCPI(-1)))	0.88	-0.47	0.19	-7.04	31.36

	[1.74006]	[-0.46010]	[1.51867]	[-0.90154]	[1.06979]
D(LOG(FCPI(-2)))	0.42	2.70	-0.06	-3.43	16.83
	[0.80239]	[2.52783]	[-0.50451]	[-0.42080]	[0.55017]
D(LOG(FCPI(-3)))	0.56	-1.03	0.24	-0.36	24.36
	[1.17438]	[-1.06076]	[2.07929]	[-0.04929]	[0.87674]
D(LOG(OP(-1)))	0.00	0.00	0.01	0.07	-0.17
	[0.09993]	[0.12783]	[3.38927]	[0.58213]	[-0.38753]
D(LOG(OP(-2)))	0.00	-0.03	0.00	-0.02	-0.25
	[0.03893]	[-1.79007]	[1.52247]	[-0.11827]	[-0.51993]
D(LOG(OP(-3)))	-0.01	-0.02	0.00	0.05	0.07
	[-1.69745]	[-1.15662]	[-0.77047]	[0.41926]	[0.15235]
D(LOG(GV(-1)))	-0.01	0.00	0.00	0.16	0.00
	[-2.00718]	[-0.35307]	[0.95262]	[3.42308]	[0.01240]
D(LOG(GV(-2)))	0.00	0.00	0.00	0.10	0.07
	[-1.61324]	[-0.28055]	[-0.50142]	[2.49360]	[0.47273]
D(LOG(GV(-3)))	0.00	0.00	0.00	0.07	0.15
	[-1.29417]	[0.50498]	[-0.02613]	[2.55137]	[1.39972]
C	0.00	0.00	0.00	0.05	-0.22
	[-1.91903]	[-1.17924]	[3.95880]	[1.51783]	[-1.97312]
R-squared	0.43	0.20	0.41	0.28	0.51
Adj. R-squared	0.30	0.05	0.30	0.14	0.41
Sum sq. resids	0.00	0.01	0.00	0.46	6.55
S.E. equation	0.00	0.01	0.00	0.07	0.28
F-statistic	1.87	1.32	3.70	2.01	5.41
Akaike AIC	-7.68	-6.27	-10.51	-2.21	0.44
Schwarz SC	-7.24	-5.83	-10.07	-1.77	0.88
Mean dependent	0.00	0.00	0.00	0.01	0.01
S.D. dependent	0.01	0.01	0.00	0.08	0.36

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 3

Oman (VECM)

Vector Error Correction Estimates Sample (adjusted): 2000M04 2008M11 Included observations: 104 after adjustments t-statistics in [ ]					
Cointegrating Eq:	CointEq1				

LOG(CPI(-1))	1.00				
LOG(NEER(-1))	0.20				
	[0.47958]				
LOG(FCPI(-1))	0.39				
	[0.72595]				
LOG(OP(-1))	-0.03				
	[-0.40126]				
LOG(GV(-1))	0.35				
	[2.92909]				
C	-9.65				
Error Correction:	D(LOG(CP))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(GV))
CointEq1	0.02	0.01	0.00	-0.31	-0.44
	[6.06734]	[1.03791]	[-3.53142]	[-3.24395]	[-2.07630]
D(LOG(CPI(-1)))	-0.08	-0.19	0.13	5.78	13.68
	[-0.77058]	[-0.53021]	[2.72579]	[1.78104]	[1.89565]
D(LOG(CPI(-2)))	-0.09	-0.32	0.15	9.61	8.06
	[-0.82577]	[-0.91501]	[3.33383]	[3.00143]	[1.13187]
D(LOG(NEER(-1)))	0.03	0.24	0.01	-0.30	-1.99
	[0.78210]	[2.26564]	[0.51619]	[-0.30821]	[-0.92337]
D(LOG(NEER(-2)))	-0.06	0.00	-0.01	-0.42	0.13
	[-1.72951]	[0.04275]	[-0.39664]	[-0.44138]	[0.06171]
D(LOG(FCPI(-1)))	0.64	-0.81	0.09	-12.78	-3.81
	[2.11559]	[-0.81136]	[0.66249]	[-1.39029]	[-0.18671]
D(LOG(FCPI(-2)))	0.36	1.49	0.11	0.91	-0.20
	[1.37159]	[1.70810]	[0.92381]	[0.11352]	[-0.01124]
D(LOG(OP(-1)))	0.00	0.00	0.01	0.13	0.35
	[-0.29743]	[-0.31656]	[4.68918]	[0.95928]	[1.19950]
D(LOG(OP(-2)))	-0.01	-0.01	0.00	0.07	0.10
	[-1.32255]	[-0.84138]	[1.84815]	[0.49810]	[0.34252]
D(LOG(GV(-1)))	-0.01	0.00	0.00	0.01	-0.56
	[-3.67509]	[0.68154]	[-0.35853]	[0.23031]	[-5.06861]

D(LOG(GV(-2)))	0.00	0.00	0.00	0.00	-0.31
	[-0.68430]	[0.93542]	[-0.36874]	[-0.05837]	[-3.04252]
C	0.00	0.00	0.00	0.01	-0.03
	[-0.27639]	[-0.45498]	[4.10861]	[0.23659]	[-0.41627]
R-squared	0.63	0.17	0.50	0.17	0.43
Adj. R-squared	0.58	0.07	0.44	0.07	0.37
Sum sq. resids	0.00	0.01	0.00	0.72	3.54
S.E. equation	0.00	0.01	0.00	0.09	0.20
F-statistic	13.99	1.71	8.30	1.67	6.43
Akaike AIC	-8.72	-6.35	-10.41	-1.91	-0.31
Schwarz SC	-8.42	-6.04	-10.10	-1.61	-0.01
Mean dependent	0.00	0.00	0.00	0.01	0.01
S.D. dependent	0.00	0.01	0.00	0.09	0.25

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 4

Saudi Arabia (VECM)

Vector Error Correction Estimates **Sample (adjusted): 2000M07 2008M11** **Included observations: 101 after adjustments** **t-statistics in [ ]**					
Cointegrating Eq:	CointEq1				
LOG(CPI(-1))	1.00				
LOG(NEER(-1))	0.57				
	[5.01528]				

LOG(FCPI(-1))	0.64				
	[4.84875]				
LOG(OP(-1))	-0.26				
	[-3.28591]				
LOG(GV(-1))	0.23				
	[2.76564]				
C	-11.41				
Error Correction:	D(LOG(CP))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(GV))
CointEq1	0.06	0.04	-0.04	-1.77	0.16
	[3.34915]	[0.61713]	[-5.69361]	[-3.74807]	[0.55413]
D(LOG(CPI(-1)))	-0.02	-0.28	0.15	6.13	-2.72
	[-0.18503]	[-0.57132]	[3.02550]	[1.72479]	[-1.25831]
D(LOG(CPI(-2)))	0.06	0.15	0.11	9.16	-1.22
	[0.45682]	[0.28993]	[2.12304]	[2.48931]	[-0.54541]
D(LOG(CPI(-3)))	0.11	-0.30	0.27	13.00	0.95
	[0.80930]	[-0.55319]	[4.91812]	[3.36420]	[0.40193]
D(LOG(CPI(-4)))	-0.23	0.25	0.05	-1.98	-1.03
	[-1.53941]	[0.41593]	[0.87800]	[-0.46705]	[-0.39824]
D(LOG(CPI(-5)))	-0.33	-0.77	0.19	11.69	0.29
	[-2.23124]	[-1.34073]	[3.22165]	[2.84466]	[0.11775]
D(LOG(NEER(-1)))	-0.04	0.38	-0.01	-0.38	-0.12
	[-1.41030]	[3.10763]	[-1.01204]	[-0.43481]	[-0.22681]
D(LOG(NEER(-2)))	-0.03	-0.10	0.03	1.19	0.19
	[-1.03838]	[-0.81253]	[2.64269]	[1.41673]	[0.37044]
D(LOG(NEER(-3)))	-0.02	0.00	-0.01	0.23	0.39
	[-0.50045]	[0.01682]	[-0.92947]	[0.27058]	[0.76772]
D(LOG(NEER(-4)))	-0.04	0.06	-0.01	-0.03	-0.67
	[-1.51471]	[0.49666]	[-0.46439]	[-0.03913]	[-1.37893]
D(LOG(NEER(-5)))	-0.02	0.03	0.01	-0.01	-0.08
	[-0.69726]	[0.28873]	[1.01726]	[-0.00696]	[-0.17490]
D(LOG(FCPI(-1)))	0.70	0.37	0.20	-11.63	-8.44

	[2.17103]	[0.29392]	[1.58913]	[-1.28348]	[-1.52887]
D(LOG(FCPI(-2)))	0.23	2.84	-0.12	-1.47	1.21
	[0.67707]	[2.14859]	[-0.88238]	[-0.15620]	[0.21105]
D(LOG(FCPI(-3)))	0.35	0.39	0.23	-6.13	3.20
	[1.09168]	[0.30981]	[1.79761]	[-0.68187]	[0.58433]
D(LOG(FCPI(-4)))	-0.33	-0.66	-0.13	-7.60	1.62
	[-0.98871]	[-0.50562]	[-0.97244]	[-0.81841]	[0.28636]
D(LOG(FCPI(-5)))	0.48	0.91	-0.22	-25.21	-1.13
	[1.54723]	[0.74953]	[-1.81963]	[-2.90209]	[-0.21456]
D(LOG(OP(-1)))	0.02	-0.01	0.00	-0.34	0.67
	[2.33535]	[-0.37277]	[-1.24732]	[-1.84026]	[5.89724]
D(LOG(OP(-2)))	0.01	-0.05	-0.01	-0.59	0.59
	[1.78775]	[-1.49155]	[-2.43474]	[-2.74808]	[4.48552]
D(LOG(OP(-3)))	0.01	-0.05	-0.01	-0.33	0.40
	[1.35634]	[-1.48673]	[-2.80324]	[-1.47609]	[2.97359]
D(LOG(OP(-4)))	0.01	-0.05	-0.01	-0.36	0.16
	[1.64911]	[-1.58915]	[-2.35032]	[-1.79324]	[1.28104]
D(LOG(OP(-5)))	0.01	-0.01	0.00	0.22	0.25
	[1.45708]	[-0.34708]	[-1.05512]	[1.48795]	[2.71935]
D(LOG(GV(-1)))	-0.01	0.03	0.01	0.40	-0.82
	[-1.75791]	[1.02599]	[2.10847]	[1.75914]	[-5.95452]
D(LOG(GV(-2)))	-0.01	0.00	0.01	0.53	-0.37
	[-1.54324]	[-0.14025]	[2.29724]	[2.08632]	[-2.38607]
D(LOG(GV(-3)))	-0.01	0.03	0.00	0.29	0.01
	[-0.96937]	[0.93417]	[1.21104]	[1.26045]	[0.05908]
D(LOG(GV(-4)))	0.00	0.01	0.00	-0.06	-0.08
	[-0.58490]	[0.26980]	[1.22207]	[-0.28345]	[-0.66740]
D(LOG(GV(-5)))	0.00	0.02	0.00	0.00	-0.01
	[0.24490]	[1.10102]	[-1.30747]	[0.03062]	[-0.11238]
C	0.00	-0.01	0.00	0.12	0.02
	[-1.80662]	[-1.83638]	[3.54269]	[2.78873]	[0.77871]

R-squared	0.61	0.38	0.68	0.45	0.66
Adj. R-squared	0.48	0.16	0.57	0.25	0.55
Sum sq. resids	0.00	0.01	0.00	0.43	0.16
S.E. equation	0.00	0.01	0.00	0.08	0.05
F-statistic	4.54	1.74	6.11	2.30	5.62
Akaike AIC	-8.76	-6.03	-10.60	-2.09	-3.09
Schwarz SC	-8.06	-5.33	-9.90	-1.39	-2.39
Mean dependent	0.00	0.00	0.00	0.01	0.01
S.D. dependent	0.00	0.01	0.00	0.09	0.07

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 5

Residual Serial Correlation LM Tests

	Country							
Lags	**Bahrain**		**Kuwait**		**Oman**		**Saudi ArabiA**	
	LM Statistics	P-Value	LM Statistics	P-Value	LM Statistics	P-Value	LM Statistics	P-Value
1	28.34	0.29	29.36	0.25	25.29	0.45	26.05	0.41
2	27.93	0.31	18.97	0.80	37.49	0.05	24.49	0.49

3	18.59	0.82	27.52	0.33	36.94	0.06	34.93	0.09
4	27.83	0.32	33.91	0.11	26.86	0.36	37.49	0.05
5	37.87	0.05	20.11	0.74	20.92	0.70	23.53	0.55
6	20.98	0.69	17.43	0.87	30.98	0.19	31.83	0.16
7	32.67	0.14	28.52	0.28	36.40	0.07	20.20	0.74
8	23.63	0.54	14.12	0.96	22.13	0.63	25.34	0.44
9	20.83	0.70	25.75	0.42	27.17	0.35	25.81	0.42
10	27.51	0.33	29.08	0.26	14.76	0.95	25.39	0.44
11	19.42	0.78	15.74	0.92	23.06	0.57	16.46	0.90
12	33.87	0.11	25.52	0.43	36.94	0.06	36.40	0.07

Table: 6

Normality Test Joint (Jarque-Bera)

Country							
Bahrain		**Kuwait**		**Oman**		**Saudi Arabia**	
Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value
23.16	0.01	113.23	0.27	124.3	0.1	130.51	0.05

Table: 7

Heteroscedasticity Tests

Country							
Bahrain		**Kuwait**		**Oman**		**Saudi Arabia**	
Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value

385.84	0.02	504.67	0.21	330.12	0.49	771.13	0.58

Appendix (9)

Table: 1

Bahrain (VECM)

Vector Error Correction Estimates **Sample (adjusted): 2000M04 2008M9** **Included observations: 102 after adjustments** **t-statistics in [ ]**						
Cointegrating Eq:	CointEq1					
LOG(CPI(-1))	1.00					
LOG(NEER(-1))	0.14					
	[2.29681]					
LOG(FCPI(-1))	-2.63					
	[-5.50641]					
LOG(OP(-1))	0.07					
	[3.05397]					
LOG(DC(-1))	0.31					

	[6.25641]					
LOG(GV(-1))	-0.16					
	[-4.71022]					
@TREND(00M01)	0.00					
	[2.34282]					
C	5.08					
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))	D(LOG(GV))
CointEq1	-0.05	-0.06	-0.01	0.79	-0.42	3.34
	[-4.32124]	[-0.75423]	[-1.16768]	[1.25710]	[-2.13784]	[5.17570]
D(LOG(CPI(-1)))	-0.10	-1.29	-0.11	-1.96	-4.71	1.92
	[-1.06461]	[-2.27105]	[-1.53210]	[-0.42902]	[-3.24119]	[0.40650]
D(LOG(CPI(-2)))	0.22	-0.22	-0.01	-2.34	-1.69	9.08
	[2.35993]	[-0.38346]	[-0.08512]	[-0.51251]	[-1.16995]	[1.93126]
D(LOG(NEER(-1)))	-0.03	0.34	0.00	-0.46	-0.43	-0.75
	[-1.53345]	[3.14354]	[0.34498]	[-0.52539]	[-1.55763]	[-0.83474]
D(LOG(NEER(-2)))	0.03	-0.16	0.01	0.58	-0.35	-0.25
	[1.68693]	[-1.46577]	[0.43645]	[0.65961]	[-1.25565]	[-0.26891]
D(LOG(FCPI(-1)))	-0.73	-0.47	0.22	-5.92	0.75	33.82
	[-4.06929]	[-0.42806]	[1.59113]	[-0.67206]	[0.26892]	[3.72531]
D(LOG(FCPI(-2)))	-0.21	1.28	-0.04	-0.87	-4.86	14.59
	[-1.13575]	[1.12433]	[-0.26224]	[-0.09520]	[-1.66900]	[1.54352]
D(LOG(OP(-1)))	0.00	0.01	0.01	-0.07	0.00	-0.18
	[1.36440]	[0.52809]	[3.37843]	[-0.48631]	[0.07751]	[-1.18964]
D(LOG(OP(-2)))	0.01	-0.01	0.00	-0.14	0.10	-0.27
	[1.85453]	[-0.37737]	[0.60544]	[-1.01593]	[2.32184]	[-1.92445]
D(LOG(DC(-1)))	0.02	0.00	0.00	-0.26	-0.03	-0.39
	[2.39117]	[0.07407]	[0.06065]	[-0.70678]	[-0.24488]	[-1.04130]
D(LOG(DC(-2)))	0.00	-0.03	0.01	0.32	-0.12	-0.28
	[0.47702]	[-0.69147]	[2.25340]	[0.98939]	[-1.18814]	[-0.86235]
D(LOG(GV(-1)))	0.00	-0.02	0.00	0.11	-0.02	-0.31
	[-0.26201]	[-1.31245]	[-1.19810]	[0.96104]	[-0.45570]	[-2.72738]

D(LOG(GV(-2)))	0.00	-0.02	0.00	0.03	0.00	-0.17
	[-0.62252]	[-1.70556]	[-0.48175]	[0.35859]	[-0.02957]	[-1.81482]
C	0.00	0.00	0.00	0.04	0.04	-0.14
	[5.23684]	[-0.14397]	[4.42181]	[1.12598]	[3.22240]	[-3.65298]
R-squared	0.42	0.23	0.33	0.13	0.26	0.52
Adj. R-squared	0.34	0.11	0.23	0.00	0.15	0.45
Sum sq. resids	0.00	0.01	0.00	0.59	0.06	0.63
S.E. equation	0.00	0.01	0.00	0.08	0.03	0.08
F-statistic	4.92	2.00	3.35	0.97	2.36	7.38
Akaike AIC	-9.83	-6.22	-10.37	-2.04	-4.33	-1.98
Schwarz SC	-9.47	-5.86	-10.01	-1.68	-3.97	-1.62
Mean dependent	0.00	0.00	0.00	0.01	0.02	0.01
S.D. dependent	0.00	0.01	0.00	0.08	0.03	0.11

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic credit, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 2

Kuwait (VECM)

Vector Error Correction Estimates Sample (adjusted): 2000M05 2008M9 Included observations: 101 after adjustments t-statistics in [ ]						
Cointegrating Eq:	CointEq1					
LOG(CPI(-1))	1					
LOG(NEER(-1))	-0.26					

	[-1.42597]					
LOG(FCPI(-1))	0.83					
	[3.27850]					
LOG(OP(-1))	-0.17					
	[-4.66744]					
LOG(DC(-1))	0.02					
	[0.21968]					
LOG(GV(-1))	-0.21					
	[-6.73340]					
C	-5.49					
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))	D(LOG(GV))
CointEq1	-0.05	0.01	0.00	0.47	0.06	4.95
	[-2.92096]	[0.36962]	[-0.75691]	[1.81337]	[0.98591]	[5.50555]
D(LOG(CPI(-1)))	-0.09	0.64	0.02	-1.37	0.42	-2.66
	[-0.82500]	[3.03450]	[0.62100]	[-0.80019]	[1.03611]	[-0.45041]
D(LOG(CPI(-2)))	0.02	0.36	-0.02	0.48	0.21	11.64
	[0.17123]	[1.68083]	[-0.74668]	[0.27631]	[0.49983]	[1.95721]
D(LOG(CPI(-3)))	0.06	0.04	-0.02	-2.44	0.61	-1.44
	[0.58822]	[0.19453]	[-0.79755]	[-1.47081]	[1.54699]	[-0.25254]
D(LOG(NEER(-1)))	-0.03	0.08	0.02	1.28	-0.21	-0.85
	[-0.53263]	[0.72577]	[1.23857]	[1.42233]	[-0.99080]	[-0.27409]
D(LOG(NEER(-2)))	-0.06	-0.11	0.04	2.11	-0.34	3.07
	[-1.20034]	[-1.01104]	[2.79882]	[2.44027]	[-1.66162]	[1.03608]
D(LOG(NEER(-3)))	-0.09	-0.01	0.00	-0.03	0.10	-0.61
	[-1.80907]	[-0.14177]	[-0.02310]	[-0.03796]	[0.46745]	[-0.20844]
D(LOG(FCPI(-1)))	1.06	-0.56	0.17	-10.83	0.75	5.07
	[2.18324]	[-0.57049]	[1.41616]	[-1.35262]	[0.39063]	[0.18426]
D(LOG(FCPI(-2)))	0.71	2.53	-0.04	-4.54	-1.54	-6.34
	[1.39598]	[2.43975]	[-0.28693]	[-0.53889]	[-0.76828]	[-0.21923]
D(LOG(FCPI(-3)))	0.74	-1.21	0.24	-2.79	-0.20	4.33

	[1.62640]	[-1.29796]	[2.13838]	[-0.36871]	[-0.10907]	[0.16688]
D(LOG(OP(-1)))	-0.01	0.01	0.00	0.02	0.01	0.13
	[-0.79468]	[0.60679]	[2.50000]	[0.13532]	[0.18793]	[0.28414]
D(LOG(OP(-2)))	0.00	-0.02	0.00	-0.05	0.00	-0.04
	[-0.52033]	[-1.45698]	[1.03348]	[-0.35637]	[-0.14888]	[-0.07928]
D(LOG(OP(-3)))	-0.02	-0.02	0.00	0.06	-0.02	0.37
	[-2.20443]	[-1.07710]	[-0.89189]	[0.52130]	[-0.72602]	[0.90402]
D(LOG(DC(-1)))	0.05	-0.13	0.01	0.48	0.00	-3.85
	[1.76491]	[-2.24649]	[0.81612]	[1.03298]	[-0.01633]	[-2.39642]
D(LOG(DC(-2)))	0.08	-0.11	0.01	0.69	0.29	-4.11
	[2.84068]	[-1.84167]	[1.99269]	[1.42305]	[2.53083]	[-2.45476]
D(LOG(DC(-3)))	0.03	-0.05	0.02	0.69	-0.02	2.00
	[1.05426]	[-0.76245]	[2.25715]	[1.32240]	[-0.16723]	[1.11673]
D(LOG(GV(-1)))	-0.01	0.00	0.00	0.09	0.02	0.10
	[-2.95311]	[-0.05985]	[-0.61380]	[1.78072]	[1.43393]	[0.59793]
D(LOG(GV(-2)))	-0.01	0.00	0.00	0.05	0.01	0.14
	[-2.36088]	[0.00828]	[-1.73929]	[1.17171]	[0.67119]	[0.97587]
D(LOG(GV(-3)))	0.00	0.00	0.00	0.05	0.01	0.18
	[-1.81428]	[0.65540]	[-0.88083]	[1.55747]	[1.29578]	[1.76009]
C	-0.01	0.00	0.00	0.06	0.01	0.03
	[-3.42231]	[-0.42873]	[3.43672]	[1.83469]	[1.03629]	[0.30896]
R-squared	0.36	0.29	0.47	0.27	0.29	0.59
Adj. R-squared	0.21	0.13	0.34	0.10	0.12	0.49
Sum sq. resids	0.00	0.01	0.00	0.47	0.03	5.51
S.E. equation	0.00	0.01	0.00	0.08	0.02	0.26
F-statistic	2.38	1.78	3.76	1.60	1.73	6.04
Akaike AIC	-7.75	-6.33	-10.55	-2.14	-5.01	0.32
Schwarz SC	-7.24	-5.81	-10.03	-1.63	-4.49	0.84
Mean dependent	0.00	0.00	0.00	0.01	0.01	0.01
S.D. dependent	0.01	0.01	0.00	0.08	0.02	0.36

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic credit, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 3

Oman (VECM)

Vector Error Correction Estimates **Sample (adjusted): 2000M08 2008M11** **Included observations: 100 after adjustments** **t-statistics in [ ]**						
Cointegrating Eq:	CointEq1					
LOG(CPI-1))	1.00					
LOG(NEER(-1))	0.19					
	[1.95421]					
LOG(WCPI(-1))	-2.16					
	[-2.47485]					
LOG(OP(-1))	-0.12					
	[-6.24544]					
LOG(DC(-1))	-0.41					
	[-8.98580]					
LOG(GV(-1))	0.06					
	[1.56775]					
@TREND(00M01)	0.01					

	[3.50022]					
C	8.04					
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))	D(LOG(GV))
CointEq1	0.09	-0.20	0.01	1.84	0.30	-1.28
	[3.70059]	[-2.68075]	[0.73070]	[2.58721]	[1.80774]	[-0.81272]
D(LOG(CPI(-1)))	-0.15	0.34	0.10	2.36	1.49	13.99
	[-1.22751]	[0.88691]	[2.14699]	[0.64959]	[1.76784]	[1.74461]
D(LOG(CPI(-2)))	-0.08	-0.15	0.15	8.44	0.45	12.63
	[-0.70088]	[-0.40653]	[3.36515]	[2.37164]	[0.53943]	[1.60576]
D(LOG(CPI(-3)))	0.22	-0.14	0.06	3.73	0.36	-5.02
	[1.98570]	[-0.39524]	[1.34775]	[1.08197]	[0.44405]	[-0.65773]
D(LOG(CPI(-4)))	0.12	0.10	-0.06	-3.24	-1.29	-1.23
	[1.12937]	[0.27743]	[-1.41694]	[-0.99074]	[-1.70037]	[-0.17029]
D(LOG(CPI(-5)))	0.27	0.65	-0.07	-3.85	1.72	-6.21
	[2.56194]	[1.86560]	[-1.56988]	[-1.17914]	[2.26499]	[-0.86045]
D(LOG(CPI(-6)))	0.08	0.25	-0.21	-8.75	-0.35	6.30
	[0.70145]	[0.66980]	[-4.68603]	[-2.49809]	[-0.42891]	[0.81349]
D(LOG(NEER(-1)))	0.08	0.27	-0.01	0.03	-0.19	-4.52
	[2.06596]	[2.26366]	[-0.68692]	[0.03031]	[-0.75057]	[-1.83582]
D(LOG(NEER(-2)))	-0.06	0.00	0.00	-0.44	-0.35	-1.51
	[-1.67642]	[-0.01448]	[-0.21442]	[-0.37133]	[-1.26930]	[-0.57785]
D(LOG(NEER(-3)))	0.03	0.01	-0.02	-0.82	-0.37	-1.17
	[0.73836]	[0.08678]	[-1.16570]	[-0.76784]	[-1.50564]	[-0.49629]
D(LOG(NEER(-4)))	-0.04	0.14	-0.02	-0.26	0.01	-1.12
	[-1.17743]	[1.22042]	[-1.15038]	[-0.24140]	[0.03761]	[-0.46636]
D(LOG(NEER(-5)))	-0.05	0.08	0.01	-0.80	-0.01	0.04
	[-1.44966]	[0.66336]	[0.37699]	[-0.74863]	[-0.04859]	[0.01773]
D(LOG(NEER(-6)))	-0.05	0.02	0.01	0.13	0.28	4.86
	[-1.37248]	[0.17042]	[0.44268]	[0.12657]	[1.17506]	[2.12925]
D(LOG(FCPI(-1)))	0.31	-0.45	0.24	2.71	1.26	-10.62
	[0.85002]	[-0.37910]	[1.62241]	[0.24178]	[0.48599]	[-0.42861]

D(LOG(FCPI(-2)))	0.46	0.06	0.27	23.54	6.72	1.83
	[1.28016]	[0.05109]	[1.90921]	[2.16206]	[2.66081]	[0.07610]
D(LOG(FCPI(-3)))	-0.05	-0.18	0.08	-3.90	3.52	45.46
	[-0.14383]	[-0.15000]	[0.51925]	[-0.34611]	[1.35030]	[1.82738]
D(LOG(FCPI(-4)))	0.30	-2.20	0.14	18.39	4.67	36.63
	[0.80682]	[-1.81875]	[0.93936]	[1.61098]	[1.76563]	[1.45198]
D(LOG(FCPI(-5)))	0.11	-1.07	-0.16	-5.80	1.68	-19.95
	[0.29522]	[-0.89120]	[-1.06373]	[-0.51241]	[0.64102]	[-0.79710]
D(LOG(FCPI(-6)))	1.33	-0.42	0.31	12.22	0.76	-3.19
	[3.93307]	[-0.38790]	[2.34101]	[1.18138]	[0.31528]	[-0.13970]
D(LOG(OP(-1)))	0.01	-0.01	0.01	0.17	0.07	0.51
	[1.50403]	[-0.75896]	[4.49186]	[1.13382]	[2.02107]	[1.54571]
D(LOG(OP(-2)))	0.00	-0.05	0.00	-0.04	-0.05	0.03
	[0.18520]	[-2.73140]	[1.05922]	[-0.28249]	[-1.40153]	[0.07965]
D(LOG(OP(-3)))	0.02	-0.04	0.00	0.18	-0.08	-0.73
	[2.93726]	[-2.02573]	[0.09973]	[1.11242]	[-1.96856]	[-2.00844]
D(LOG(OP(-4)))	0.01	-0.03	0.00	-0.12	-0.12	-1.33
	[1.97312]	[-1.44951]	[-0.60470]	[-0.69263]	[-3.10971]	[-3.48400]
D(LOG(OP(-5)))	0.01	0.02	0.00	-0.01	-0.02	-0.76
	[1.75807]	[1.20772]	[-0.71627]	[-0.07667]	[-0.44925]	[-1.90070]
D(LOG(OP(-6)))	-0.02	0.01	-0.01	-0.29	-0.07	0.05
	[-2.82726]	[0.77286]	[-2.49210]	[-1.78385]	[-1.82963]	[0.13292]
D(LOG(DC(-1)))	0.03	-0.03	0.01	0.60	0.14	-3.19
	[1.83282]	[-0.57904]	[1.54854]	[1.10074]	[1.12854]	[-2.65407]
D(LOG(DC(-2)))	0.04	-0.04	0.00	-0.04	-0.13	-0.48
	[2.25917]	[-0.73314]	[-0.41237]	[-0.07436]	[-1.02949]	[-0.41681]
D(LOG(DC(-3)))	0.02	-0.08	0.00	-0.04	0.09	0.15
	[1.44185]	[-1.39386]	[0.31054]	[-0.08023]	[0.76183]	[0.12882]
D(LOG(DC(-4)))	0.03	-0.09	-0.01	0.07	0.04	-0.23
	[1.56019]	[-1.62650]	[-0.80870]	[0.12722]	[0.31770]	[-0.20681]
D(LOG(DC(-5)))	0.01	-0.09	0.00	0.15	-0.22	-1.54
	[0.82872]	[-1.66051]	[-0.52447]	[0.29292]	[-1.81110]	[-1.35711]

D(LOG(DC(-6)))	0.05	-0.10	0.01	0.66	-0.07	-3.40
	[2.69507]	[-1.81429]	[1.72430]	[1.28311]	[-0.54891]	[-3.00240]
D(LOG(GV(-1)))	0.00	0.02	0.00	-0.18	0.00	-0.82
	[-1.96784]	[2.90013]	[-1.76320]	[-2.51837]	[0.26120]	[-5.26847]
D(LOG(GV(-2)))	0.00	0.02	0.00	-0.16	0.02	-0.62
	[-0.86459]	[2.32414]	[-0.97935]	[-1.91135]	[1.09649]	[-3.31981]
D(LOG(GV(-3)))	0.00	0.01	0.00	-0.05	0.04	-0.46
	[-0.78448]	[0.92456]	[-0.14636]	[-0.62187]	[1.95116]	[-2.45749]
D(LOG(GV(-4)))	0.00	0.00	0.00	-0.04	-0.01	-0.58
	[-0.57197]	[0.56122]	[-0.44714]	[-0.43108]	[-0.27573]	[-3.14004]
D(LOG(GV(-5)))	0.00	0.01	0.00	-0.03	0.01	-0.48
	[0.00635]	[1.22531]	[-0.54183]	[-0.37632]	[0.38917]	[-2.77670]
D(LOG(GV(-6)))	0.00	0.01	0.00	-0.05	0.01	-0.19
	[-0.56546]	[2.08227]	[-1.12089]	[-0.93463]	[0.81428]	[-1.48418]
C	-0.01	0.02	0.00	-0.16	-0.05	-0.07
	[-2.69949]	[1.52834]	[0.09130]	[-1.64329]	[-2.48338]	[-0.31258]
R-squared	0.78	0.50	0.75	0.47	0.60	0.67
Adj. R-squared	0.65	0.21	0.59	0.15	0.36	0.48
Sum sq. resids	0.00	0.00	0.00	0.41	0.02	2.02
S.E. equation	0.00	0.01	0.00	0.08	0.02	0.18
F-statistic	5.90	1.70	4.91	1.48	2.52	3.46
Akaike AIC	-8.72	-6.38	-10.58	-1.89	-4.81	-0.30
Schwarz SC	-7.73	-5.39	-9.59	-0.90	-3.82	0.69
Mean dependent	0.00	0.00	0.00	0.01	0.01	0.01
S.D. dependent	0.00	0.01	0.00	0.09	0.02	0.25

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic credit, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 4

Saudi Arabia (VECM)

Vector Error Correction Estimates						
Sample (adjusted): 2000M07 2008M8						
Included observations: 98 after adjustments						
t-statistics in [ ]						
Cointegrating Eq:	CointEq1					
LOG(CPI(-1))	1.00					
LOG(NEER(-1))	0.34					
	[9.97869]					
LOG(FCPI(-1))	-0.46					
	[-1.18152]					
LOG(OP(-1))	-0.11					
	[-3.54424]					
LOG(DC(-1))	0.06					
	[5.36499]					
LOG(GV(-1))	0.10					
	[3.20618]					
@TREND(00M01)	0.00					
	[1.44591]					
C	-5.23					
Error Correction:	D(LOG(CPI))	D(LOG(NEER))	D(LOG(FCPI))	D(LOG(OP))	D(LOG(DC))	D(LOG(GV))
CointEq1	0.26	-0.51	-0.06	-0.82	-3.22	0.52
	[4.88592]	[-2.44076]	[-2.52317]	[-0.49020]	[-0.99847]	[0.49318]
D(LOG(CPI(-1)))	-0.28	0.72	0.18	2.75	3.73	-1.83
	[-1.88545]	[1.21696]	[2.94198]	[0.58732]	[0.41419]	[-0.61726]
D(LOG(CPI(-2)))	-0.22	0.95	0.05	3.74	-4.07	-2.01
	[-1.54068]	[1.70098]	[0.84971]	[0.84432]	[-0.47877]	[-0.71999]

D(LOG(CPI(-3)))	-0.19	0.64	0.23	10.74	9.86	-1.12
	[-1.31629]	[1.11670]	[3.76163]	[2.35880]	[1.12788]	[-0.39116]
D(LOG(CPI(-4)))	-0.24	0.35	0.05	-2.86	-7.64	0.09
	[-1.59371]	[0.58955]	[0.82795]	[-0.60433]	[-0.83845]	[0.02966]
D(LOG(CPI(-5)))	-0.34	-0.43	0.14	8.19	-1.33	0.89
	[-2.41852]	[-0.78068]	[2.36963]	[1.86175]	[-0.15742]	[0.32157]
D(LOG(NEER(-1)))	-0.05	0.37	-0.01	-0.02	-2.59	-0.34
	[-1.66376]	[3.19413]	[-0.82242]	[-0.02585]	[-1.47989]	[-0.59204]
D(LOG(NEER(-2)))	-0.03	-0.09	0.05	1.95	2.86	0.14
	[-1.12838]	[-0.80071]	[4.16125]	[2.11332]	[1.60986]	[0.23438]
D(LOG(NEER(-3)))	-0.02	-0.07	-0.01	0.20	-1.23	0.67
	[-0.56849]	[-0.62413]	[-0.82623]	[0.21399]	[-0.67975]	[1.12414]
D(LOG(NEER(-4)))	-0.04	0.09	0.00	0.35	-1.12	-0.91
	[-1.64602]	[0.81423]	[0.31972]	[0.42145]	[-0.69561]	[-1.70535]
D(LOG(NEER(-5)))	-0.04	0.00	0.02	0.29	2.43	-0.04
	[-1.52106]	[0.00253]	[1.66388]	[0.35668]	[1.57529]	[-0.08036]
D(LOG(FCPI(-1)))	0.61	1.37	0.23	-10.34	2.79	-7.15
	[1.95425]	[1.11299]	[1.73436]	[-1.05195]	[0.14781]	[-1.15263]
D(LOG(FCPI(-2)))	0.08	1.71	-0.11	-0.56	-35.85	3.37
	[0.25127]	[1.36761]	[-0.81420]	[-0.05593]	[-1.87519]	[0.53685]
D(LOG(FCPI(-3)))	0.34	-0.27	0.29	-2.99	25.22	3.49
	[1.11359]	[-0.22214]	[2.24887]	[-0.31115]	[1.36499]	[0.57540]
D(LOG(FCPI(-4)))	-0.29	-1.02	-0.24	-10.11	-27.53	1.31
	[-0.90118]	[-0.81161]	[-1.78708]	[-1.00621]	[-1.42642]	[0.20572]
D(LOG(FCPI(-5)))	0.45	0.86	-0.08	-16.56	-25.61	-3.49
	[1.50524]	[0.72860]	[-0.65975]	[-1.75258]	[-1.41134]	[-0.58449]
D(LOG(OP(-1)))	0.02	-0.05	0.00	-0.09	0.05	0.66
	[3.27189]	[-1.82571]	[-0.41760]	[-0.43987]	[0.12427]	[4.80825]
D(LOG(OP(-2)))	0.02	-0.08	-0.01	-0.41	-0.18	0.59

	[2.25641]	[-2.60962]	[-1.77327]	[-1.79124]	[-0.40488]	[4.04598]
D(LOG(OP(-3)))	0.01	-0.05	-0.01	-0.25	-0.34	0.36
	[1.27756]	[-1.61016]	[-2.54540]	[-1.06671]	[-0.76143]	[2.48587]
D(LOG(OP(-4)))	0.01	-0.03	-0.01	-0.37	-0.31	0.11
	[1.36963]	[-1.28001]	[-2.49006]	[-1.83425]	[-0.78214]	[0.87731]
D(LOG(OP(-5)))	0.00	0.01	0.00	0.18	-0.12	0.19
	[1.01832]	[0.63437]	[-1.47402]	[1.17068]	[-0.39484]	[1.95380]
D(LOG(DC(-1)))	-0.02	0.03	0.00	-0.03	-2.54	-0.13
	[-3.67946]	[1.68039]	[-0.03038]	[-0.21502]	[-8.33643]	[-1.25400]
D(LOG(DC(-2)))	0.00	-0.01	0.00	0.14	0.62	-0.06
	[0.14962]	[-0.41702]	[1.11652]	[0.63088]	[1.46603]	[-0.41599]
D(LOG(DC(-3)))	-0.01	0.01	-0.01	-0.10	0.66	0.02
	[-0.75830]	[0.52637]	[-1.96983]	[-0.48841]	[1.64750]	[0.16851]
D(LOG(DC(-4)))	-0.01	0.02	0.01	0.41	0.10	0.05
	[-1.90154]	[0.64523]	[2.70855]	[1.90658]	[0.25234]	[0.40395]
D(LOG(DC(-5)))	-0.01	-0.06	0.01	0.21	0.06	0.22
	[-2.03334]	[-1.93546]	[1.92266]	[0.89466]	[0.12572]	[1.52923]
D(LOG(GV(-1)))	-0.02	0.07	0.01	0.23	0.23	-0.83
	[-2.44120]	[2.16053]	[1.67207]	[0.92722]	[0.48529]	[-5.36529]
D(LOG(GV(-2)))	-0.01	0.00	0.01	0.44	0.39	-0.37
	[-1.19661]	[0.12161]	[2.19415]	[1.69027]	[0.77056]	[-2.23435]
D(LOG(GV(-3)))	0.00	0.01	0.00	0.38	-0.13	0.04
	[-0.23956]	[0.31509]	[1.51265]	[1.60489]	[-0.29749]	[0.23589]
D(LOG(GV(-4)))	0.00	-0.03	0.01	0.08	0.03	-0.05
	[0.51296]	[-0.99705]	[2.00691]	[0.39084]	[0.07105]	[-0.35980]
D(LOG(GV(-5)))	0.00	0.00	0.00	0.10	-0.01	0.00
	[0.71363]	[-0.00132]	[-1.05783]	[0.66194]	[-0.03594]	[-0.02240]
C	0.00	-0.01	0.00	0.11	0.18	0.02
	[-0.89107]	[-2.13414]	[3.74001]	[2.62317]	[2.11312]	[0.59752]
R-squared	0.72	0.48	0.67	0.42	0.80	0.65
Adj. R-squared	0.59	0.24	0.51	0.15	0.71	0.49

Sum sq. resids	0.00	0.01	0.00	0.36	1.31	0.14
S.E. equation	0.00	0.01	0.00	0.07	0.14	0.05
F-statistic	5.48	1.99	4.23	1.55	8.51	4.03
Akaike AIC	-9.03	-6.28	-10.76	-2.13	-0.82	-3.05
Schwarz SC	-8.19	-5.43	-9.92	-1.29	0.02	-2.20
Mean dependent	0.00	0.00	0.00	0.01	-0.03	0.01
S.D. dependent	0.00	0.01	0.00	0.08	0.26	0.06

Note: CPI = Consumer price index, NEER = Nominal effective exchange rate, FCPI = Trading partner consumer price index, OP = Oil price, DC = Domestic credit, GV = Government spending, D = first difference. Lags are selected based on the information criterion.

Table: 5

Residual Serial Correlation LM Tests

	Country							
Lags	**Bahrain**		**Kuwait**		**Oman**		**Saudi Arabia**	
	LM Statistics	P-Value	LM Statistics	P-Value	LM Statistics	P-Value	LM Statistics	P-Value
1	38.08	0.38	41.04	0.26	39.56	0.31	40.15	0.29
2	44.98	0.14	33.94	0.57	28.77	0.80	25.34	0.91
3	40.84	0.27	36.60	0.44	29.03	0.79	48.76	0.08
4	50.49	0.06	41.46	0.24	29.93	0.75	44.30	0.16
5	46.95	0.10	30.34	0.73	26.54	0.88	32.03	0.66
6	22.73	0.96	20.36	0.98	25.06	0.91	34.72	0.53
7	50.86	0.05	46.25	0.12	24.20	0.93	41.63	0.24
8	26.48	0.88	19.47	0.99	25.70	0.90	38.38	0.36
9	30.22	0.74	36.77	0.43	46.96	0.10	40.11	0.29
10	35.28	0.50	30.67	0.72	39.29	0.32	32.00	0.66

11	31.53	0.68	37.62	0.39	44.51	0.16	31.62	0.68
12	48.76	0.08	43.51	0.18	46.08	0.12	50.86	0.05

Table: 6

Normality Test Joint (Jarque-Bera)

Country							
Bahrain		**Kuwait**		**Oman**		**Saudi Arabia**	
Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value
36.1	0	233.53	0.01	71.58	0.07	214.89	0.05

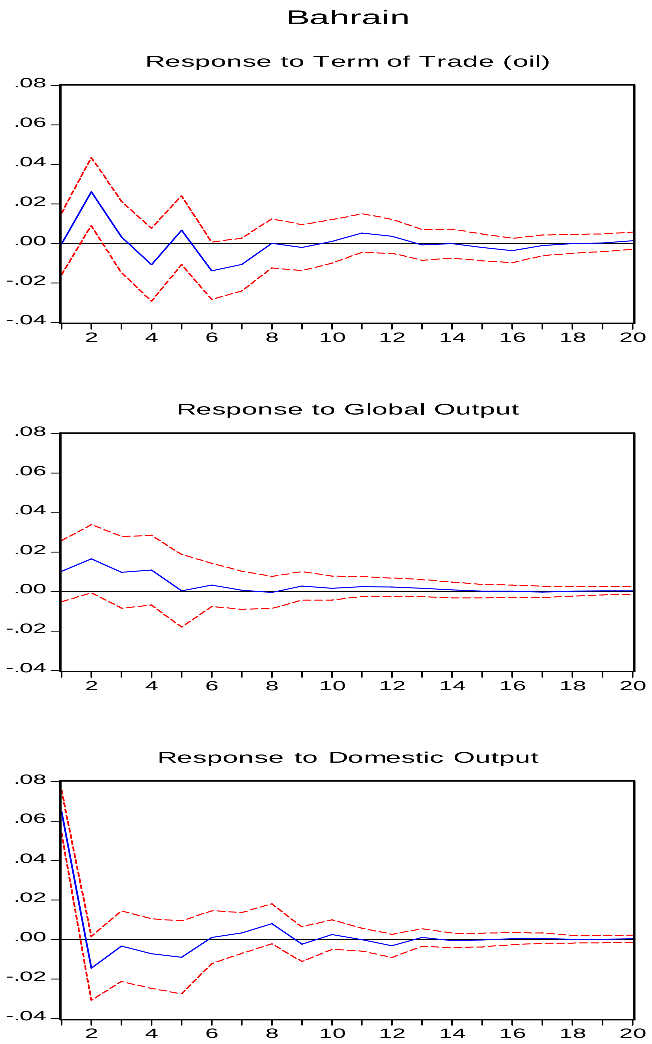
Table: 7

Heteroscedasticity Tests

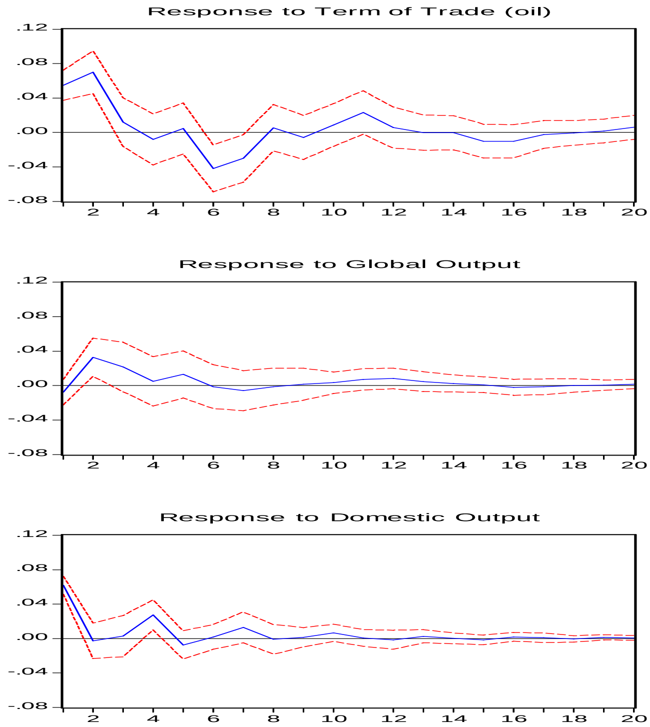
Country							
Bahrain		**Kuwait**		**Oman**		**Saudi Arabia**	
Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value	Chi-Square Statistics	P-Value
584.87	0.12	830.77	0.2	1585.96	0.28	1319.45	0.36

Appendix: (10)

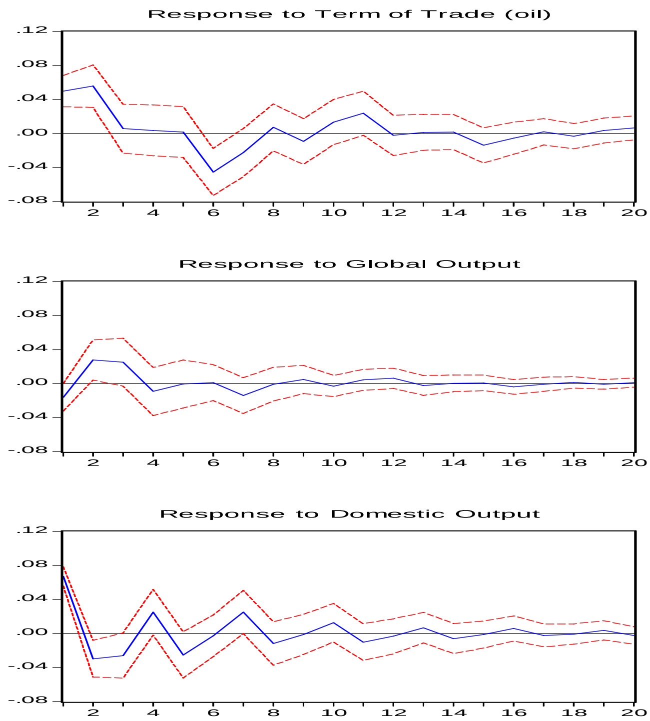
(Impulse Response with US Zone)


Bahrain
Response to Term of Trade (oil)
.08
.06
.04
.02
.00
-.02
-.04
2 4 6 8 10 12 14 16 18 20
Response to Global Output
.08
.06
.04
.02
.00
-.02
-.04
2 4 6 8 10 12 14 16 18 20
Response to Domestic Output
.08
.06
.04
.02
.00
-.02
-.04
2 4 6 8 10 12 14 16 18 20

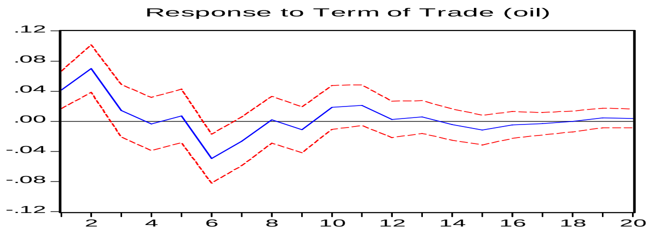
Kuwait

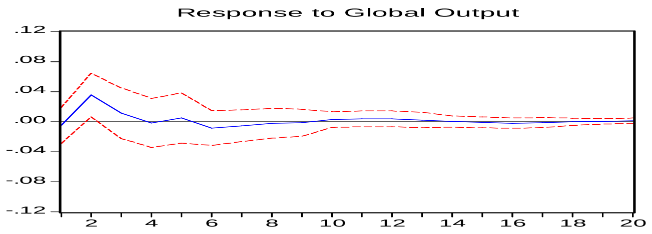

Response to Term of Trade (oil)
.12
.08
.04
.00
-.04
-.08
2 4 6 8 10 12 14 16 18 20
Response to Global Output
.12
.08
.04
.00
-.04
-.08
2 4 6 8 10 12 14 16 18 20
Response to Domestic Output
.12
.08
.04
.00
-.04
-.08
2 4 6 8 10 12 14 16 18 20

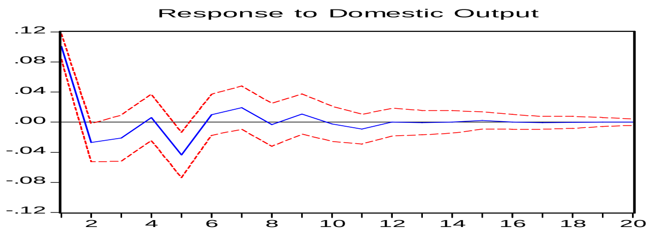
Oman


Response to Term of Trade (oil)
.12
.08
.04
.00
-.04
-.08
2 4 6 8 10 12 14 16 18 20
Response to Global Output
.12
.08
.04
.00
-.04
-.08
2 4 6 8 10 12 14 16 18 20
Response to Domestic Output
.12
.08
.04
.00
-.04
-.08
2 4 6 8 10 12 14 16 18 20

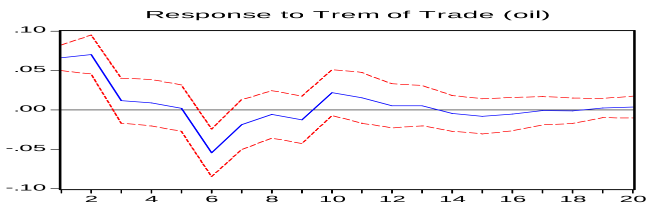
Qatar

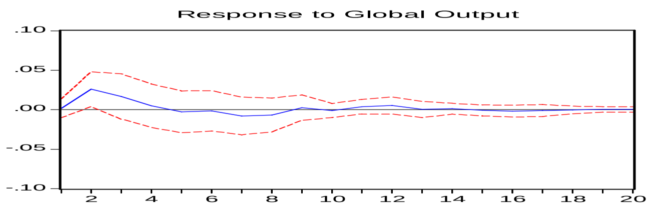


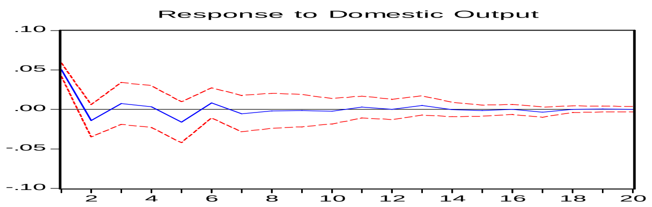


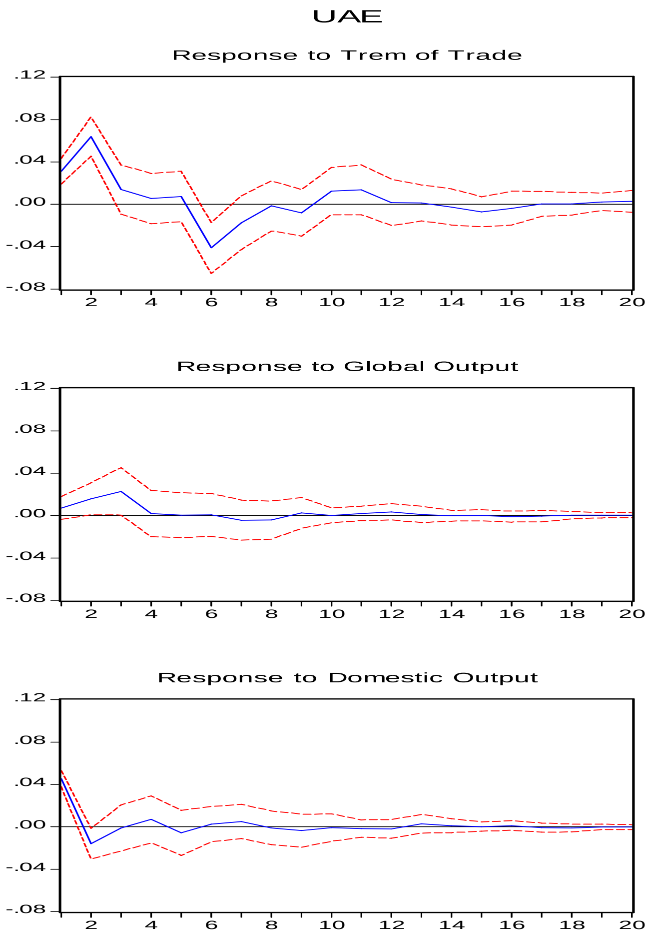


Saudi Arabia

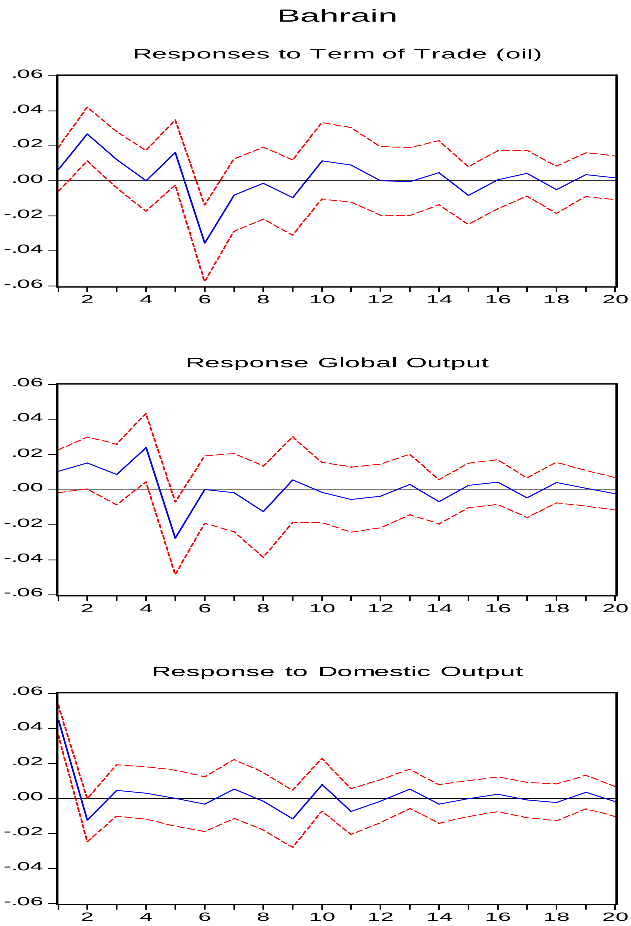






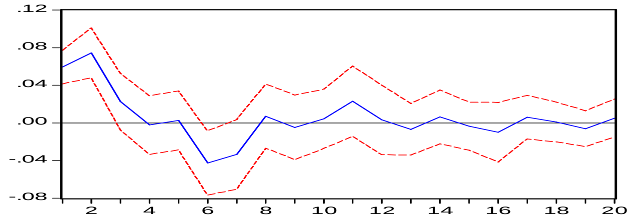

UAE
Response to Trem of Trade
.12
.08
.04
.00
-.04
-.08
2
4
6
8
10
12
14
16
18
20
Response to Global Output
Response to Domestic Output

(Impulse Responses with Euro Zone)

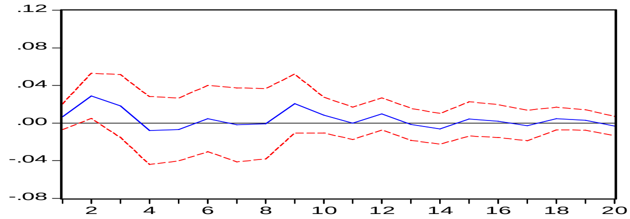


Kuwait

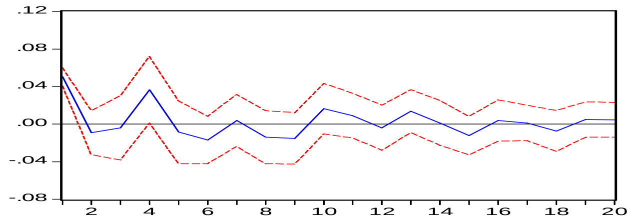
Response to Trem of Trade (oil)



Response to Global Output

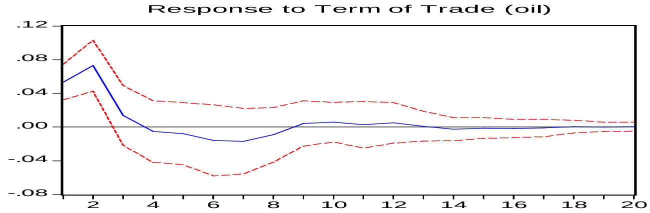


Response to Domestic Output

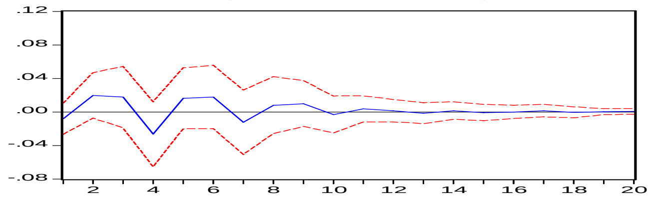


Oman

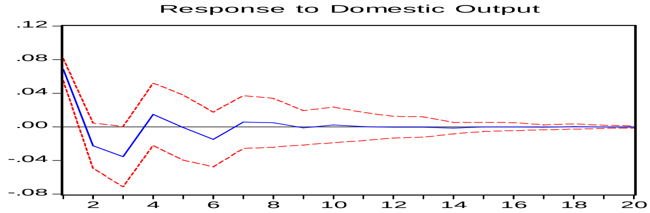
Response to Term of Trade (oil)



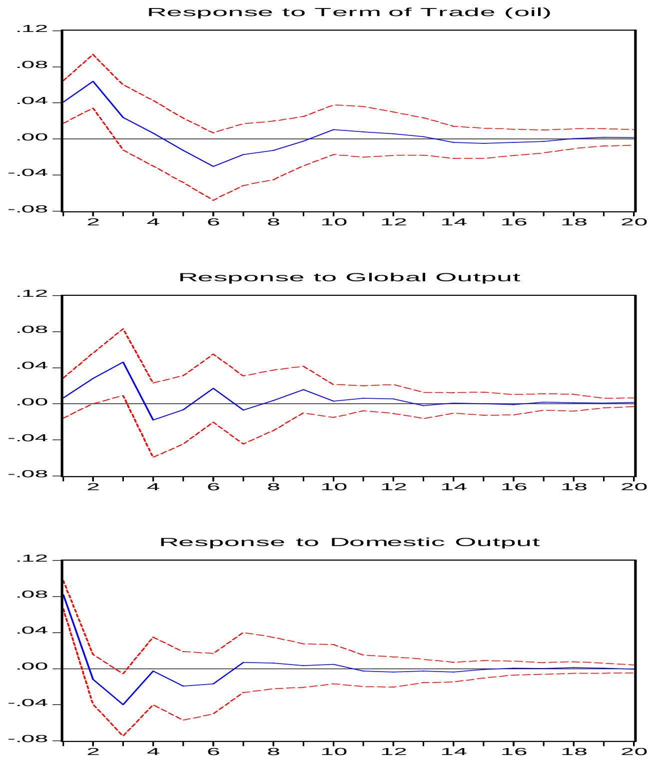
Response to Global Output



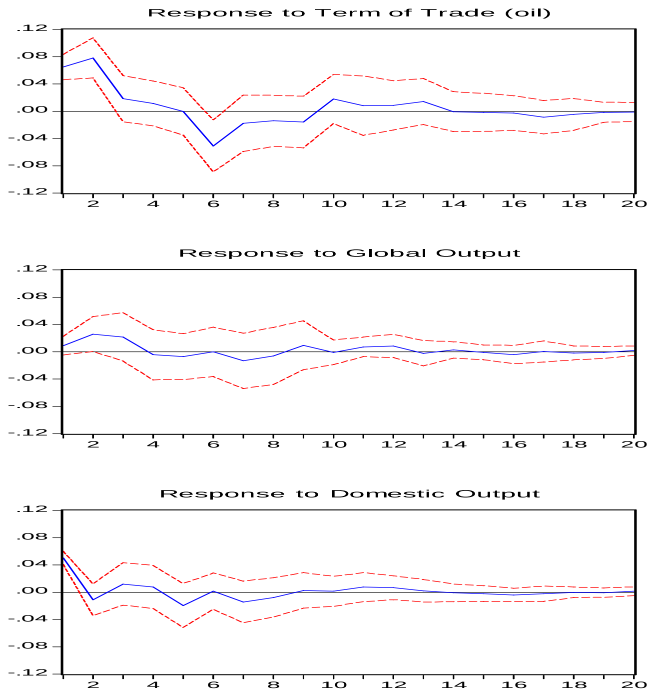
Response to Domestic Output



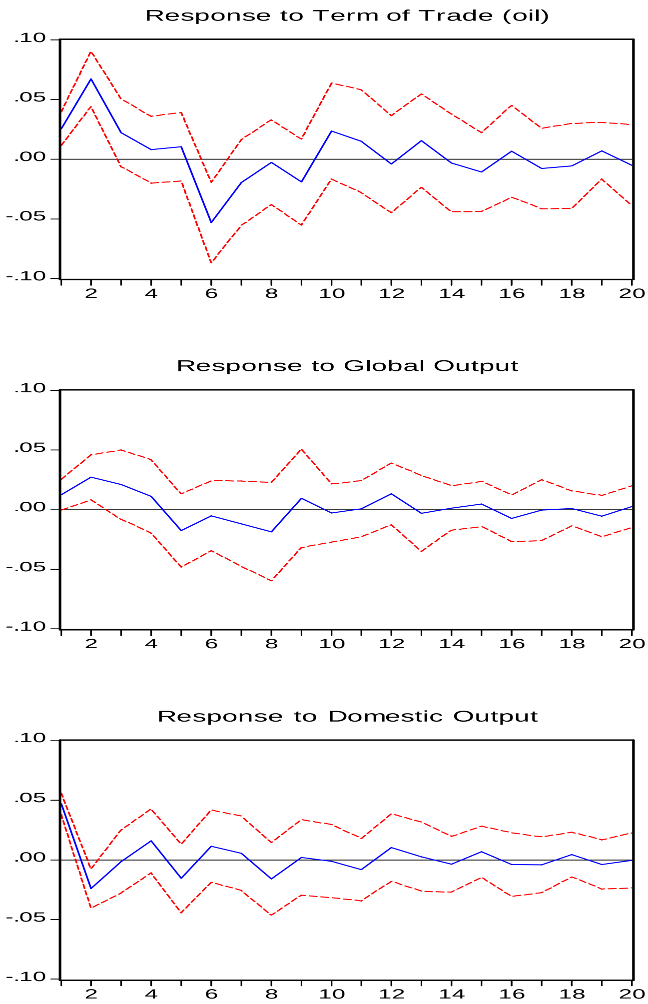
Qatar



Saudi Arabia



UAE


Response to Term of Trade (oil)
.10
.05
.00
-.05
-.10
2 4 6 8 10 12 14 16 18 20
Response to Global Output
.10
.05
.00
-.05
-.10
2 4 6 8 10 12 14 16 18 20
Response to Domestic Output
.10
.05
.00
-.05
-.10
2 4 6 8 10 12 14 16 18 20