On The Road to Monetary Union – Do Arab Gulf Cooperation Council Economies React in the same way to United States' Monetary Policy Shocks?

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Abstract

This paper empirically estimates the responses of inflation and non-oil output growth from Arab Gulf Cooperation Council (AGCC) Countries to monetary policy shocks from the United States (US) in order to determine whether there is evidence to support the US dollar as the anchor for the proposed unified currency. For this, a structural vector autoregression identified with short-run restrictions was employed for each country with fund rate as US monetary policy instrument, non-oil output growth, and inflation. The main results that are of interest to decision makers suggest that (i) with respect to inflation, AGCC countries show synchronized responses to monetary policy shocks from the US and these responses are similar to US own inflation; (ii) with respect to non-oil output growth, there is no clear indication that US monetary policy can do as good of a job for AGCC countries as it has done at home. Therefore, importing monetary policy from the United States via a dollar peg may guarantee stable inflation for AGCC countries but not necessarily stable non-oil output growth. To the extent that the non-oil output response is taken seriously and there are concerns over the dollar's ability to perform its role as a store of value, a basket peg with both the US dollar and the Euro may be a sound alternative as confirmed by the variance decomposition analysis of our augmented SVAR with a proxy for the European short-term interest rate.

Keywords: AGCC Countries, US monetary policy shock, monetary union, currency peg, SVARs

JEL Classification: C32, E52, F15

On The Road To Monetary Union – Do Arab Gulf Cooperation Council Economies React in the same way to United States Monetary Policy Shocks?

Introduction

The objective of this paper is to determine how Arab Gulf Cooperation Council (hereafter AGCC) economies, namely, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia , and United Arab Emirates (UAE) respond to monetary policy shocks from the United States (US) as they are heading towards the adoption of a single currency in 2010. Among the four alternatives available: (a) free float; (b) peg to a basket; (c) peg to Euro; or (d) peg to US Dollar, the AGCC has opted for the latter with the possibility to reconsider later. The issue of currency arrangement is not without controversies. There is a huge literature and a continuous debate on the choice of exchange rate regime and on dollarization of economies. Most notably, is the seminal contribution of Mundell (1961) on optimum currency area (OCA) along with subsequent works by McKinnon (1963), Kenen (1969), and Tower and Willet (1976) that stress the importance of relative economic sizes, labor mobility, degree of openness, trade concentration, and similarity of shocks for assessing the suitability of fixed, flexible exchange rate regimes, and prospective monetary unions. The determination of the degree of shocks symmetry across countries has been thus far the most popular criterion used in empirical works to evaluate OCAs. According to this approach, one needs to test whether aggregate demand and aggregate supply shocks are correlated across member countries, not with a third party, to conclude whether a monetary union is feasible or not, ceteris paribus. In this paper, we take a slightly different, yet innovative, approach by investigating how each AGCC member country reacts to monetary policy shocks from the US to further justify their choice of the US dollar as the anchor for the new currency. It bears emphasizing that we are **not** looking at suitability of monetary union for GCC countries but rather at the suitability of the US Dollar as the proposed anchor for the new currency. Our hypothesis is that since the

dollar is already the denominated currency for the oil and gas portion of output of the AGCC countries traded in international markets, if the remaining portion of their economies characterized by non-oil GDP and the overall price levels respond in the same way to monetary policy shocks from the US as US prices and output do, the dollar can then be seen as fulfilling an important role for both sectors of the AGCC economies.

There exist a number of studies on OCA in the AGCC countries that follow the footprints of previous studies for European Union and typically look at suitability of monetary union in terms of costs and benefits for each country (Sturm and Siegfried, 2005; Jadresic, 2002; Iqbal and Fasano, 2003; Fasano and Iqbal, 2002; Oman Economic Review, 2002; Ibrahim, 2004, and Belkacem and Imad, 2002). These studies draw mainly on convergence criteria focusing on comparisons of inflation, real GDP growth, fiscal imbalances, tariff structures, current accounts, debt to GDP ratio, non-oil fiscal deficits and movement in real effective exchange rate across countries. Their main objectives are to determine whether a currency union is justifiable since trade among member countries is relatively small and there is little or no volatility in the fluctuations of their currencies. The most comprehensive study thus far on monetary integration in the GCC countries is Sturm and Siegfried (2005) but does not offer further convincing evidence to peg the new currency to the US dollar beyond the already observed commonality in the current choice of a fixed exchange rate to the dollar by five of the six countries.

Some studies have attempted to shed light on the choice of anchor by evaluating different alternatives. Jadresic (2002) uses descriptive statistics to show that a common currency between AGCC countries is a worthwhile endeavor in terms of economic efficiency, regional integration, and expansion of the non-oil sector, if implemented properly. In his view, for this

initiative to work, it must accompany political integration, freer intraregional trade and investment, and agreements on policy frameworks to foster economic stability. In terms of the choice of exchange rate arrangement for the new currency, Jadresic's cost and benefit analysis shows that a peg to the dollar is the natural choice since all the countries but Kuwait had their national currencies pegged to the US Dollar and moreover oil output, which represents a significant portion of their Gross Domestic Product (GDP) is already traded in the international market in US dollar. Jadresic finds a peg to the euro is the second-best alternative among all others, peg to a basket and free float. In line with Jadresic (2002), Laabas and Limam (2002) acknowledge that there are potential benefits for AGCC countries to grasp in a monetary union, despite what macroeconomic fundamentals show, if they are determined to lift restrictions on free movement of goods and factors of production. Their analysis, however, is mute over the choice of exchange rate regime beyond the currency union

Abed, Erbas, and Guerami (2003), by contrast, use regression analysis to compare a dollar peg to a dollar-euro basket peg of the new GCC currency in terms of their ability to warrant exchange rate and trade stability. Their results show that the alternative dollar-euro basket peg does not dominate the existing dollar peg in most GCC countries. The obvious deduction coming from this study is that there is no potential loss for AGCC countries to adopt either of these arrangements for the new currency. Abed et al., however, does not inform how the AGCC countries react to shocks from either the US or the European Union to justify the use of the dollar and/or the euro as the anchor for the new currency The present paper is a natural complement to all previous studies on monetary integration for AGCC countries.

What seems to be missing from the existing literature is how AGCC countries react to monetary policy shocks from the US and whether the responses are similar across member countries. There are a number of reasons why this issue is important: (a) the large-small country hypothesis postulates that US as a large country does not take into consideration non-oil shocks that occur in small countries when setting monetary policy to alter the path of output, employment, and inflation at home; (b) most of the countries have made commitments to further diversify their economies and reduce the share of oil output to GDP, thereby making aggregate demand and supply shocks more recurrent; (c) import and exports to US respectively represent 9 and 12 percent of AGCC's total output, making the US a negligible partner in comparison to the European Union (EU) where these figures are 32 and 11 percent (Sturm and Siegfried, 2005, p. 14); (d) the US dollar has been depreciating against major alternative currencies, which reduces its importance as a store of value. All these point to the choice of the US dollar as the anchor for the new currency for perhaps political reasons and for the importance of the oil and gas sector, which carries less weight for Bahrain since its oil reserves are expected to deplete by 2011 and gas reserves by 2012. It is therefore a natural question to ask whether AGCC countries react in the same fashion to exogenous monetary policy shocks from the US. Our contribution is that if we isolate the oil sector of the economy and concentrate on the non-oil sector, we can then trace the responses of this sector for each country to a once-and-for-all US monetary policy shock to determine whether there is any synchronization, which could further justify the use of the US dollar as the anchor currency.

There are actually three pieces of information that are crucial in assessing the macroeconomic situation of a country or a group of countries: inflation, unemployment, and real output growth (Mankiw, 2001). The puzzle that we face with the AGCC countries is how to

disentangle prosperity that comes from gifts of nature and prosperity that comes from human contributions. First of all, oil represents a large portion of their output and the price of oil along with the demand for oil has been increasing at an exponential rate (though, not lately). Using overall output growth to understand the effect of US monetary policy shocks might be misleading, because by setting monetary policy, the US alters the relative price of the US dollar in which oil is already quoted. The response of output growth to monetary policy shock from the US might be overshadowed by the oil components of AGCC's output. Second, labor is mostly imported from foreign countries and data on unemployment are not available, thereby making it difficult to grasp the full effect of monetary policy imported from the US, or to even talk about prosperity. We therefore consider two key economic variables: non-oil output and inflation.

Our results show that on average inflation in each AGCC country react similarly to US monetary policy shocks and these responses are in line with the responses of US own inflation. With respect to non-oil GDP growth, Saudi Arabia and Oman display an output puzzle and show similar responses to US monetary policy shocks but these responses are opposite to US own output and other AGCC members. Bahrain, Kuwait, and Qatar react similarly to US monetary policy shocks and their responses are synchronized with US own output responses. The UAE appears to be in a league on its own. At shorter horizons, its responses are close to Bahrain, Kuwait and Qatar, but at longer horizons, they are close to Saudi Arabia and Oman. Therefore, whether monetary policy that has worked for US in terms of output will also work for the AGCC as an economic bloc depends on whether the combined responses of non-oil output growth from Bahrain, Kuwait, Qatar, and the UAE (why not!) to US monetary policy shocks dominate Saudi Arabia's and Oman's combined

responses to the same. This might be a long stretch since Saudi Arabia has the largest economy of all AGCC countries.

Overall, from a non-oil output growth perspective, there may be adjustment costs or losses involved for the AGCC countries in using the US dollar as the anchor currency but these losses might be minimal or offset with fiscal adjustments and factor mobility that usually accompany monetary unions. From an inflation perspective, our research lends support to the view that a peg of the currency to the US dollar is suitable. Monetary policy in the US appears to have done the job at home and in the AGCC countries under the fixed exchange rate regime. However, care must be exercised! If the US dollar continues to depreciate against other major currencies, pegging the new currency to a basket might be a sound alternative. In the end, it is the relative magnitude of the two sectors of the new economic bloc that will determine whether a depreciation of the US dollar is beneficial or not. As it stands now, the non-oil sector accounts for approximately 54 percent of total AGCC output, hence, the basis for our recommendation.

The rest of the paper is organized as follows. Section 2 presents the underlying theory and SVAR methodology. Section 3 describes and analyzes the data in details. Section 4 discusses the empirical results and Section 5 concludes the paper.

Section 2 Theory and Methodology

The underlying theoretical framework of this paper is the basic Mundell-Fleming or IS-LM-BP model, with fixed exchange rate regime and perfect capital mobility for small open economies. Macroeconomic equilibrium occurs when the IS and LM Curves and the perfectly

elastic BP curve intersect at once, and domestic interest rate equals foreign interest rates and actual output, which may or may not be equal to potential output, is determined. Since this is a fixed-price model, nominal interest rate equals real interest rate. This model depicts an economy that is so small that, although it is being affected by what happens in the rest of the world, it does not really affect the outside world.

This paper uses the structural vector autoregression technique to uncover the dynamics of the AGCC economies as related to the influence of monetary policy in the United States. This methodology has been used extensively in the economic profession after Sims (1986) and Bernanke (1986) have used short-run restrictions and Blanchard and Quah (1989) have used long-run restrictions as a way to model the innovations using economic analysis in response to Cooley and Leroy's (1985) critique of Sims's (1980) unidentified VAR. Further improvement in the SVAR technique was brought about with the work of Gali (1992) that combines short- and long-run restrictions to identify their model. Our SVAR exposition follows closely Enders (2004).

Assuming Z_t is a vector containing the so-ordered variables (Fund rate = i_t, non-oil GDP growth = y_t, inflation = π_t) that are driven by the so-ordered structural innovations ε_t = (US monetary policy shock = ε_t^f, non-oil supply shock = ε_t^s, inflation shock = ε_t^i), which are assumed to follow a normal distribution with covariance matrix equal to the identity matrix, I. Simply put, $E(\varepsilon_t \varepsilon_t') = I$. Let $B(L)$ be the polynomial lag matrix. Hence, by ignoring the mean values, the system can be written

as:

$$B(L)Z_t = \varepsilon_t \qquad (1)$$

If $B(L)$ is invertible, a condition that holds if and only if the polynomial lag matrix of the reduced form model is invertible, then one can write the infinite Wold moving average $[MA(\infty)]$ of the structural system as:

$$Z_t = R(L)\varepsilon_t \qquad (2)$$

Where $R(L) = B(L)^{-1}$. However, since the structural model cannot be estimated because ε_t is not observable, one has to first estimate the reduced form model and transform its residuals in order to obtain ε_t. The reduced form VAR representation is as follows:

$$\psi(L)Z_t = e_t \qquad (3)$$

where $\psi(L) = \psi_0 + \psi_1 L + \psi_2 L^2 + ... + \psi_p L^p$; L is the lag-operator with $L^i Z_t = Z_{t-i}$, and ψ_0 is the identity matrix. e_t is the reduced-form residuals set with covariance matrix, Ω, being symmetric. In few words, $E(e_t e_t') = \Omega$. Assuming $\psi(L)$ is invertible, one can write the reduced-form MA(∞) representation as:

$$Z_t = C(L)e_t \qquad (4)$$

Where $C(L) = \psi(L)^{-1}$. Following Blanchard and Quah (1989), the relationship between the structural shocks and the reduced form shocks can be established by equating (2) and (4), the MA(∞) of both systems. It follows that:

$$R(L)\varepsilon_t = C(L)e_t \qquad (5)$$

Since $C(0)$ is equal to I and this equation holds for all t, it is straightforward that:

$$R(0)\varepsilon_t = e_t \qquad (6)$$

By squaring both sides and taking expectations, one finds that:

$$R(0)R(0)' = \Omega \qquad (7)$$

and by substituting (6) in (5):

$$R(L)\varepsilon_t = C(L)R(0)\varepsilon_t \qquad (8)$$

and by dividing both side of (8) by ε_t :

$$R(L) = C(L)R(0) \qquad (9)$$

Since Ω is symmetric, Equation (7) places $n(n + 1)/2[= 3(3 + 1)/2 = 6]$ restrictions on the elements of R(0), the additional $n(n - 1)/2[=3(3-1)/2=3]$ restrictions needed are taken from economic theory in order to fully identify $R(0)$. Knowledge of this matrix enables us to recover i) $R(L)$ given that $C(L)$ is already known from (4); and ii) ε_t from (6). Finally, the variance decomposition and the impulse responses analyses follow from (2).

We use short-run restrictions to just-identify the SVAR model as in Sims (1986). We assume that 1) the Fed Fund rate, as monetary policy instrument of the US as a large country, does not react in the short-run (if it reacts at all) to non-oil supply and inflation shocks originating in AGCC countries, seen as small countries; and 2) non-oil output growth responds to inflation shock with a one-year lag. The first restriction is in line with the small-large country hypothesis of the basic Mundell-Fleming model and is a standard theory in international economics. The second restriction might lend itself to criticisms but our objective is to account for the lag in production process that may arise when the economy suffers from either cost-push or demand-pull inflation. Since we are dealing with annual data, a one-period lag might appear to be long but there is no way around it.

Section 3 Data and Data Analysis

The annual data set used for the empirical analysis covers the period 1970 – 2006. The series include non-oil GDP at constant 1990 prices in US dollar calculated as the total value added of all sectors but mining and quarrying; GDP deflator with 1990 as base year due to unavailability of consumer price index (CPI); and Fed Fund rate. All but the fund rate were

taken from United Nations Statistical Databases – National Accounts Main Aggregates. The fund rate was taken from the website of the Federal Reserve Bank of St. Louis. The series were then tested for unit roots by using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests assuming both a trend and an intercept and a maximum lag truncation of 9 in accordance with the Schwarz information criterion, which is the default automatic selection in Eviews 5.1. Although some counterintuitive results have emerged from the unit root tests in Table 1, due to the trend in non-oil GDP of all countries, we have considered output and price variables in our model to be integrated of order 1 or non-stationary. The critical values are from MacKinnon (1996). In reference to the fund rate, we have no strong arguments to back up the non-stationarity, which implies that the series exhibit a clear tendency to increase or decrease over time or to revert to a given mean value. We follow Enders (2004, pp. 158-159) in assuming that the fund rate is stationary.

Table 1 about here

As a prelude to the empirical estimation, it is customary to look at the raw data in order to form an idea about the possible relationship among the variables. We carry out two types of analysis of the data: one on an aggregate-level basis and the other on a per-capita basis, which is included in Appendix A. On the basis of the aggregate-level data, Figures 1 and 2 respectively display the paths of non-oil GDP and GDP deflator over time for all AGCC countries along with the US's. Non-oil Outputs as well as prices are synchronized among AGCC countries and with the US. There is even a tighter link between prices. The gap between AGCC's outputs and the US's in Figure 1 can be explained by the use of Real GDP for the US instead of non-oil output, which, in our view, is not necessary in this case. Since oil output is already being traded in US dollar, the share of the non-oil sector to total output is

crucial to understanding whether it even matters to look at the possibility of other currency arrangements or not. Figure 3 shows that non-oil GDP ranges from 40 percent in Qatar to almost 70 percent in Bahrain. Table 2 shows that for the AGCC as a block, non-oil GDP is around 54 percent of total GDP, which is considerable by all standards. Figure 3 conveys information about a deliberate initiative of the AGCC countries to reduce their dependence on oil revenue. Bahrain and Qatar have no other choices than to go along with nature's move. Bahrain' oil and gas reserves are expected to deplete by 2011 / 2012 while Qatar has seen its effort offset by new discoveries of natural gas. Table 2 provides further evidence that the share of non-oil output to GDP has become more and more stable over time as judged by the standard deviations.

Figure 1 about here

Figure 2 about here

Table 2 about here

Figure 3 about here

Table 3 compares the growth of the non-oil sector in AGCC countries with US GDP growth decade by decade and shows that on average AGCC countries have grown about 3 times faster than the overall US economy. However, when volatilities are considered, AGCC's non-oil sector is 4 times less stable than the US. Table 4 provides the breakdown on a country-by-country basis. The first Gulf war is definitely a contributing factor to volatility, with the standard deviation for Kuwait's output growth being 10 times or more higher than that of other AGCC countries. The 1980s was the only decade with negative growth rate coinciding with the debt crisis of 1982.

Table 3 about here

Table 4 about here

Inflation Performance of AGCC countries along with its link with US inflation and monetary policy is shown in Table 5. Starting the 1970s, average inflation in AGCC was 23 percent and 6.8 percent in the US, with a maximum average of 84.8 and 9.4 percent respectively. The Federal Reserve in the US responded by increasing the fund rate to a maximum of 12 percent in the 1970s and 17 percent in the 1980s to bring inflation down to an average of 4.8 percent in the 1980s with a peak of 9.4 percent occurring in 1981. The AGCC countries, with their currency pegged to the US$ and oil output traded in US dollar in the international market, had seen a drop in average inflation to 2.3 percent with a peak of 35.1. The worst inflation year was 1980 for all AGCC countries. Further tightening of monetary policy in the US brought inflation further down in both US and AGCC countries. We observe a resurgence of inflation in the 2000s in AGCC countries, which corresponds with a period of expansionary policy in the US to accommodate inverse supply and demand shocks, the war in Iraq, and post September 11 downturns. Though the rise in inflation might be due to economic boom stemming from reinvestment of oil revenue in infrastructure and repatriation of Middle-Eastern capital from the US and elsewhere, there seems to be a coincidence between monetary policy that has worked for the US and the resulting effects on the AGCC countries that have pegged their currencies to the dollar. Appendix A provides details about non-oil GDP per capita, which do not differ that much from our analysis on the level data. The data shows that AGCC economies are converging towards North American living standard. Whether the same social landscape is there is a totally different question, but income-wise each AGCC country has seen improvement in their standard of living over time due to the

multiplier effect of oil revenue investment. In sum, the data provides some insights about the relevance of monetary policy in the US for the AGCC countries.

Table 5 About here

Section 4 Empirical Results

This section presents the empirical results associated with the estimation of a just-identified trivariate SVAR for each AGCC country with 2 lags as suggested by the sequential modified LR test statistic at the 5 percent significance level.[1] We consider a lower-triangular structure $Z_t = [i_t, y_t, \pi_t]'$ implying that the instrument of monetary policy of the United States, i_t, is the most exogenous variable and does not respond contemporaneously to non-oil supply shocks from AGCC countries, the measure of real economic activity in terms of growth, y_t, can respond contemporaneously to both fund rate and real activity, whereas the measure of inflation, π_t, responds to all variables contemporaneously. It bears reiterating that the fund rate is the variable common to all the VARs estimated.

For comparison purposes, we also estimate a trivariate SVAR with 2 lags for the US using a lower-triangular ordering of the variables common to the literature, say, $W_t = [y_t, \pi_t, i_t]$, which implies that neither policy shock nor inflation shock from the US affects real economic activity contemporaneously, and policy shock does not produce contemporaneous effects on inflation. The last equation is referred to as a contemporaneous policy rule, which is standard in the literature. Our main goal is to determine whether the AGCC countries react similarly to monetary policy shocks from the US and whether the effects of US monetary policy at home

[1] We use that same lag length althroughout the paper because it is the lag length most suggested by other information criteria across models and also since we are endowed with annual data and want to avoid serious degrees of freedom problems, a lag length of 2 is the most sensible choice available.

can be compared to its effects abroad on the AGCC countries to justify the use of the dollar as anchor currency.

Since the impulse responses and standard errors are not valid if the reduced-form VAR is not stable, we test the stability of the parameters using the autoregressive roots. All roots are contained in the unit circle indicating the VARs satisfy the stability condition.[2] We summarize the empirical results in Figure 4 where the dotted lines are 95% confidence bands (analytical) and the solid lines are point estimates as follows:

Figure 4 about here

(1) With respect to inflation, the responses to US monetary policy shock (except for Qatar) are characterized by a price puzzle: an increase in US interest rate by 1-percentage point produces first an increase in inflation, rather than a decrease, that lasts about one period and thereafter decreases below the baseline for each country. This result is consistent with the effects of US contractionary monetary policy on inflation at home (see the bottom right panel of Figure 4) and the price puzzle is a frequent anomaly in VAR estimation for the US as documented in the literature (Sims, 1992; Christiano, Eichenbaum and Evans, 1999; Hanson, 2004; Giordani, 2004, and Leeper and Roush, 2003).

What Sims (1992) argues is that the central bank may have more information about future inflation that a simple VAR could adequately capture, and as a result, the price puzzle occurs. A way to remedy the problem is to include a commodity price index in the VAR to capture

[2]Due to space constraints, the estimation outputs such as the reduced-form VARs, the structural factorization, variance decomposition, responses of both output and inflation to own and each other's shocks are not supplied but are available upon request. They are not incorporated as an appendix either because they would render the paper bulky

enough additional information. To the extent that the price puzzle that emerges in our estimation is due to the use of GDP deflator instead of CPI, which is not available for the period considered, our paper provides evidence that monetary policy that works for the US might also work for the AGCC countries as group in terms of inflation. Table 6 showing the cross correlation of inflation supports our finding.

Table 6 about here

(2) With respect to non-oil output growth, we observe a dichotomy in terms of responses to US monetary policy shock: Bahrain, Kuwait, Qatar and UAE output growth show relatively similar patterns of responses to what would be anticipated for the US (a decline, as per bottom left panel of Figure 4) while Oman and Saudi Arabia display an output puzzle: an increase instead of a decrease in non-oil output growth as a result of contractionary monetary policy. UAE even displays an odd case; a decline in output almost similar to Bahrain, Kuwait, and Qatar and a tendency to return to the baseline similar to Saudi Arabia and Oman at longer horizons. Whether monetary policy from the US is able to smooth non-oil output in AGCC countries in the same fashion at home depends on the combined responses of Bahrain, Kuwait, Qatar, and UAE (perhaps) relative to the combined responses of Saudi Arabia and Oman. We believe this is a long stretch because Saudi Arabia is the largest economy of all AGCC countries. To this effect, we make a last attempt to shed light on this issue by estimating a SVAR with fund rate, average non-oil output growth, and average inflation rate for the AGCC Countries. The impulse responses in Figure 5 shows that it is the combined responses of Saudi Arabia and Oman with the output puzzle that dominate the other countries' responses to US monetary policy shock.

Figure 5 about here

A plausible explanation for the puzzle is that positive supply shocks due to reinvestment of oil revenue may in fact dominate the effects of the foreign monetary policy shocks on AGCC's outputs at shorter horizons. This is evident from the changing structure away from oil and the major build ups of infrastructure in the region. Sterne and Bayoumi (1993) obtained similar results for countries such as Ireland, Portugal, Greece, and Spain over the period 1960 – 1988 that have moved away from agriculture as the engine of their economies. Our paper therefore shows that monetary policy shocks from the US does not influence AGCC output growth in a way similar to US output growth. The weak link that characterizes the output data is also present in the cross correlation shown in Table 7.

Table 7 about here

Overall, our findings lend support to a synchronization of AGCC countries'inflation but not non-oil output growth to US monetary policy shocks, which partially qualify the US dollar as anchor currency for the new AGCC currency. Put differently, these results suggest that adjustment costs may be an issue. It is also the case that a continued depreciation of the US dollar might complicate things in the long-term. It might put the non-oil export sector of the group in a competitive position while the oil sector might suffer. At the end of the day, it is the relative magnitude of these two effects that will matter for the union, and this entirely depends on how fast the non-oil sector grows as a share of total output. If the situation calls for major concerns in the future, and even now, linking the new currency to a basket of currencies might be the best alternative. This is pretty much what the variance decomposition analysis of our augmented quadravariate SVAR suggests when we use the average of the

short-term interest rates of France and Italy as a proxy for the European short-term interest rate. The results are presented in Table 8. [3]

Table 8 About here

Table 8 shows that the portion of the variability in AGCC non-oil output that could be explained by the European short-term rate proxy is far greater than that of the US at all horizons. However, when we turn to the dynamics of inflation, the European effect is stronger for the first period only. Although US monetary policy shocks show a clear dominance, the proportion of variance in AGCC inflation that can be explained by European monetary policy shocks averages around 25 percent, which in our view is non-negligible. This result undeniably confirms our findings and further substantiates our recommendation that a basket peg with both the US dollar and the Euro might be a plausible alternative anchor for the AGCC currency.

[3] We estimate an augmented lower triangular SVAR with 2 lags of the form $Z_t = [\, i_t^{US},\, i_t^{Euro},\, y_t,\, \pi_t]'$ allowing both non-oil output and inflation to be influenced by both the fund rate and the European short-term interest rate. We follow the same identification scheme of small and large countries in identifying the model and also account for the fact that the US economy is the largest economy followed by the European Union (EU) in ordering the variables. It is customary in the literature to use all three major European Union economies in computing proxies for the EU over a long period of time (see Horvath and Rátfai, 2004). However, we could not use the short-term interest rate for Germany in the computation of the proxy for the European interest rate because it contains a number of missing data points. We have attempted to remedy this problem by switching to the money market rates for France, Germany, and Italy provided by the International Financial Statistics but our efforts were in vain since the model fails to improve after 1 iteration, as per the error message from Eviews 5.1, which is used for all the estimations in this paper. Therefore, our findings presented in Table 8 are based on the proxy computed as the average of the short-term interest rates for France and Italy taken from OECD Outlook No. 81. The data set is available upon request

Section 5 Conclusion

On the issue of pegging the new currency of the AGCC economic block to the US dollar, this paper has studied the effects of monetary policy shocks on AGCC countries's non-oil output and inflation to determine whether there is synchronization and also whether what is observed in terms of responses is similar to US own output and inflation to validate the choice of the US dollar as the anchor currency. The paper builds upon the basic Mundell-Fleming model of open-economy with fixed exchange rate regime and employs the structural vector autoregression technique to obtain the impulse responses.

The SVAR models are just identified with short-run restrictions in line with Sims (1986): (1) the instrument of monetary policy of the United States is not contemporaneously affected by AGCC countries' non-oil supply and inflation shocks – the large-small country hypothesis; (2) non-oil output growth reacts with lag to inflation shock. The overall results show that the responses of inflation to monetary policy shocks from the United States are similar across AGCC countries and to the responses of US's own inflation. The same does not necessarily hold true for non-oil output growth. Therefore, we argue that choosing the dollar as the anchor currency may involve some adjustment costs or losses. Though, oil output, which represents approximately 46 percent of AGCC total output, is already traded in the international market in US dollar. Our finding that the non-oil sector does not respond in the same way to monetary policy shocks coming from the US and their overall responses are not similar to the effects of US monetary policy on own output is in itself a puzzle for decision makers and an issue that requires further research. Our result here partially lends support to the US dollar as the anchor currency if AGCC countries believe the primary purpose of a

dollar peg is to warrant stable inflation. However, we caution that if the US currency continues to depreciate against major currencies and loses its importance as a store of value, pegging the new currency to a basket of Euro and US dollar might be an optimal choice, when considering the responses of non-oil output. Though, it is the relative importance of the non-oil sector that matters for AGCC countries in case of continuous depreciation of the dollar.

References

Abed, G. T., S. N. Erbas, and Behrouz Guerani (2003) The GCC Monetary Union: Some Considerations for the Exchange Rate Regime. IMF Working Paper (WP/03/66), International Monetary Fund, Washington, D.C.

Belkacem, L. and I. Limam (2002 Are GCC Countries Ready for Currency Union? *Arab Planning Institute*,(April).

Bernanke, B. (1986). Alternative Explanations of the Money-Income Correlation. *Carnegie-Rochester Conference Series on Public Policy* **25**, pp. 49–99

Blanchard, O. J.; Danny Quah (1989) The Dynamic Effects of Aggregate Demand and Supply Disturbances. *The American Economic Review*, Vol. 79, No. 4. (Sep., 1989), pp. 655-673.

Christiano, L J, Eichenbaum, M and Evans, C L (1999) 'Monetary policy shocks: what have we learned and to what end?', in Taylor, J B and Woodford, M (eds), *Handbook of Macroeconomics*, Vol. 1A, Elsevier Science, pages 65-148.

Cooley, T. F. and S. F. Leroy (1985) Atheoretical Macroeconometrics: A Critique. *Journal of Monetary Economics*, 16, pp. 283-308.

Enders, W. (2004) *Applied Econometric Time Series*. Wiley, 2nd Edition.

Fasano-Filho, Ugo and A. Schaechter (2003) Monetary Union Among the Member Countries of the Gulf Cooperation Council. IMF Occasional Paper 223, International Monetary Fund, Washington, D.C.

Fasano-Filho, Ugo and Z. Iqbal (2002) Common Currency. *Finance and Development* 39(4) (December), pp. 42 – 46.

Fasano, U. and Iqbal, Z. (2003) GCC countries: from oil dependence to diversification, International Monetary Fund, Washington, D. C.

Giordani, P (2004) An alternative explanation of the price puzzle. *Journal of Monetary Economics*, Vol. 51, pages 1,271-96.

Hanson, M S (2004) 'The "Price Puzzle" reconsidered'. *Journal of Monetary Economics*, Vol. 51, pages 1,385-413.

Horvath, J., and A. Rátfai (2004) Supply and Demand Shocks in Accession Countries to the Economic and Monetary Union. *Journal of Comparative Economics*, 32(2), 202-211.

Igbal, Z. and Fasano Ugo (2003) Gulf Cooperation Council: Challenges on the Road to a Monetary Union. Box 1.5, *World Economic Outlook*, September, IMF, Washington, DC; p. 48

Ibrahim, Badr-El-Dim A. (2004) Do the AGCC Economies need a Single Currency? Some Potential Costs and Benefits of a Monetary Union for the Member States of the Arab Gulf

Cooperation Council (AGCC). *Economic Research Forum*, Conference Proceedings **Number:** 112004004

Jordi Galí (1992) How Well Does the IS-LM Model Fit Postwar U.S. Data? *The Quarterly Journal of Economics*, Vol. 107, No. 2. (May), pp. 709-738.

Jadresic, E. (2002) On a Common Currency for the GCC Countries. IMF Policy Discussion Paper (PDP/02/12), International Monetary Fund, Washington, D.C.

Kenen, P. B. (1969) The Theory of Optimum Currency Areas: An Eclectic View. In R. A, Mundell and A. K. Swoboda, Monetary Problems of the International Economy, University of Chicago Press, pp 41-60.

Leeper, E M and Roush, J (2003) Putting 'M' back in monetary policy. *Journal of Money, Credit and Banking*, Vol. 35(2), pages 1,217-56, December.

Mankiw, N. G. (2001) U.S. Monetary Policy During the 1990s. NBER Working Papers (W8471), May.

MacKinnon, James G. (1996). "Numerical Distribution Functions for Unit Root and Cointegration Tests," Journal of Applied Econometrics, 11, 601-618.

McKinnon, R. I. (1963) Optimum Currency Areas. *American Economic Review*, 53, pp. 717 – 725.

Mundell, R. A. (1961) A Theory of Optimum Currency Areas. *American Economic Review*, 51, pp. 657-665.

Oman Economic Review (2002). Does the Gulf Really Need a Single Currency, March.

Sims, Christopher A. (1980) Macroeconomics and Reality. *Econometrica*, 48, pp. 1-48.
_____ (1986) Are Forecasting Models Usable for Policy Analysis? *Federal Reserve Bank of Minneapolis Quarterly Review*, pp. 2-15

Sims, C A (1992) Interpreting the macroeconomic time series facts: the effects of monetary policy. *European Economic Review*, Vol. 36(5), pages 975-1,000.

Sterne G., T. Bayoumi (1993): *Temporary Cycles or Volatile Trends? Economic Fluctuations in 21OECD Countries.* Bank of England, Working Paper Series No. 13.

Sturm, M. and N. Siegfried (2005) Regional Monetary Integration in the Member States of the Gulf Cooperation Council. Occasional Paper Series No. 31, June, European Central Bank.

Tower, Edward, and Thomas D. Willett (1976) The Theory of Optimum Currency Areas and Exchange Rate Flexibility. Special Papers in International Economics, No. 11. International Finance Section, Department of Economics, Princeton University.

Table 1 Unit Root Test Results

Variable	ADF	PP
Funds_Rate	-2.67	-1.92
GDP Deflator Bahrain	-2.96	-2.37
GDP Deflator Kuwait	-3.01	-2.96
GDP Deflator Oman	-3.75	-4.05
GDP Deflator Qatar	-2.74	-2.58
GDP Deflator Saudi Arabia	-3.18	-2.75
GDP Deflator UAE	-2.18	-2.49
Non-oil GDP Per Capita Bahrain	-2.44	-2.25
Non-oil GDP Per Capita Kuwait	-2.37	-2.37
Non-oil GDP Per Capita Oman	-1.78	-2.13
Non-oil GDP Per Capita Qatar	-0.60	-1.38
Non-oil GDP Per Capita Saudi Arabia	-4.01	-2.72
Non-oil GDP Per Capita UAE	-2.69	-2.37
Non-oil GDP Bahrain	-2.51	-2.04
Non-oil GDP Kuwait	-3.12	-3.14
Non-oil GDP Oman	-1.47	-1.79
Non-oil GDP Qatar	-2.12	-2.60
Non-oil GDP Saudi Arabia	-4.34	-3.07
Non-oil GDP UAE	-4.33	-2.79

The MacKinnon critical values at 1, 5, and 10 percent are -3.63, -2.95, and -2.61, respectively

Table 2 The Share of non-oil GDP to GDP, Decade by Decade

Decades		Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	AGCC
1970s								
	Mean	35.14	27.80	40.19	44.50	41.99	31.08	36.78
	Standard Deviation	2.67	5.44	7.45	4.55	6.21	7.41	5.62
1980s								
	Mean	61.20	51.27	54.86	52.45	61.89	45.30	54.50
	Standard Deviation	10.02	4.81	4.02	4.57	7.24	8.11	6.46
1990s								
	Mean	66.89	45.42	51.52	47.77	55.13	52.56	53.21
	Standard Deviation	1.56	4.39	1.36	4.62	1.33	3.98	2.87
2000-2006								
	Mean	66.35	47.95	56.41	39.03	57.15	58.86	54.29
	Standard Deviation	2.86	1.79	3.32	1.28	1.19	1.64	2.01

Note: Non-oil GDP is the sum of value added of all sectors except mining and quarrying divided by total value added at constant 1990 prices in US dollars.

Source: United Nations Statistical Databases – National Accounts Main Aggregates and author's calculations

Table 3 US Growth vs. AGCC Non-oil GDP Growth, Decade by Decade

		1970s	1980s	1990s	2000-2006	Average
US						
	Mean	**3.00**	**3.39**	**3.04**	**1.68**	**2.78**
	Standard Deviation	2.28	3.31	1.61	3.06	**2.57**
AGCC						
	Mean	**17.70**	**4.44**	**4.60**	**4.60**	**7.84**
	Standard Deviation	21.72	8.33	8.73	8.73	**11.88**

Note: Non-oil GDP is the sum of value added of all sectors except mining and quarrying divided by total value added at constant 1990 prices in US dollars.

Source: United Nations Statistical Databases – National Accounts Main Aggregates and author's calculations

Table 4 Output Growth, Decade by Decade

Decades		Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	AGCC	USA
	Non-oil GDP Growth								GDP Growth
1970s									
	Mean	**12.29**	**4.83**	**20.00**	**8.35**	**15.17**	**45.54**	**17.70**	**3.00**
	Standard deviation	22.48	6.13	21.60	15.63	14.18	50.30	21.72	2.28
1980s									
	Mean	**6.84**	**1.59**	**8.09**	**3.21**	**2.07**	**4.84**	**4.44**	**3.39**
	Standard deviation	13.43	3.75	9.85	11.23	5.50	6.23	8.33	3.31
1990s									
	Mean	**4.09**	**5.80**	**5.85**	**2.97**	**2.18**	**6.73**	**4.60**	**3.04**
	Standard deviation	3.39	37.48	3.65	3.42	**1.77**	2.66	8.73	1.61
2000-2006									
	Mean	**7.82**	**8.06**	**6.56**	**8.88**	**4.29**	**8.27**	**7.31**	**1.68**
	Standard deviation	4.95	2.59	2.67	8.02	1.39	2.43	3.68	3.06
	Maximum	**15.44**	**11.94**	**10.21**	**23.46**	**6.60**	**11.43**	**13.18**	**4.39**

Table 5 Inflation Performance and US Monetary Policy, Decade by Decade

Decades	Inflation	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	AGCC	USA	Fund rate
1970s										
	Mean	**14.9**	**33.9**	**28.6**	**22.3**	**29.9**	**8.2**	**23.0**	**6.8**	**8.0**
	Standard deviation	6.8	55.1	55.4	9.7	45.1	11.9	26.5	1.8	2.4
	Maximum	**26.2**	**176.5**	**165.7**	**36.2**	**147.9**	**31.5**	**84.8**	**9.4**	**12.0**
	Year of Worst Inflation	1974	1974	1974	1979	1974	1972		1975	1979
1980s										
	Mean	**5.4**	**2.9**	**2.3**	**0.9**	**0.2**	**1.9**	**2.3**	**4.8**	**10.4**
	Standard deviation	12.8	17.8	19.3	16.8	15.6	5.1	14.6	2.6	3.3
	Maximum	**25.7**	**43.9**	**50.9**	**40.6**	**38.0**	**11.8**	**35.1**	**9.4**	**16.8**
	Year of Worst Inflation	1980	1980	1980	1980	1980	1980		1981	1981
1990s										
	Mean	**0.2**	**1.6**	**0.7**	**1.6**	**2.5**	**1.2**	**1.3**	**2.2**	**5.4**
	Standard deviation	5.0	12.5	8.9	9.4	7.7	4.6	8.0	0.9	1.4
	Maximum	**9.4**	**22.1**	**15.0**	**17.1**	**13.1**	**9.0**	**14.3**	**3.8**	**8.2**
	Year of Worst Inflation	1994	1999	1990	1999	1990	1999		1990	1990
2000 - 2006										
	Mean	**7.1**	**11.4**	**7.7**	**14.4**	**7.8**	**10.1**	**9.7**	**2.5**	**3.3**
	Standard deviation	6.8	10.6	9.5	15.8	6.6	9.0	9.7	0.5	2.0
	Maximum	**14.3**	**23.9**	**19.9**	**33.5**	**16.1**	**22.4**	**21.7**	**3.1**	**6.5**
	Year of Worst Inflation	2000	2005	2000	2000	2005	2006		2005	2000

Note: Inflation is the percentage change in GDP, Implicit Price Deflators – US Dollars. The values for AGCC is the average performance of the six countries

Sources: United Nations Statistical Databases – National Accounts Main Aggregates, Federal Reserve Bank of St. Louis and author's calculations

Table 6 Correlation of Inflation Across AGCC Countries

	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDI	UAE	US
BAHRAIN	1.000000						
KUWAIT	0.604653	1.000000					
OMAN	0.611209	0.960975	1.000000				
QATAR	0.709197	0.507939	0.517248	1.000000			
SAUDI	0.603056	0.969471	0.965315	0.502203	1.000000		
UAE	0.367714	0.097253	0.079777	0.613558	0.079724	1.000000	
US	0.711132	0.470810	0.443426	0.429799	0.498737	0.037612	1.000000

Table 7 Cross Correlation of non-oil Output Growth across AGCC Countries along with US Output Growth

Correlation	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDI	UAE	US
BAHRAIN	1.000000						
KUWAIT	0.088193	1.000000					
OMAN	-0.141811	0.080833	1.000000				
QATAR	0.500469	0.022125	-0.038247	1.000000			
SAUDI	-0.021985	-0.027882	0.101837	0.138701	1.000000		
UAE	-0.160121	-0.059867	0.229952	-0.060951	0.701363	1.000000	
US	0.019861	0.051232	-0.192322	0.024794	-0.304071	-0.211267	1.000000

Table 8 Relative Importances of US and European Monetary Policy Shocks for Output Growth and Inflation in AGCC Countries

Variance Decomposition of Output Growth

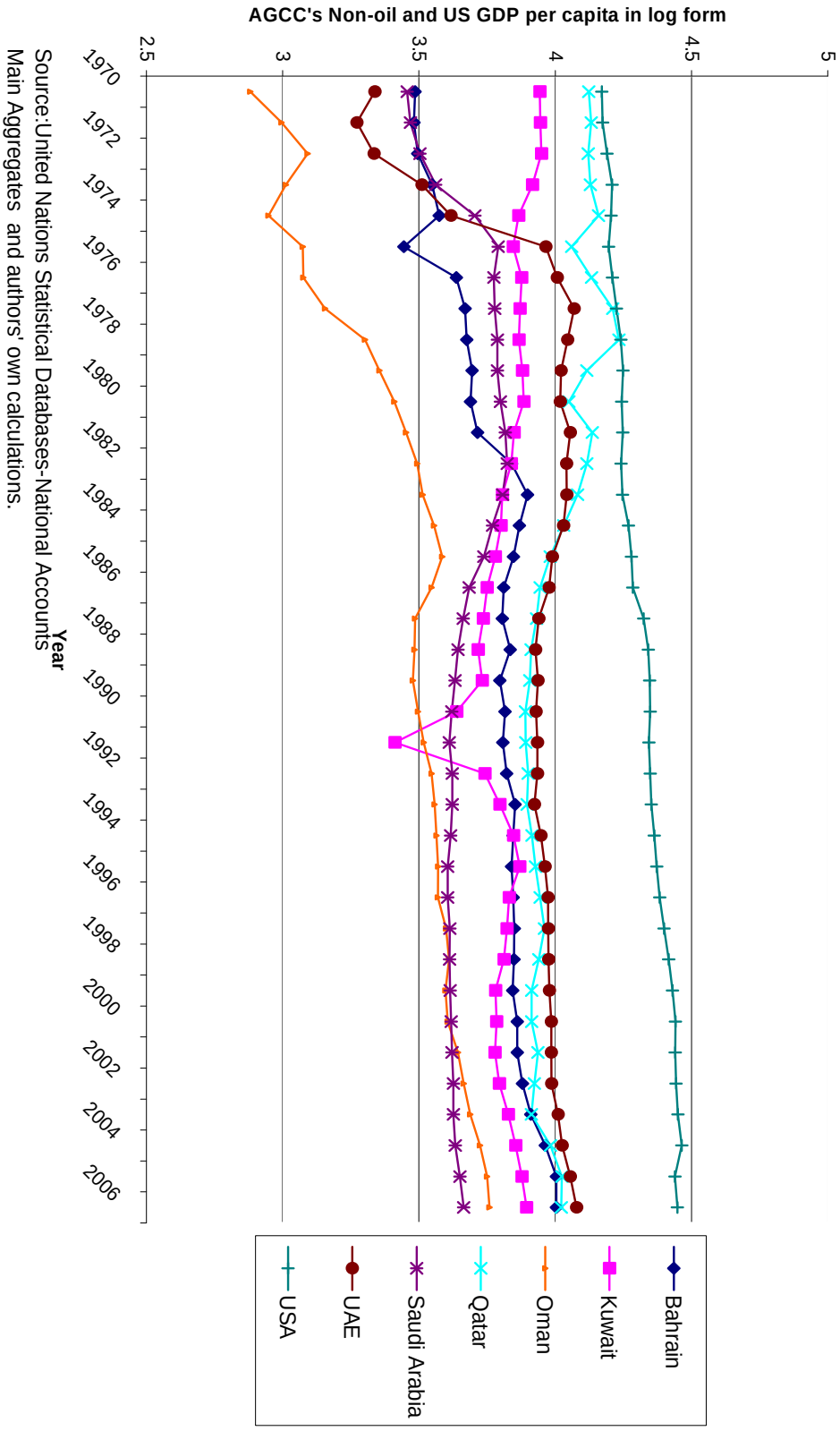
Period	S.E.	US Policy Shock	European Policy shock	Supply Shock	Demand Shock
1	0.016921	1.049236	14.62119	84.32957	0
2	0.020781	2.215929	34.91676	56.63494	6.232372
3	0.023502	1.955719	38.27767	44.28949	15.47711
4	0.02364	1.971455	37.87789	43.79068	16.35997
5	0.023904	2.936192	37.16727	43.59671	16.29982
6	0.024483	7.418349	35.43385	41.6087	15.5391
7	0.02528	13.1588	33.23686	39.02939	14.57495
8	0.025994	17.68193	31.46927	37.05748	13.79131
9	0.026546	20.54106	30.54706	35.65742	13.25446
10	0.027043	22.38913	30.29878	34.43441	12.87768

Variance Decomposition of Inflation

Period	S.E.	US Policy Shock	European Policy shock	Supply Shock	Demand Shock
1	0.049996	20.92845	31.36454	0.001794	47.70522
2	0.05396	29.72414	28.60351	0.283828	41.38852
3	0.056063	27.76501	27.03537	6.214185	38.98543
4	0.057536	30.47854	26.34426	6.159028	37.01817
5	0.060131	34.66182	25.651	5.653851	34.03332
6	0.061963	37.37845	24.79006	5.666778	32.16472
7	0.062756	38.73333	24.18621	5.682544	31.39792
8	0.063463	39.38546	24.29261	5.606481	30.71544
9	0.064332	39.92702	24.61854	5.458871	29.99557
10	0.065257	40.70221	24.66614	5.312217	29.31943

Figure 1

Behavior of Output



Source:United Nations Statistical Databases-National Accounts Main Aggregates and authors' own calculations.

Figure 2

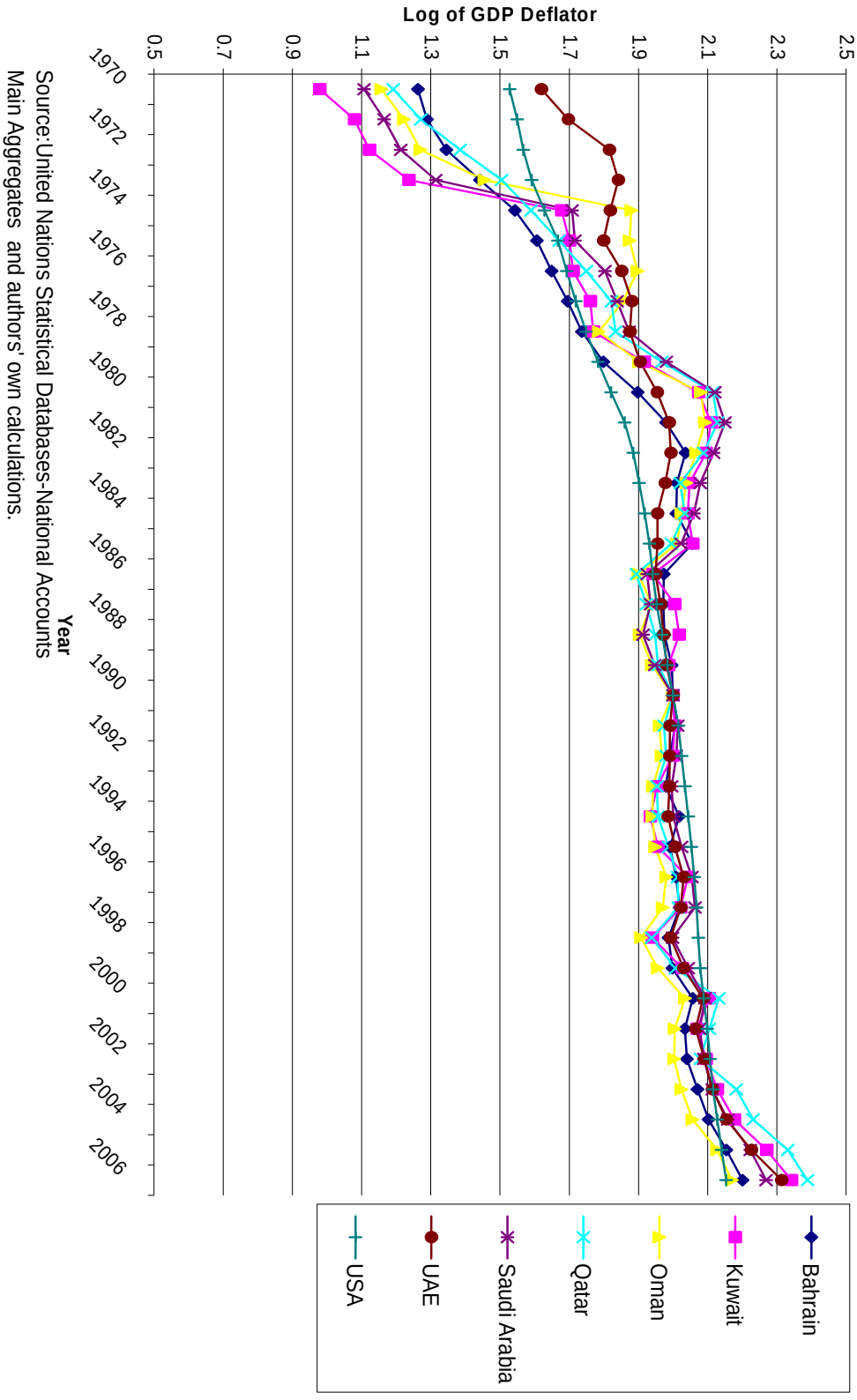
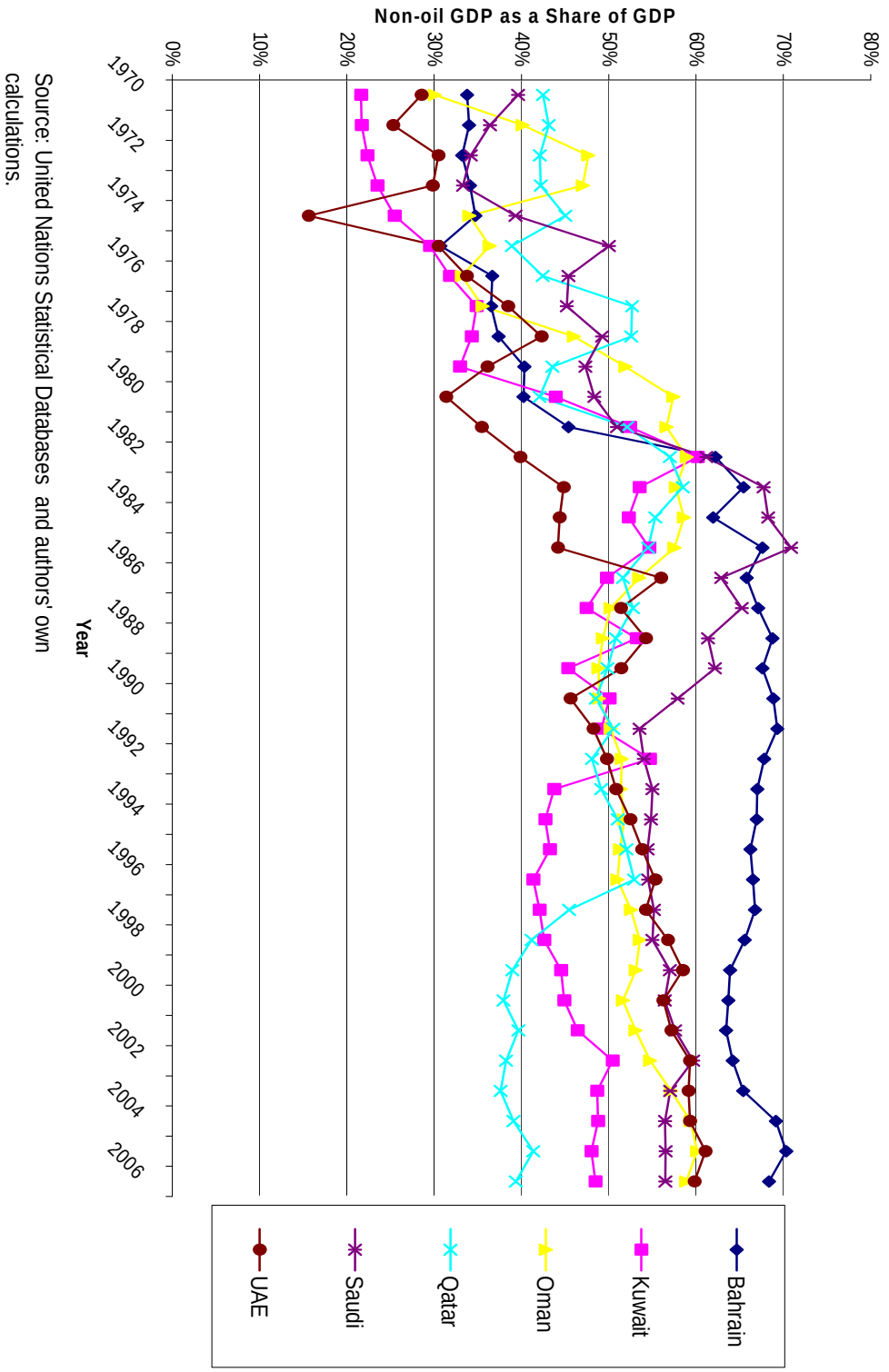

Behavior of Prices
Log of GDP Deflator
2.5
2.3
2.1
1.9
1.7
1.5
1.3
1.1
0.9
0.7
0.5
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
Year
Bahrain
Kuwait
Oman
Qatar
Saudi Arabia
UAE
USA
Source:United Nations Statistical Databases-National Accounts Main Aggregates and authors' own calculations.

Figure 3

Relevance of the Non-oil Sector for AGCC Countries



Source: United Nations Statistical Databases and authors' own calculations.

Figure 4 Impulse Responses to a US Structural Monetary Policy Shock

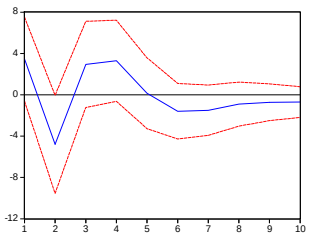
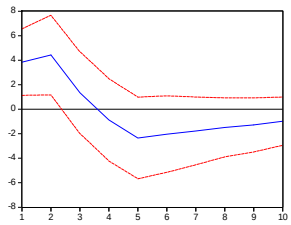
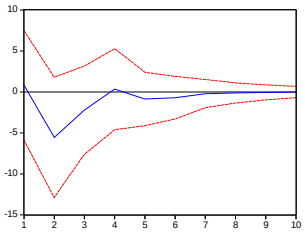
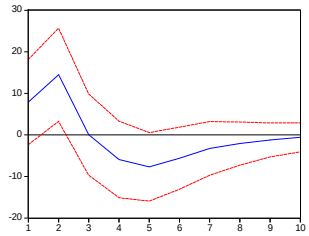
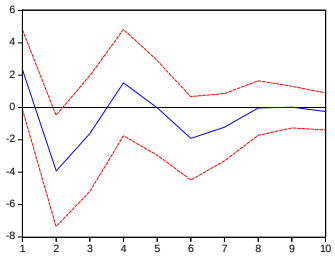
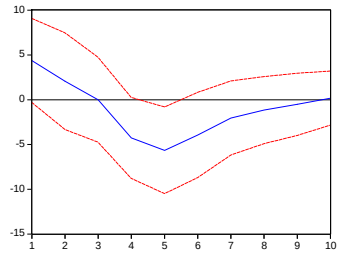
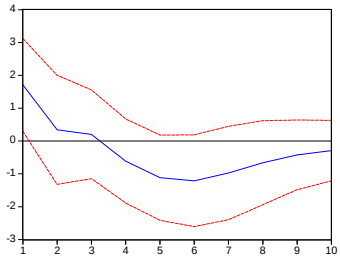
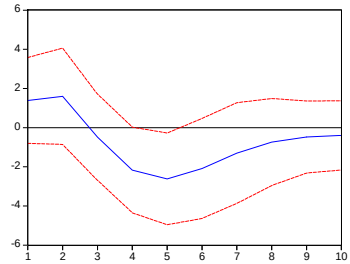
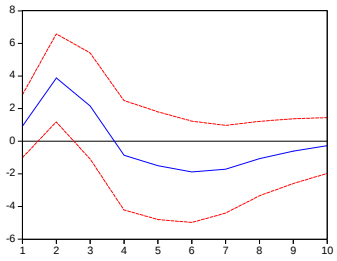
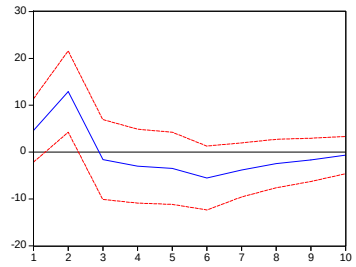
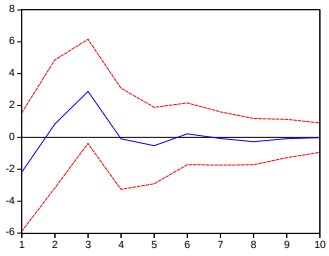
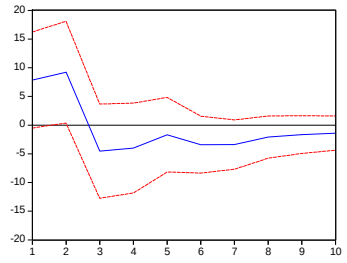
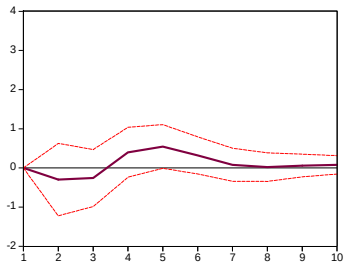
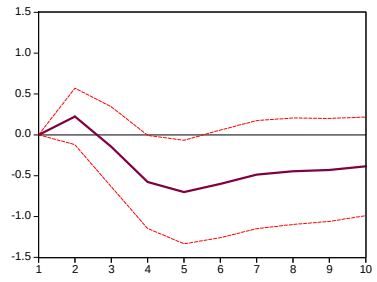
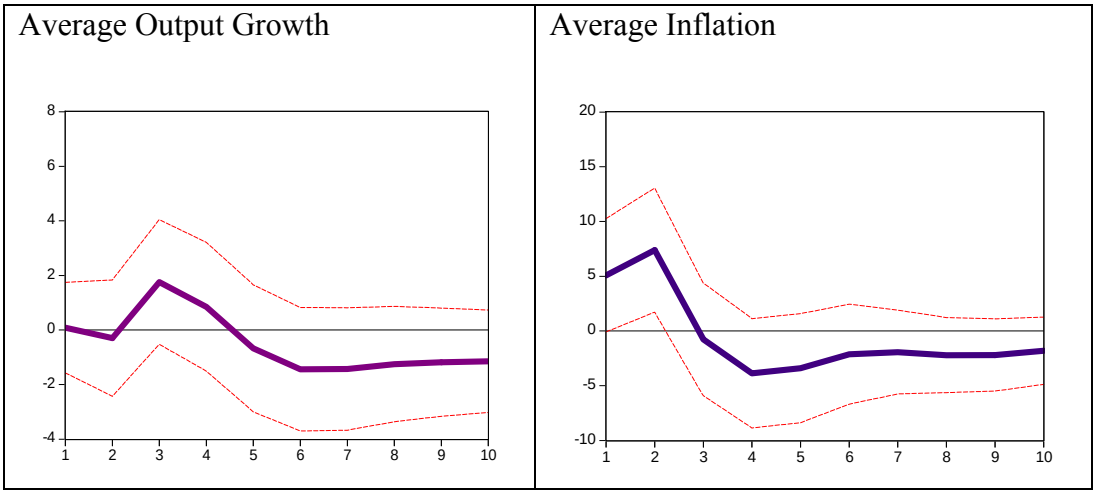
Non-oil GDP Growth	Country	Inflation
	**Bahrain**	
	**Kuwait**	
	**Qatar**	
	**UAE**	
	**Saudi Arabia**	
	**Oman**	
	**US**	

Figure 5 Impulse Responses of Average AGCC Countries to US Monetary Policy Shocks



APPENDIX A

TABLE A1 Output Growth, Per Capita, and Decade by Decade

Decades		Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	USA	AGCC
1970s									
	Mean	7.22	-1.49	14.63	0.87	9.51	24.10	2.04	9.14
	Standard deviation	21.27	5.54	20.54	14.95	13.65	41.82	2.26	19.63
1980s									
	Mean	3.06	-3.27	3.21	-4.28	-3.39	-1.82	2.33	-1.08
	Standard deviation	12.97	3.72	8.82	10.00	5.02	5.07	3.26	7.60
1990s									
	Mean	1.12	6.53	2.85	0.24	-0.41	1.00	1.95	1.89
	Standard deviation	3.06	40.94	3.14	3.77	1.81	2.44	1.60	9.19
2000-2006									
	Mean	5.53	3.86	5.48	3.87	1.69	3.38	0.64	3.97
	Standard deviation	4.85	3.16	2.85	7.65	1.44	2.88	3.02	3.81

Note: Non-oil GDP per capita is Non-oil GDP divided by population. Non-oil GDP is the sum of value added of all sectors except mining and quarrying divided by total value added at constant 1990 prices in US dollars.

Source: United Nations Statistical Databases – National Accounts Main Aggregates and authors' calculations

TABLE A2 US Growth vs. AGCC Non-oil GDP Growth, Per Capita, and Decade by Decade

		1970s	1980s	1990s	2000-2006	Average
US						
	Mean	2.04	2.33	1.95	0.64	**1.74**
	Standard Deviation	2.26	3.26	1.60	3.02	**2.54**
AGCC						
	Mean	9.14	-1.08	1.89	3.97	**3.48**
	Standard Deviation	19.63	7.60	9.19	3.81	**10.06**

Note: Non-oil GDP is the sum of value added of all sectors except mining and quarrying divided by total value added at constant 1990 prices in US dollars.

Source: United Nations Statistical Databases – National Accounts Main Aggregates and authors' calculations