Implications of real exchange rate misalignment in developing countries: theory, empirical evidence and application to growth performance in Zimbabwe

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IMPLICATIONS OF REAL EXCHANGE RATE MISALIGNMENT IN DEVELOPING COUNTRIES: THEORY, EMPIRICAL EVIDENCE AND APPLICATION TO GROWTH PERFORMANCE IN ZIMBABWE

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ABSTRACT

The influence of exchange rate signals in an economy is very powerful and often pervasive. Moreover, sustained real exchange rate overvaluation, will, by distorting resource allocation away from productive activities, eventually lead to drastic adjustments of relative prices and reduction of aggregate economic growth. However, the direct theoretical and empirical link between exchange rate misalignment and macroeconomic indicators still remains to be fully understood. Nonetheless, empirical studies continue to make attempts to understand this relationship by exploring relationships that incorporate different measures of exchange rate misalignment in traditional growth regression models. Thus, based on a behavioural equilibrium exchange rate derived measure exchange rate misalignment, this paper presents an empirical analysis of the relationship between real gross domestic product growth and real exchange rate misalignment for Zimbabwe. After controlling for other structural and policy variables, the main findings demonstrate that exchange rate misalignment exerts a negative and highly statistically significant impact on growth. Overall, the results lend support to the hypothesis that chronic real exchange rate overvaluation was a key fundamental behind the post-2000 economic growth contraction in Zimbabwe.

JEL Classification: E31, F31, F43

Keywords: Zimbabwe, Real exchange rate misalignment, exchange rate overvaluation, economic growth, growth performance

1. **INTRODUCTION**

1.1 Background

Zimbabwe's dramatic post-2000 economic collapse was of almost unprecedented scale. Ten years of successive negative economic growth resulted in a cumulative contraction of real gross domestic product (GDP) of more than 40 percent between 1998 and 2007[1]. A combination of one of the worst hyperinflation episodes in modern history and further deterioration in the business climate contributed to an additional 14 percent fall in real GDP in 2008 (IMF 2009). Inflation, as measured by the consumer price index, reached an all-time peak of 622 percent in January 2004. While it later dropped slightly in 2004 ‐ 05, it still remained very high at three ‐ digit annual growth rates. Subsequently, it rebounded, breaking the 1000 percent mark in 2006 and swiftly moving to peak in September 2008 "… at about 500 billion percent" (Ibid.). As for GDP growth:

> This contraction compares to an average GDP decline in civil wars around the world of about 15 percent and is far worse than the economic impact of full-scale civil wars in Cote d'Ivoire (–7 percent), Democratic Republic of Congo (–19 percent), and Sierra Leone (–25 percent) (Moss 2007: 134);

Sustained exchange rate overvaluation as well as structural distortions, particularly in the agricultural and manufacturing sectors resulted in exports declining from 30.3 per cent of GDP in 2000 to 9.6 per cent in 2001 (AFDB/OECD, 2004). The cumulative decline in export receipts from 1996 to 2001 was 37 percent. This critically impaired the ability of the economy to acquire essential imports, resulting in total imports falling from 31.4 per cent of GDP in 2000 to 16 per cent in 2002 (Ibid.). Unable to generate the critical foreign exchange, the parallel market for foreign currency quickly exploded in dominance as was the unofficial dollarization of the economy, while the Zimbabwe dollar virtually disappeared from circulation. In January 2009, the Reserve Bank finally announced the termination of the Zimbabwe dollar as legal tender. This brought the currency misalignment crisis and hyperinflation to an abrupt end, and only then, some slender emergence of economic recovery prospects.

[1] IMF (2009), Moss (2007).

To this end, debate among economic and political circles on causes and outcomes of the crisis has been varied and sometimes controversial. One prominent view holds that the growth crisis ultimately originated from sustained exchange rate overvaluation. While the evolution of the crisis has also been interpreted as a consequence of the failure of political governance and overall economic management, this paper will seek to explore the impact of real exchange rate (RER) misalignment on real GDP growth performance in Zimbabwe for the period 1985 - 2004. Specifically, the paper explores the hypothesis that RER overvaluation, caused by inconsistent macroeconomic policies, distorts resource allocation away from productive activities and therefore retards real GDP growth.

1.2 The Economic Role of the Real Exchange Rate

The real exchange rate (RER) is one of the most important fundamentals in an open economy. As a relative price that measures the relative market value of common baskets of international and domestically produced goods, the level and stability of the RER are crucial elements in the process of macroeconomic adjustment and performance. By influencing the allocation of productive resources between tradable and non-tradable goods and services, the RER is a major determinant of the external competitiveness of a country and, hence, of its balance of payments. It can also be understood as a true indicator of the incentives faced by economic agents in making production and consumption choices between domestic and foreign goods. The RER affects decisions to save and invest, hence, the composition and direction of international capital flows. Variations in the RER have direct effects on demand, supply, the level and stability of commodity and factor prices, employment, government finances, distribution of income and wealth, and on the overall success of economic policies.

The general approach in the literature considers the RER as misaligned when it deviates from the underlying level that would have prevailed in the absence of price rigidities, frictions, and other short-run factors (Razin and Collins 1997). A more structured definition of misalignment uses the notion of the “equilibrium RER” (ERER). This definition, which is based on the internal – external balance equilibrium relationship, has been extensively adopted in the literature. According to Edwards (1989, p6), RER misalignment is a "sustained deviation of the actual RER from its long-run equilibrium level." Empirically, an exchange rate is labelled "overvalued" when it is more appreciated than the equilibrium rate and "undervalued" when it is more depreciated than the equilibrium rate.

RER misalignment can be classified either as macroeconomic-induced or structural (Edwards 1994). Macroeconomic induced misalignment occurs when inconsistencies between macroeconomic policies, particularly monetary policy, and the official nominal exchange rate cause the RER to depart from its equilibrium value. For instance, expansive monetary policy that is incompatible with the predetermined nominal exchange rate will cause domestic goods prices to rise faster than world inflation. This will effectively result in a RER appreciation. In structural misalignment, changes in the determinants of the equilibrium RER are not immediately translated into actual changes in the RER. As a result, temporary changes in fundamentals can lead to major deviations of the actual RER from its equilibrium (Ibid.).

This RER misalignment can seriously distort economic behaviour, significantly reducing a country's welfare and efficiency (Willet 1986, Edwards 1988). Such disequilibrium sends incorrect signals to economic agents and increases economic instability. However, despite the highly pervasive role of RER misalignment, studies have attempted to determine its growth impact on Zimbabwe. Some prominent related studies, notable McDonalds and Ricci (2004), and Aron, Elbadawi and Khan (1997)'s investigations on South Africa have only gone as far as determining the level of the ERER and hence estimating the underlying RER misalignment.

Thus, based on a behavioural RER misalignment measure, the paper will attempt to empirically determine the impact of RER misalignment on Zimbabwe's economic performance using a standard growth equation. The rest of the paper is organized as follows: Section 2 reviews different theoretical approaches that have been employed to define and measure the ERER. Section 3 explores some key linkages on how sustained RER overvaluation can eventually lead to a contraction in economic growth within a developing country context. This is followed by a review of the empirical literature in section 4. Section 5 presents empirical evidence on the growth impact of RER misalignment for Zimbabwe. Section 6 concludes.

2 APPROACHES TO EQUILIBRIUM EXCHANGE RATE DETERMINATION

2.1 The Purchasing Power Parity Theory

One of the earliest views of the ERER, based on the purchasing power parity (PPP) theory, assumes that the ERER is constant over time, as nominal exchange rates are deemed to adjust rapidly to any price differentials between the economy and its trading partners. The equilibrium level is therefore determined by taking the value of the RER in some past period (the base year) when the external equilibrium was assumed to hold. However, most empirical tests of the PPP found that mean reversion of the RER to a constant level was very low or nonexistent (MacDonald 1995, Rogoff 1996). This widespread empirical failure of PPP led to the consensus that absolute PPP does not hold.

A further shortcoming of the PPP was its emphasis on only monetary sources of RER fluctuations, which implied that it does not adequately consider changes in the sustainable ERER that are caused by real macroeconomic fundamentals (Edwards 1989, Ghura and Grennes 1993). In the ongoing debate, more recent interpretations of the PPP puzzle, notable, Taylor and Taylor (2004) have also alluded to the earlier view that short run PPP does not hold. Alternatively, they have also drawn support to the hypothesis that exchange rates nevertheless adjust to the PPP level in the long run. But the evidence is considered weak and the adjustment as being very slow (Ibid.).

2.2 The Behavioural Equilibrium Exchange Rate (BEER) Approach

Modern approaches focus on the continuous interaction between the ERER and macroeconomic fundamentals (Edwards, 1989; Williamson, 1994, McDonalds and Ricci 2003). These models can be classified according to their level of disaggregation (one good, traded and nontraded, with exportables, importables and nontraded goods) and time horizon (static and dynamic models) (Clarke and McDonalds 1999). They generally assume that the ERER is flexible and may change if the economy is shocked by dynamic forces that affect equilibrium. The framework further distinguishes between the effects of temporary and permanent changes in the determinants of the RER. The Behavioural Equilibrium Exchange Rate (BEER) approach (Clarke and McDonalds 1999) determines the level of RER misalignment by relating the observed RER to the value generated by the 'estimated equilibrium' reduced-form relationship.

The choice of fundamentals captured in the reduced form may vary depending on the theoretical model used. For instance, Edwards (1989) singled out international terms of trade; international transfers or aid; world real interest rate; trade policies; exchange and capital controls; the composition of government expenditure and technological progress as some of the most important determinants of the ERER in analytical and policy discussions. Furthermore, the sustainability of the RER depends on the sustainability of the underlying long-run macroeconomic equilibrium. Hence, the BEER approach requires judging whether the economic fundamentals that determine exchange rate behaviour are themselves at 'sustainable' or 'equilibrium' levels (Clarke and McDonalds 1998). Montiel (1999b: p 264) defines this 'sustainable' long-run equilibrium as "the value of the RER that emerges from the economy's macroeconomic equilibrium when policy and exogenous variables are at sustainable "permanent" levels and when the operationally relevant subset of the economy's predetermined variables have settled into their steady-state configurations (Ibid.)."

The dependent economy model, based on Salter and Swan (1959, 1960), has been extensively applied to model the RER in developing countries. Dornbusch (1980) developed the model in the context of a two-good economy with tradables and nontradables. The Dornbusch (1980) framework was used to investigate the characteristics of disequilibrium RERs and the effects of ERER disturbances in a flex-price full employment model. Edwards (1988) extended the model to a three-good framework with perfect foresight, featuring exportables, nontradables, and importables. A major contribution by Edwards was the introduction of a dual exchange rate regime in which the fixed nominal exchange rate for financial transactions coexists with a freely floating parallel market exchange rate for financial transactions.

General equilibrium intertemporal models of a small open economy have also been extensively used to analyse how the RER equilibrium path responds to macroeconomic disturbances (Edwards 1989, Rodriguez 1989). In particular, Edwards (1989) features a three goods intertemporal model that allows for foreign borrowing and lending. In that framework the ERER is affected not only by current fundamentals but also by the expected evolution of these variables. The behaviour of the ERER depends on whether changes in fundamentals are perceived as permanent or temporary. Elbadawi (1994) extended this basic framework by linking capital flows to expected real depreciation in the context of a linear rational expectations model. He maintained that a successful ERER modelling strategy should 1) specify the ERER as a forward-looking function of fundamentals; 2) allow for flexible dynamic adjustment of the RER toward the ERER; and; 3) it should allow for the influence of short- to medium-run macroeconomic and exchange rate policy on the RER.

Other variants of the BEER framework include the stochastic version of the Mundell-Fleming model developed by Frenkel and Razin (1995) and implemented by Razin and Collins (1997). They assume that output, money supply and domestic demand are stochastic processes driven by independent and identically distributed shocks. The model has both the standard flex-price solution and a full-fledged solution incorporating price rigidities. Models in the dependent economy tradition were also modified to incorporate microfoundations with a predetermined nominal exchange rate and flexible domestic wages and prices (Dornbusch *et al* 1983). Montiel (1999a) adapted that model for the determination of the ERER by introducing money and an endogenous country risk premium. It was further extended by Baffes, Elbadawi and O'Connell (1999) to include rationing of foreign credit, changes in the domestic relative price of traded goods, and short-run rigidities in domestic wages and prices.

Despite wide application of the BEER approach to developing countries, the theoretical framework however remains subject to some limitations (Edwards 2001):

i. The analytical models typically do not incorporate explicitly the sources of rigidities, and thus do not provide convincing reasons why the RER should ever be misaligned.
ii. Models based on the single equation reduced form approach do not establish a direct link between the ERER and the current (or capital) account.
iii. The models do not specify a direct relationship between the estimated ERER and measures of internal equilibrium, including the level of unemployment, price stability or the relation between actual and potential growth (Ibid.).

2.3 The Parallel Market Premium as a Measure of Misalignment

The premium of the parallel market rate over the official rate has also been used as an indicator of misalignment of the official rate (Kamin 1993, Edwards 1989, Ghura and Grennes 1993). That approach assumes that the price of foreign exchange in the parallel market is determined through free trading among agents. Hence, this 'freely' determined unofficial exchange rate has been naturally interpreted as an indicator of the value that the official exchange rate would reach if left to market forces and, thus, as an estimate of the long-run ERER (Hinkle and Montiel 1999). Ghei and Kamin (1999), however, argue that the floating parallel market rate should not necessarily equal the unified long-run RER at any given moment.

This is because as an asset price, the spot value of the floating rate depends on both its expected future value and the current stock of foreign exchange held by residents. Thus, when macroeconomic conditions and policies are volatile, as frequently is the case in such settings, adverse expectations may drive the parallel exchange rate to levels much more depreciated than the unified long-run RER that would prevail. The conditions that give rise to a parallel market - an overvalued official exchange rate combined with foreign exchange rationing - may also lead to scarcities of, and excess demand for, foreign exchange in the parallel market (Ibid.).

Goldberg and Karimov (1997), using an asset market model, supplemented by explicit treatment of smuggling and second-economy activity, also advance support for criticisms of the use of black market exchange rates as a guide to equilibrium fixed exchange rates in transition economies. This is because both real and nominal black-market exchange rates can overshoot in response to goods market events, in addition to overshooting in response to actual or pending foreign exchange market reforms (Ibid).

2.4 The Fundamental Equilibrium Exchange Rate (FEER) Approach

Another strand of literature focuses on the Fundamental Equilibrium Exchange Rate (FEER) approach developed by Williamson (1994) as an alternative methodology for measuring RER misalignment. The FEER approach defines the ERER as that rate which is consistent with macroeconomic balance – full employment and low inflation (internal balance) and a sustainable current account that reflects underlying and desired net capital flows (external balance). This approach imposes internal and external balance on an estimated macroeconomic model and solves for the RER. This rate is classified as the FEER, and the extent of misalignment is determined by comparing it to the observed RER (Ibid, Clarke and MacDonalds, 1998).

The exchange rate is denoted as "fundamental" because it abstracts from short-run cyclical conditions and temporary factors and emphasizes "economic fundamentals," which are identified as those conditions and variables that are likely to persist over the medium term. Because these conditions are not necessarily those projected to occur in the future, but rather are desirable outcomes that may in fact never be realized, this renders the FEER measure normative.

The main difficulty associated with the application of the FEER approach, however, arises from the need for a fully specified multilateral structural model. Further, it does not provide an empirical link between the RER and its determinants. The estimation of the FEER also requires considerable parameter estimation and normative judgements, which are bound to generate disagreement about the results. Potentially controversial choices include the type of model to use and estimates of potential output of the country concerned and its major trading partners. In addition, the method requires an estimate or judgment regarding sustainable external balance over the medium term, the policy mix used to achieve internal balance, the timing of that policy, and the target for the current account (Black 1994, MacDonalds 1995, Clarke and McDonalds 1999).

2.5 Lessons for the Choice of Equilibrium Exchange Rate Measures

While all the approaches to ERER determination have their shortcomings, different circumstances may reasonably justify the use of each method. Notably the relative PPP approach becomes viable where the RER can be shown to be stationary. Its simplicity also makes it a method of choice especially in large multi-country studies. The method has been found to be useful for initial detection of misalignment mostly in high-inflation countries, and for the identification of hypotheses for subsequent analysis using more sophisticated methods (Hinkle and Montiel 1999).

Whereas the FEER is designed to calculate the medium-term real effective value of the currency in order to assess the current value of the RER, the BEER attempts to explain the actual behaviour of the RER in terms of relevant economic variables. In the FEER approach, equilibrium is determined through the macroeconomic balance, whereas in the BEER approach it is given by an appropriate set of explanatory variables. In this regard, a key merit of the BEER is its relatively limited data requirements. Moreover, the parallel market exchange rate is deemed to be subject to very high risk and scarcity premiums that may significantly reduce its reliability as an unbiased proxy for the ERER. For these reasons and its underlying analytical strength, the BEER methodology has the potential to generate credible empirical estimates of the ERER in specific country cases, and is therefore adopted as a measure of misalignment in this study.

2.6 Implications for Empirical Exchange Rate Misalignment-Growth Modelling

An analysis of the theoretical ERER models reveals two fundamental gaps in the literature. The first is that the theoretical models have so far been unable to establish a direct link between the ERER and the current (or capital) account balance; and secondly, the inability of the models to specify a direct relationship between the estimated ERER and measures of internal equilibrium. The presence of these limitations therefore means that there is currently no unified analytical model that directly connects RER misalignment and economic growth.

To overcome the limitations posed by the lack of a unified framework, Section 3 of the paper will discuss the theoretical aspects on some of the potential transmissions mechanisms from RER misalignment to economic growth. In particular, the discussion attempts to address the following: 1) how exchange rate misalignment distorts economic activity via the parallel market for foreign exchange; 2) the impact of relative price distortions on export competitiveness and 3) how an overvalued exchange rate can negatively impact on investment uncertainty by generating exchange rate volatility. In the absence of a unified theoretical model, this review of possible transmission mechanisms sets up the framework for the specification of the empirical growth model in section 4.

3 THE MISALIGNMENT-GROWTH TRANSMISSION MECHANISMS

3.1 The Parallel Market Transmission Mechanism

Parallel markets usually develop in response to a systematic bias against devaluation of an overvalued official exchange rate (Kiguel and O'Connell, 1995).When faced with foreign exchange constraints, monetary authorities often resort to foreign exchange controls or tighter macroeconomic policies to protect international reserves and slow down their depletion. Edwards (1988) particularly notes that RER overvaluation is usually accompanied by the imposition of an array of exchange and trade controls. These exchange controls further limit access to foreign exchange in the official market, introducing large efficiency costs that encourage strong lobbies who compete for the rents generated by the protective measures (Ibid., Elbadawi 1994, Degefa 2001).

In the presence of pervasive capital controls, the parallel market will also become a major element in financing capital flight and private portfolio transactions, foreign currency being a hedge against the domestic inflation tax and adverse political change (Agenor and Haque, 2005). The parallel market premium is also an important indicator of the inconsistency between macroeconomic policy and the foreign trade and exchange rate regimes. This signal is likely to affect macroeconomic outcomes by influencing government policy and private sector expectations of government policy.

A high and persistent premium can substantially undermine the allocational role of the RER by exposing the credibility (time consistency) problem of macroeconomic policy. In addition to the often huge costs of law enforcement to counteract illegal activities and punish offenders, parallel markets encourage rent-seeking activities such as corruption and bribery of government officials which lead to a suboptimal allocation of scarce resources (Agenor 1992, Agenor *et al* 1993). Kiguel and O'Connell (1995) also argue that a major channel through which parallel markets for foreign exchange affects the economy is via illegal trade**.** Accordingly, **s**ustained increases in the exchange premium encourage the diversion of exports from official to unofficial channels and the reverse for imports.

Premium increases, therefore, tend to worsen the official trade balance and produce an accumulation of private net foreign assets through the parallel current account balance.[2] Trade tax revenues will decline with officially remitted export revenues as the authorities further compress imports to avoid excessive reserve losses. Hence, the presence of parallel markets, whether legal or illegal, may generate opportunities for selective protection of inefficient import-substituting industries both through the rationing of foreign exchange and through political pressure (Bhagwati 1978).

3.2 The Trade Balance and Export Competitiveness

In developing countries, RER misalignment often takes the form of overvaluation (Sekkat and Aristomène 1998, Elbadawi 1994, Ghura and Grennes. 1993, Cottani et al 1990). This means that domestic firms producing goods in competition with foreign firms incur higher costs than their foreign counterparts do. Therefore, to remain profitable, domestic firms face difficult options of charging higher prices, cutting profit margins, or production levels in order to lower costs, both on the export and import side. Reduction of profitability, however, leads to declining investment and exports. As a result, misalignment, by hurting tradable activities, tends to affect growth adversely. This is because productivity improvements tend to be concentrated in export or import – competing industries. In addition, an overvalued RER encourages substitution of imported inputs for domestic inputs or labor, leading to higher import content for the whole economy, which will worsen the trade balance (Dornbusch 1991).

The structure of incentives facing key export-oriented sectors such as the agricultural sector is also strongly influenced by indirect interventions such as exchange rate policies, trade, and other macroeconomic policies (Elbadawi, 1992). Given the high degree of tradability in agriculture, policies that lead to RER overvaluation will create a structure of incentives biased against agriculture *vis-a-vis* other sectors in the economy, especially the nontraded services sector. Evidence suggests that these implicit policy-induced effects can be sufficiently strong as to overwhelm any favorable sector-specific agricultural price policies and other direct forms of interventions (Krueger et al 1988).

[2] The parallel current account is the difference between the overall current account (which may be unobservable because of illegal trade) and the current account balance that is reported to take place at the official exchange rate. It is therefore the balance of private sector current account transactions that take place (implicitly or explicitly) at the parallel exchange rate (Kiguel and O'Connel 1995: 22).

Moreover, Dornbusch (1991) maintains that poor performance of the traded goods sector will constrain activities in the rest of the economy. This is because exports are not only vital where they represent a large share of total production and employment, but in most countries the availability of foreign exchange is one of the main determinants of the overall level of economic activity. Even where exports account for a small portion of GDP, a shortage of foreign exchange can slow down economic performance. Poor performance of the export sector and the resulting unemployment causes a reduction in aggregate spending and, hence, in the demand for nontraded goods. Firms in the nontraded goods sector will also be forced to cut production and employment, causing a further decline in output and employment. This loss can be translated into a substantial economy-wide employment problem, leading to loss of government revenue.

Furthermore, traders will try to borrow in domestic currency to finance the build up of imports or to carry exports that are held off pending devaluation. This increases interest rates, with negative effects on investment and other sectors. Persistent overvaluation ultimately causes many industries that are involved in speculation to go bankrupt. If banks fail the government may have to incur heavy costs to bail out the financial system (Ibid: pp 81-82.). Over the long run, sustained overvaluation will lead to disinvestment and capital flight. With imperfections in local capital markets these costs can assume significant proportions in situations of short-term structural misalignment.

While a country with a small traded goods sector can easily finance a transitory trade deficit, persistent overvaluation that leads to substantial trade deficits financed by foreign borrowing creates an unsustainable situation. Thus, even though the resulting trade deficit can be financed by running down reserves or by borrowing, it may be unwise to give up these resources or to incur increased external liabilities unless those resources are productively invested to yield a return at least equal to their ultimate service and amortization costs (Ibid.).

3.3 Exchange Rate Volatility and Investment Uncertainty

RER misalignment raises the conditional variance of the RER – leading to sharp, sudden, and unanticipated swings. These movements create uncertainty, which increases transaction costs and interest rates, discourage international trade and investment, and ultimately fuels inflation. In addition, with incomplete futures markets, increased exchange rate volatility will also translate into higher risk. If risk aversion obtains, exchange rate risk gives rise to a risk premium which increases the differential between interest rates on domestic capital and those prevailing in world capital markets (Ibid.). Greater uncertainty on relative prices will then lead to shorter investment horizons and high adjustment costs as production moves back and forth from tradable to nontradable sectors (Cottani, et al 1990).

Exchange rate volatility may also trigger financial instability as expectations of exchange rate changes lead to interest rate volatility. Further, exchange rate volatility tends to increase the threshold point that expected returns must reach before investment is implemented. In this regard, Krugman (1989) argues that uncertainty creates an incentive for firms to pursue a “wait and see” strategy. Thus, following an increase in RER volatility, a risk-neutral exporter or import–competing firm will wait for a higher RER level before undertaking an investment project (Erdal 2001). This widens the range of inaction in which firms neither enter nor exit the product market. The incentive not to act is greater the more volatile the exchange rate. However, it does not necessarily affect the observed rate of return once the investment is made (Guerin and Revil 2001).

In spite of the general consensus, more recent research by Aghion, Bacchetta, Rancie and Rogoff (2009) has demonstrated that the relationship between RER volatility and output growth also depends critically on the level of a country’s financial development. Using a simple monetary model, they have successfully demonstrated that RER uncertainty exacerbates the negative investment effects of domestic credit market constraints, and that these financial market shocks are amplified in developing countries with thin and poorly developed credit markets (Ibid).

4. REVIEW OF EMPIRICAL DEVELOPING COUNTRY STUDIES

4.1 Misalignment and Growth Performance

Empirical studies have emphasized the profound economic impact that the RER exerts through its influence on foreign trade flows, the balance of payments, the level and structure of production, employment, domestic prices, and resource allocation.

Most empirical evidence has in this context attributed the sluggish performance of developing countries, particularly in Africa and Latin America, to chronically misaligned RERs. High levels of growth in Asia, on the other hand, have been ascribed to prudent macroeconomic, in particular trade and exchange rate, policies (Cottani et al, 1990; Dollar 1992, Ghura and Grennes, 1993). Empirical evidence from developing countries supports the hypothesis that growth and alternative measures of macroeconomic stability are positively related (Frenkel and Khan 1990). Indeed such studies have been pivotal in reinforcing the widely held view which dictates that appropriate policies - aimed at keeping a low inflation rate, properly aligned RERs, fiscal responsibility - and predictability of these policies support long-run growth performance (Ibid).

Edwards (1988) presents one of the early studies on the macroeconomic effects of RER misalignment in a developing country context. Using a panel of twelve developing countries, he finds significant empirical support for the adverse macroeconomic consequences of misalignment over the period 1965-85. He concludes that countries which manage to maintain their RERs close to equilibrium systematically outperform those with persistent RER misalignment. The results of the study show that average growth of real GDP varies negatively with the average degree of misalignment. Furthermore, using the black market premium as an alternative measure of misalignment, Edwards (1988, 1989) further demonstrates that an increase in the black market premium is negatively associated with economic performance in the same countries.

In other pioneering studies, Dollar (1992) also investigates the misalignment-growth nexus in a cross country study of 95 developing countries over the period 1976-85.[3] He uses the non-traditional measure of the RER based on the international comparison of price levels that correspond to a country's resource endowment, prepared by Robert Summers and Allan Heston (1988). Using the price level, population density, per capita GDP, and investment rate as performance indicators, he finds that outward-oriented policies, reflected in a level of the RER that encourages exports, promote the development of the tradable sector in Asia. On the other hand, inward orientation and overvalued RERs encourage growth of the nontradable sector in Latin America and

[3] The sample included 16 Asian economies, 24 from Latin America and 43 from Africa.

Africa. A negative relationship between RER distortions and growth of per capita GDP was found after controlling for the effects of RER variability and investment.

The impact of RER overvaluation is also documented in large multi-country studies. Among the prominent ones, Ghura and Grennes (1993) in particular find a negative relationship between RER misalignment and economic performance (growth, imports, exports, saving and investment) for 33 countries in Sub-Saharan Africa (SSA). Using the black market premium, the PPP-based measure of misalignment, and a model-based misalignment index, they show that high levels of RER overvaluation are associated with periods of macroeconomic instability, while lower levels of overvaluation correspond to better economic performance. Domestic investment is adversely affected by both misalignment and instability while savings are adversely affected only by misalignment but not by instability.

Similarly, Cottani et al (1990) reveal a strong negative correlation between per capita GDP growth and RER misalignment for a cross section of 24 LDCs using a model-based measure of misalignment, a PPP-based measure, as well as a measure of RER instability. Their findings indicate that the negative effect of RER instability seems to outweigh RER misalignment in explaining net investment. The results from Elbadawi (1994), who applies a simplified framework of Edwards' (1989) model to Chile, Ghana, and India also revealed a similar association between misaligned RERs and growth.

Razin and Collins (1997) employed panel data methods with fixed country effects for 93 countries over 1975-92. Their results show a negative association between growth and average misalignments (and the standard deviation of misalignment) as well as RER volatility. However, the estimation does not reflect a significant relationship between RER undervaluation and growth. An investigation for the presence of non-linearities in the relationship between growth and both misalignment and the volatility of misalignment was done by subdividing the groups of 90 countries with over-valued RERs and the 62, with under-valued RERs, into low, medium, high and very high income categories. The findings confirmed the existence of important non-linearities in the relationship between misalignment and growth. While very high overvaluation was associated with slower growth, moderate to high (but not very high) undervaluation appears to stimulate growth. In particular, only very high overvaluations are associated with slower economic growth (Ibid)

Research on growth accelerations, (Hausmann, Pritchet and Rodrik, 2005) show that RER overvaluation is a predominant factor that makes it difficult to sustain growth spurts. Toulaboe (2006) obtains a negative relationship between the mean growth rate of per capita GDP and RER misalignment, but not with RER instability, using data from 33 developing countries. Panel data studies that report a negative impact of misalignment on real GDP growth using a model-based measure of misalignment and the black market premium include Easterly, Loayza and Montiel (1997) and Easterly (2004).

These studies have also found nonlinear negative growth effects of RER misalignments – that is, undervaluation, possibly reflecting competitive devaluations, may drive the exchange rate to a level that encourages exports (Aguirre and Calderón, 2005). In turn, this may positively affect growth by enhancing economies of scale and technology acquisition. Their panel and time series cointegration study of 60 countries reveals that further appreciation of the local currency generates more adverse growth effects for countries with higher current degrees of overvaluation. The results on the other hand indicate that, on average, small degrees of undervaluation (up to 12 percent) are associated with a positive and significant growth response. Overall, the growth response is negative and significant for undervaluations larger than 25 percent.

4.2 Impact on Export Performance and Stabilization Programs

The importance of RER misalignment for economic performance is also evident from its observed impact on export performance. This follows from the conviction that unstable and overvalued RERs supported by protectionist policies provide weak incentives to export, while persistently misaligned RERs in Africa cause severe contraction in agricultural output (The World Bank, 1984). Balassa (1990) investigates this proposition and demonstrates that exports in general and agricultural exports in particular, are highly responsive to price incentives. He finds that market-oriented countries in Sub-Saharan Africa generally gained, and interventionist countries lost export market shares.

Differences in export performance were even greater between private market economies and etatist countries. Overall, countries with highly overvalued exchange rates experienced considerable losses in export market shares (Ibid). Sekkat and Aristomène (1995) observe a significant impact of changes in the REER for export performance in a panel of major Sub-Saharan Africa countries for 1970-92. Their estimates indicate that countries which were successful in promoting manufactured exports had implemented cautious exchange-rate policies leading to steadily declining RER overvaluation.

The growth literature also uses the parallel premium as a "proxy for government distortions of markets," with the results yielding a negative economic growth effect (Easterly 1994). Kiguel and O'Connel (1995) also note that export under-invoicing and import over-invoicing increases the longer the controls remain in place and as the parallel premium increases – creating a leak in the system and undermining the desired price insulation effect of foreign exchange reserves. Aron and Elbadawi (1992) found evidence for Zambia for the period 1970–89, showing that h high premium retards copper production and export, while also encouraging over-importing (and probably over-invoicing) of officially traded imports.

Hence overvalued RERs have been widely blamed for the failure of stabilization programmes in developing countries. Among those who have demonstrated the effect, Veiga (1999) used a panel of thirty four stabilization episodes in a binary probit model, to show that RER appreciation, lack of foreign reserves, and government budget deficits are the main causes of failure of inflation stabilization plans. The failure to sustain adequate exchange rate policy is seen as having triggered the collapse of the Southern Cone (Argentina, Chile, and Uruguay) experiments with economic reform and free market policies in the 1970s. Other adverse effects of misalignment have been linked to the emergence of currency crises, particularly in Latin America, Russia and the Asian crisis of 1998 (Teunissen 1996, Kemme and Roy 2006).

In a more recent contribution to the literature, Aghion , et al, (2009), use cross-country panel data to provide fairly robust evidence suggesting the importance of financial development for the relationship between the choice of exchange rate regimes and long-run growth. Their findings validate the hypothesis that higher levels of excess exchange rate volatility can stunt growth, especially in countries with thin capital markets and where financial shocks are the main source of macroeconomic volatility.

4.3 Conclusions

The theoretical and empirical literature presents overwhelming consensus that overvalued RERs tend to discourage domestic economic activity and ultimately restrict economic growth. Moreover, it may be reasonably held that failure to implement appropriate exchange rate policies will inevitably compromise the short- and long-term economic goals of any country. Conversely, undervaluation – which could be the result of competitive devaluations – may encourage exports and stimulate growth through economies of scale effects and the adoption of new technologies, especially as the profitability of exports increases.

Furthermore, evidence from both theory and empirical studies further concedes that economic performance may be hindered by a volatile economic environment that is directly influenced by the RER. However, while some prominent studies maintain that RER volatility and misalignment are among the main sources of aggregate volatility, the complete theoretical and empirical link between RER misalignment and economic growth is not yet well understood

In conclusion, one of the main weaknesses in the foregoing review of both the theoretical and empirical literature can be said to be the lack of an explicit analytical framework that connects the RER to aggregate growth. Furthermore, it is important to note that while empirical literature makes good attempts to introduce country specific control variables, the role of financial development, as articulated by Aghion et al (2009), does not feature in any of the past studies. This is viewed as a serious gap in the literature, which could well compromise the robustness of findings across countries with different levels of financial development.

Thus, in the absence of a unified analytical model, the empirical literature will be used, together with the preceding review of the theory, to provide a basis for the empirical specification of the growth equation for the case of Zimbabwe in Section 4.

5. APPLICATIONS TO GROWTH PERFORMANCE IN ZIMBABWE

5.1 The Empirical Link between Growth and RER Misalignment

Notwithstanding the apparent analytical limitations, a number of attempts have been made in the literature to explore the misalignment – economic growth nexus. The most commonly applied methods involve adding the RER misalignment variable to a set of explanatory variables generally incorporated in empirical growth regressions (Razin and Collins 1997, Aguire and Calderon 2005). Control variables such as population growth and investment as a percentage of GDP have also been incorporated in standard growth theories. For instance, Razin and Collins (1997) select explanatory variables following Barro and Lee (1994), who propose the inclusion of indicators of initial conditions, the external environment, and macroeconomic policy as explanatory variables.

Some studies have also incorporated explanatory variables such as life expectancy at birth, and human capital proxied by the proportion of the total relevant age group enrolled in secondary school (Toulaboe 2006). Generally, these variables are intended to control for the effects of initial conditions in sample countries for cross country estimations. Government consumption as a percentage of GDP and inflation is often used to account for the stance of domestic fiscal policy (Aguire and Calderon 2005). Hutchison and Neuberger (2001) offer a general model that could serve as a possible synthesis of alternative approaches to the RER – growth relation. They specify a growth equation that can be easily adapted to account for most of the common variables that influence the growth impact of RER misalignment. The determinants of output are domestic policy and external factors as well as the occurrence of currency crises:

$$y_t = \beta_0 + \beta_k x_t + \beta_h w_t + \beta^{cc} D^{cc}_{(t-1)} + \varepsilon_t \qquad (1.0)$$

where y_t represents real output growth, x is a k-element vector of policy variables at time t, w is an h-element vector of exogenous variables at time t, $D^{cc}_{i(t-1)}$ is a dummy variable that assumes the value of unity if the country has recently experienced a currency or balance of payments crisis (and zero otherwise). The domestic policy factors may include government budgets and credit growth. External factors (w_t) include growth in world output and the RER misalignment index. β_k is a k-element vector measuring the impact of policy changes on output. β_h is an *h*-element vector measuring the impact of exogenous factors on output while β^{cc} captures the effect of either currency or balance-of-payments crises on output growth.

Sekkat and Aristomene (1998) used a similar equation to estimate the impact of RER misalignment on African exports. Razin and Collins (1997) included the actual RER among the right hand side variables as an indicator of macroeconomic policy. This specification may therefore be considered appropriate for small open developing country economies. In such economies, the export sector, which is mainly driven by primary exports like agriculture, is a major contributor to employment, generating vital foreign exchange inflows. Thus, α_3 is expected to be positive as RER depreciation is expected to improve external competitiveness and, consequently, to enhance economic growth.

5.2 Estimation of the Equilibrium Real Exchange Rate

Using the BEER methodology, and following Edwards (1994), the level of the RER that is consistent with internal and external balance is expressed as a function of a set of exogenous and policy variables, the RER "fundamentals" ($\mathbf{F}_{it}$), which assume a log-linear relationship:

$$\ln(RER_t) = \boldsymbol{\beta}_i'\mathbf{F}_{\mathrm{it}} \tag{1.1}$$

The vector of parameters, β_i, is estimated from the long-run steady-state relationship between the observed values of the fundamentals and the RER:

$$\ln RER_t = \boldsymbol{\beta}_i'\mathbf{F}_{it} + \varepsilon_t \tag{1.2}$$

The structural relationship between the ERER and economic fundamentals is modelled in line with the reduced form equation specified by Edwards (1994),

$$\log(RER_t^*) = \beta_0 + \boldsymbol{\beta}_i \log(\mathbf{F}_{it}) + \mu_t \tag{1.3}$$

where RER_t^* is the estimated ERER and $\mathbf{F}_{it}$ is the vector of fundamental variables. By defining the vector of $\mathbf{F}_{it}$, the final estimation equation for the RER is:

$$\begin{aligned}\log(RER)_t = {} & \beta_0 + \beta_1 RID_t + \beta_2 \log NFA_t + \beta_3 (DCE)_t + \beta_4 NOMDEV_t + \beta_5 \log(OPEN)_t \\ & + \beta_6 \log(GCGDP)_t + \beta_7 (INVGDP)_t + \beta_8 NXGDP_t + \beta_9 TOT_t + \mu_t.\end{aligned} \tag{1.4}$$

where RID is the real interest rate differential; NFA is net foreign assets of the monetary authorities as a proxy for net (the negative of) capital flows; DCE is the rate of domestic credit expansion; NOMDEV is the rate of nominal devaluation or currency depreciation; OPEN is a measure of the degree of trade restrictions in the economy given by the sum of exports and imports as proportions of real GDP; GCGDP is the proportion of government consumption to real GDP; INVGDP is the ratio of domestic investment (proxied by gross capital formation) to GDP and NXGDP is the ratio of net exports to GDP. The terms of trade (TOT) was eventually eliminated due to data unavailability.

Monthly national accounts data was sourced from the Reserve Bank of Zimbabwe (RBZ) and the *International Financial Statistics* (IFS) database. The degree of openness (OPEN) was computed using monthly import and export data, deflated to the 2000 base year. Data was available only for the period 1985:1 up to 2004:12. Government consumption of nontradables is proxied by the ratio of total government consumption to GDP. Five dummy variables; 1991_Float, 1998_Fix, 2000:8_Dev, 2003:2_Dev and 2004:1_Dev were included to capture the impact of exchange rate liberalization, as well as key devaluations that occurred in August 2008, February 2003 and January 2004. The optimal lag length was determined using the AIC. Before, estimating the model, unit root tests were conducted in order to determine the order of integration of the variables.

The results, illustrated in Table A1 (Appendix) revealed that all variables were I(1), with the exception of the rate of nominal devaluation, domestic credit expansion and the bilateral RER which were found to be I(0). Hence, a major limitation of using standard cointegration procedures in this case is that they require a strict classification of the regressors as either *I(0)* or *I(1)* processes. No allowance is made for fractionally integrated processes. Estimating a relationship that contains a mix of both *I(0)* and *I(1)* variables using standard cointegration techniques presents serious estimation problems. However, these limitation have been overcome through the use of an alternative approach, the autoregressive distributed lag (ARDL) that was pioneered by Pesaran and Shin (1995). The main advantage of the ARDL method is that it can be applied irrespective of whether the variables are *I(0)*, *I(1)* or fractionally integrated.

Table A3 and A4 (Appendix) illustrate the short and long run estimated model parameters obtained using the ARDL approach to cointegration method. The results show that overall, the RER depreciates in response to an increase in interest rate differentials, net foreign assets, the investment to GDP ratio, and improvements in the trade balance. On the other hand, increases in domestic credit expansion, government expenditure and the degree of openness appreciate the RER both in the short- and long-run estimates. Thus, consistent with the theory, the results positively indicate that inconsistent monetary and fiscal policies were the major causes of RER overvaluation in Zimbabwe.

5.3 RER Misalignment and GDP Growth Trends

After estimating the ERER model, the RER fundamentals ($\mathbf{F}_{it}$) are decomposed into permanent ($\mathbf{F}_{it}^{P}$) and transitory components ($\mathbf{F}_{it}^{T}$), using the Hodrick-Prescott Filter decomposition method. Assuming that the long-run parameters, $\boldsymbol{\beta}_i$'s, are stable within the sample period, the ERER, denoted RER_t^*, is then determined by inserting the permanent components of the fundamentals, F_t^P, into the estimated RER equation (1.1) along with the $\boldsymbol{\beta}$ parameters to give

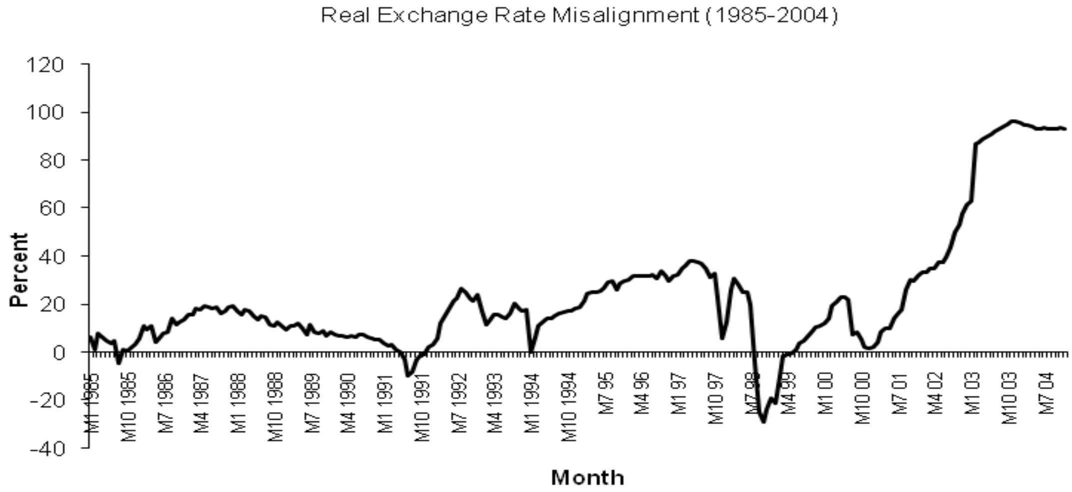
$$\log(RER_t^*) = \boldsymbol{\beta}_i' \mathrm{F}_{it}^{\mathrm{P}} \tag{1.5}$$

The resulting "fitted" time series, RER_t^*, is interpreted as the path through time of the ERER. Comparing the equilibrium real exchange rate obtained in (1.5) to the actual RER gives a measure of the extent of RER misalignment:

$$MIS_t = \frac{RER_t^* - RER_t}{RER_t^*} \tag{1.6}$$

If the actual RER is more appreciated than the estimated equilibrium rate $(ERER_t > RER_t)$ the RER is considered to be overvalued (MIS>0). Conversely, the RER is undervalued (MIS<0). Figure 1 illustrates the estimated monthly RER misalignment for the period 1985-2004. The trend in the misalignment index shows that the Zimbabwe dollar was overvalued in real terms by more than 5 percent for at least 75 percent of the period between 1985 and 2004. While the overvaluation appears to decline steadily in 1987-1991, the post 1994 to 1999 period is characterized by high levels of misalignment of up to 40 percent. After a marginal decrease in mid 1999 and 2000, the overvaluation sharply increases to all time high levels of up to 95 percent by 2004.

Figure 1: Real Exchange Rate Misalignment Indices



Computed RER Model misalignment estimates

The estimated RER misalignment index also shows that the highest levels of RER overvaluation were attained during the same period. In terms of real GDP growth, figure 2 shows that the observed trends show that annual growth rates were negative for seven years out of the 19-year sample, 1985-2004. Six years of the negative growth period occurred between 1999 and 2004. Figure 2 illustrates that while real GDP growth remained positive and averaged about 5 percent in 1985-1991, the trend significantly fluctuated during and after the Economic Structural Adjustment Programme (ESAP).

Figure 2: Annual and Monthly Real GDP Growth and RER Misalignment: 1985-2004

Data Source: Reserve Bank of Zimbabwe

Firstly, the negative growth trend in 1991-1992 can be linked to the devastating drought, which led to a significant production slowdown in the agro-based economy. After the drought subsided, both annual and monthly growth rates sharply rose to a peak of about 10.4 percent in 1996. However, from the end of 1997, the economy suddenly slid into a severe recession in the wake of the 1997 currency crisis. Subsequently, real GDP grew by a meagre 1.3 percent annually in 1997 before the recession intensified.

In addition, the sharply negative growth in 1992 also coincides with an upsurge in RER overvaluation, although the impact of the drought during this period is fundamental. RER overvaluation also appears to be intermittently positively related to growth, in particular between 1986-88, 1993-94 and 1995-96. These short-term positive growth cycles, which closely coincide with the announcement of export incentives in 1986; balance of payment support inflows in mid 1990s and a construction boom at that time; are however not sustained as the RER misalignment persists. The contraction of output is persistently negative from 1998 – 2004.

5.4 Econometric Specification of the Growth Equation

The computation of the RER misalignment index provides a key independent variable for the growth model estimation. However, like most studies that have used the growth model-based approach to evaluate the impact of RER misalignment, the appropriate specification for Zimbabwe is highly constrained by data availability. The final choice of variables is limited by the availability of monthly data for the period 1985-2004 to give the following equation linking real GDP growth and RER misalignment:

$$\begin{aligned} GROWTH_t &= \alpha_0 + \alpha_1 MIS_t + \alpha_2 GFCF_t + \alpha_3 BRER_t + \alpha_4 RERV_t \\ &+ \alpha_5 1992\_Drought + \alpha_6 D2 + D3_7 + \alpha_8 polrisk + C \end{aligned} \quad (1.7)$$

$\alpha_1 < 0$, $\alpha_2 > 0$ $\alpha_3 > 0$, $\alpha_4 < 0$, $\alpha_5<0$ and $\alpha_6<0$, $\alpha_7<0$, $\alpha_8>0$

where GROWTH$_t$ is monthly real GDP growth and MIS_t is the index of RER misalignment. $GFCF_t$ is gross fixed capital formation and $BRER_t$ represents the bilateral RER while $BRERV_t$ is the index of BRER volatility. The RER volatility is computed as the standard deviation of the RER. α_3 is expected to be positive as RER depreciation tends to improve external competitiveness and, hence, growth. The coefficients of the misalignment index and BRER volatility, α_1 and α_4, are expected to be negative, reflecting the effects of policy and market distortions as well as aggregate uncertainty.

Drought is a dummy variable that takes the value of 1 during the devastating drought that occurred in 1992[4]. Two dummy variable are included to capture the 1997 currency crisis period, i.e D2, covering December 1997 to August 2000, while D3 to capture the fixed exchange rate period from August 2000 to January 2003. The model was also specified to test for the potential effects of institutional quality, namely the role of country risk, using the International Country Risk Guide (ICRGP) political risk index (*polrisk*) measure. The index is constructed so that higher values indicate better institutions and thus, the coefficient α_8 is expected to be positive.

5.5 Data and Time Series Properties

Equation (1.7) was estimated with monthly data for the period 1985-2004. Before the estimation, unit root tests were first conducted using the Augmented Dickey Fuller (ADF) methods. The results in Table A2 (appendix) confirm that 5 of the 6 variables are I(1). However, the bilateral RER is I(0).

Similar to the ERER estimation (section 5.2), this mix of I(1) and I(0) variables necessitates the use of the ARDL approach to cointegration. Hence the bounds test proposed by Pesaran and Shin (1995) is first conducted to test for the existence of a long-run relationship between the variables.

$$GROWTH_t = \beta_0 + \sum_{j=1}^{n} \beta_1 \Delta MIS_{t-i} + \sum_{j=1}^{n} \beta_2 GFCF_{t-1} + \sum_{j=1}^{n} \beta_3 \Delta RER_{t-i} + \sum_{j=1}^{n} \beta_4 \Delta RERV_t \\ + \delta_1 MIS_{t-1} + \delta_2 GFCF_{t-1} + \delta_3 BRER_{t-1} + \delta_4 RERV_{t-1} + \mu_t \quad (1.8)$$

In the second step, tests for the presence of a long-run relationship were conducted by restricting all estimated coefficients of the lagged level variables to zero – to test the null hypothesis of 'non-existence of the long-run relationship', i.e. $\delta_1 = \delta_2 = \delta_3 = \delta_4$ against $\delta_1 \neq 0$, $\delta_2 \neq 0$, $\delta_3 \neq 0$, $\delta_4 \neq 0$. The variable addition test results (Table A5, Appendix) gave a computed F-statistic of 8.5339. This statistic is much higher

[4] The 1991-1992 drought, which affected Southern Africa, was the region's worst drought in living memory. Agricultural output contracted by 23 percent, leading to an overall 9 percent contraction in real GDP and an escalation of food prices. Source, State of the Environment in Southern Africa, SADC, 1994

than the tabulated critical 95 percent values of 2.850 and 4.049 (lower and upper bonds), thus verifying the presence of a long-run relationship.

5.6 The Short and Long Run Parameters

The growth equation is estimated using the ARDL approach to cointegration where in accordance with Pesaran and Pesaran (1997), the general procedure is represented by the following equation:

$$\phi(L,p)Y_t = \sum_{i=1}^{k} \beta_i(L,q_i)X_{it} + \delta'\mathbf{w}_t + u_t \qquad (1.9)$$

where

$$\phi(L,p) = 1 - \phi_1 L - \phi_2 L^2 - .... - \phi_p L^p \qquad (2.0)$$

and

$$\beta_i(L,q_i) = 1 - \beta_{i0} + \beta_{i1}L + ... + \beta_{iqi}L^{qi}, i = 1,2,....,k \qquad (2.1)$$

Y_t denotes the dependent variable, X_{it} represents the *i* explanatory variables, *L* is a lag operator and $\mathbf{w}_t$ is the Sx1 vector representing the deterministic variables employed, including intercept terms, dummy variables, and other exogenous variables. With ARDL model, the reaction to Y_t after a change in X_t is distributed over a number of time periods. The model thus contains *p* lagged terms and the current X_t term, so it takes $p + 1$ for the full effects of a change in X_t to influence Y_t. In addition, the dependent variable is regressed on its past lags, with the relative impact given by the φ coefficients. The optimum lag length is determined by minimizing either the Akaike Information Criterion (AIC) or the Schwarz Bayesian Criteria (SBC). However, there are 3 critical parameters to consider in the estimation and interpretation of the ARDL model:

a) **The impact multipliers**, β_0, are the weights attached to the current (X_t) given by $\Delta Y_t/\Delta X_t$. They show how much the average growth in output would be when X_t changes by one unit in the particular sample period. An impact multiplier gives the effect of a unit increase in an exogenous variable on an endogenous variable in the particular sample period
b) **The interim multipliers**, β_i, given by $\Delta Y_t/\Delta X_{t-1}$ show the average change in Y_t for a unit increase in X_{t-i}, i.e for a unit increase in *X* made *i* periods before *t*. It can be

said that an interim multiplier gives the effect of a unit increase in an exogenous variable on an endogenous variable when that effect is sustained for a specified amount of time.

c) **The long-run equilibrium multipliers**, which are the sum of all the impact and interim multiplier effects adjusted for the dependent variable impact. A long-run equilibrium multiplier therefore gives the effect of a unit increase in an exogenous variable on an endogenous variable when sustained into the indefinite future.

Using the ARDL specific model, the long run coefficients are given by;

$$\hat{\theta}_t = \frac{\hat{\beta}_{i0} + \hat{\beta}_{i1} + ... + \hat{\beta}_{qi}}{1 - \hat{\phi}_1 - \hat{\phi}_2 - ...\hat{\phi}_p} \quad \forall \text{ i=1,2,....,k} \qquad (2.2)$$

In the numerator is the sum of the impact and interim multipliers on the exogenous variables, depending on the number of lags. The denominator adjusts for the interim multiplier effect on the dependent variable, i.e the real GDP growth. Thus in the foregoing estimation, the ARDL estimates are first reported for the short run, which considers only the impact in the current period and the time-specific impact captured in the estimated lags. The long run parameters then give estimates of the sustained future outcomes, or long run equilibrium, when the economy is at the steady state.

5.7 Estimation of the Growth Model

Following Aguire and Calderon (2005) and Razin and Collins (1997), the estimation approach also made attempts to determine the extent to which overvaluation impairs growth and undervaluation could be said to enhance it. The literature argues that overvaluations may hurt growth since they may either reflect inconsistent macroeconomic policies or proxy the size of a future currency crisis episode (Razin and Collins, 1999). Others have argued that to the extent that undervaluations reflect competitive depreciations, they will have a positive impact on growth. This involved first estimating the model with a dummy variable that is arbitrarily defined to capture periods during which the RER is overvalued by at least 5 percent. While the overvaluation threshold was subsequently increased to levels up to 25 percent, the variable remains negative but nonetheless statistically insignificant, while the model selection criteria statistics (Akaike and Schwartz Bayesian Information criteria) increase.

The ARDL estimates of the growth equation are reported in tables 2 and 3. The order of the model was determined using the SBC criterion. The model displays a very good fit with an adjusted R-squared of about 89 percent. The F-statistic for the model is statistically significant, while the DW-statistic is very close to 2. The validity of the results is further verified by the diagnostic LM and F tests of residual correlation which are both significant at 5 percent LOS. Tests for functional form and normality are also significant. The diagnostic tests reject the presence of heteroscedasticity – with all statistical inference tests demonstrating a good measure of reliability of the model.

Table 2: Autoregressive Distributed Lag Estimates

Regressor	Coefficient	Standard Error	T-Ratio[Prob]	Elasticity
GROWTH(-1	0.764	.0357	21.4062[.000	---
MISAL	-.00354	0.000904	-3.9123[.000]	-1.28570
GFCF	0.000904	0.00000161	-3.4061[.001]	
GFCF(-1)	0.00000613	0.00000167	3.6753[.000]	
BRER	0.0000621	0.0000223	2.7854[.006]	3.66690
BRER(-1	-0.0000747	0.0000238	-3.1420[.002]	-4.40878
RERV	-0.00148	0.000703	-2.0971[.037]	-1.58928
RERV(-1	0.00115	0.00115	1.6179[.107]	1.23600
POLRISK	-0.0328	0.00785	-4.1743[.000]	
POLRISK(-1	0.0272	.00779	3.4946[.001]	
DROUGHT	-0.00248	0.000483	-5.1339[.000	
D2	-0.00209	0.000570	-3.6665[.000]	
D3	-0.0016634	0.000456	-3.6490[.000]	
OVERVALUATION	-0.0001217	0.000389	-.31317[.754]	
Constant	.00291	.00105	2.7583[.006]	
R-Squared	0.89502	R-Bar-Squared 0.88846		
S.E. of Regression	0.0015680	F-stat. 136.4054[.000]		F(14, 224)
RSS	0.0005507	S.D. of 0.0046947	Dependent	Variable
DW-statistic	0.0232	EquationLog-likelihood		1212.1
		Durbin's h-statistic		-0.21519[.830]

The estimation results in tables 2 and 3 show that real GDP growth responds positively and significantly to its one period lag using both the short run ARDL and error correction model specification. In the interpretation of the results, the coefficients are annualized by multiplying by 12. The coefficient of the misalignment indicator is negative, with a significant impact on real GDP growth. This implies that as the exchange rate becomes more overvalued (an increase in the misalignment index) real GDP growth declines and the converse holds as the overvaluation decreases.

Table 3: Estimated Long Run Coefficients using the ARDL Approach

Regressor	Coefficient	Standard Error	T-Ratio[Prob]	Elasticity
MISAL	-.0150	.00332	-4.5187[.000]	-5.44945
GFCF	0.00000278	0.000000867	3.2085[.002]	
BRER	-0.0000533	0.0000545	-.97717[.330]	-3.14399
RERV	-0.00140	.00128	-1.0889[.277]	-1.49749
POLRISK	0.0235	0.0109	-2.1642[.032]	
DROUGHT	-0.0105	0.00190	-5.5196[.000]	
D2	-0.00886	0.00207	-4.2849[.000]	
D3	-0.00705	0.00166	-4.2522[.000]	
OVERVALUATION	-0.000516	0.00165	2.7940[.006]	
Constant	0.0123	0.00441	2.7940[.006]	

Accordingly, a 1 unit (1 percentage point) increase in the misalignment index would on average, lead to a 0.0035 unit (percentage point) contraction in the monthly GDP growth rate. In annualized terms, this is equivalent to approximately 0.042 percentage point reduction in the growth rate. This then implies that if the RER misalignment index doubles, monthly growth would decline by about 0.35 percent, which is equivalent to an annual growth contraction of up to 4.2 percent. In addition, the computed short run partial elasticity of the misalignment index (of -1.28) shows that output growth is elastic to an increase in real overvaluation.

The long run parameters indicate that a unit increase in RER overvaluation would spur a contraction of about 0.015 and 0.18 percentage points in monthly and annual real GDP growth rates respectively. This, on average translates to an 18 percent point reduction in annual growth rates from a doubling of the misalignment index that is maintained into the long run. The adverse impacts of sustained exchange rate overvaluation are also empirically confirmed by the 4-fold increase in the negative long run elasticity, relative to the short run scenario. Given that RER misalignment increases from about 0 up to 95 percent from 1999 – 2003, the findings provide empirical support to the argument that chronic exchange rate overvaluation was a major determinant of the severe growth contraction.

As for other policy variables, the BRER is shown to exert a positive and statistically significant impact on output growth in the current period. The effect however reverses after one lag and then turns out to be statistically insignificant in the long run period. The high short run elasticity of 3.67 can be interpreted as an indication that exchange rate policies which achieve significant real devaluation effects can act as a potentially powerful stimulant to real output growth in developing countries.

Like the BRER, RER exchange rate volatility had the expected negative sign in the current period as well as the long run estimates. However, only the short run impact multiplier was statistically significant. The computed short run elasticity is comparative close to that of the RER misalignment index. Similar to the findings reported in Aghion, et al (2009), these conflicting results on the RER volatility tend to be inconclusive and may well reflect the observed instability of the relationship the RER and aggregate output in countries with limited financial sector development.

Of the structural control variables, gross fixed capital formation was found to be highly significant throughout all cases although it had the opposite sign in the short run estimates. However, the first lag effect and the long run estimates have the expected positive and statistically significant coefficients. The dummy variables that capture the 1992 drought and the post-1997 currency crisis periods all have negative and highly significant coefficients. The drought period brings about the most adverse impact on real growth, in both short and long run, followed by the aftermath of the currency crash in 1997. The dummy variable, D3, suggests that the currency crisis effect decreases marginally after the August 2000 devaluation but nevertheless remains significant.

The dummy variable that captures RER overvaluation periods of over 5 percent had a negative, though statistically insignificant coefficient in both the short and long run estimates. The negative sign of the coefficient could be interpreted as an indication that RER overvaluation episodes of 5 percent or more are generally associated with adverse effect on real GDP growth. The political risk index was highly significant in both the short and long run estimations, but was of the "wrong" negative sign in the current period (impact multiplier) and the long run. The conflicting results may indicate that while political risk perceptions act with a lag on economic growth, they are nevertheless not sustained into the long run.

6. CONCLUSIONS

The paper provides evidence in support of the hypothesis that RER misalignment, caused by a combination of excessively expansionary monetary and fiscal policies was a major factor behind the growth slowdown in Zimbabwe. Controlling for the presence of other exogenous effects such as the 1991-1992 drought and the compound effects of the post-1997 currency crisis, the results empirically confirm that RER misalignment is the most significant policy-induced factor that led to a reduction in real GDP growth in both the short and the long run. The decline in real GDP growth is highly elastic to an increase in RER overvaluation. Furthermore, the partial elasticity of the misalignment index increases more than 4 – fold in the long run, and indication that sustained RER overvaluations can have deleterious growth implications.

Other key findings pertain to the negative impact of RER volatility, particularly in the short-run estimates. Of the policy indicators, RER depreciation was found to exert a highly significant positive impact on growth in both the short and long run estimations. Overall, real GDP growth decreases with an increase in RER overvaluation, an increase in RER volatility as well as during the drought and currency crisis periods. On the other hand, growth increases significantly with gross fixed capital formation and RER depreciation.

The empirical evidence on Zimbabwe also indicates that periods during which the RER is overvalued are associated with a negative growth effect. Though this association was not statistically significant at conventional levels, the results nevertheless indicate that an increase in overvaluation hinders growth while undervaluation promotes it. In conclusion, the theory and empirical evidence provides positive support for the proposition that keeping the RER at levels close to, or below, equilibrium, that is, avoiding periods of protracted RER overvaluation will promote economic growth.

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APPENDIX: UNIT ROOT TESTS AND REGRESSION RESULTS

Table A1: Unit Root Tests: The Equilibrium Exchange Rate Model

	Levels		First Differences	
	Constant	Constant and Trend	Constant	Constant and Trend
	CV = --2.87	CV = --3.43	CV = -2.87	CV =-3.43
LRGDP	-1.681084	-0.339216	-2.981865	-3.797310
LBRER*	-1.819074	-3.494414	-10.46568	-10.44105
LPRERDEV	-2.696378	-2.768447	-14.11182	-14.08581
LRERDEV	1.455596	0.140954	-13.06884	-13.29094
LRMS	-3.000462	-3.472014	-17.74862	-17.71095
RIR	1.567941	1.223094	-5.037843	-5.321253
IR	-2.835434	-4.056547	-7.827501	-7.816922
LEXDEV_ENER	1.454547	0.140234	-13.07415	-13.29630
LEXDEV_PNER	-3.025850	-3.188485	-14.17182	-14.14183
Phillips – Perron (PP) Test				
	Constant	Constant and Time Trend	Constant	Constant and Time Trend
LRGDP	-1.962391	0.684669	-2.915746	-3.868396
LBRER	-1.675014	-3.109535	-10.50174	-10.47759
LPRERDEV	-2.931439	-3.003227	-14.11101	-14.08499
LRERDEV	0.429148	-0.624431	-13.72844	-13.84175
LRMS	-2.863567	-3.472014	-18.12982	-18.08794
RIR	-2.470065	-2.972042	-18.33430	-18.29385
IR	-4.677348	-6.606103	-21.81803	-21.77133
LEXDEV_ENER	0.429068	-0.624482	-13.73333	-13.84663
LEXDEV_PNER	-3.264562	-3.453222	-14.38918	-14.34928

*LBRER becomes *I(1)* after controlling for structural breaks in 2003:2 and 2004:1.

Table A2. ADF Tests for Unit Roots: The Growth Model

	Levels		First Differences	
	Constant	Constant and Time Trend	Constant	Constant and Time Trend
	CV = --2.87	CV = --3.43	CV = -2.87	CV =-3.43
BRER*	-3.8768	-4.3881	-14.0262	-13.9949
RERV	-2.7585	-3.0317	-11.0122	-10.9884
GFCF	2.0535	1.3565	-3.4965	-3.5668
MISAL	.099229	-.86198	-11.2131	-11.2830
RGDPG	-2.8970	-3.7350	-16.1760	-16.1419
POLRISK*	-.91417	-1.2230	-15.3522	-15.4054

TABLE A3: Short-Run Estimates of the ARDL ERER Model

ARDL(4,2,2,0,4,0,4,3), selected based on Akaike Information Criterion, Dependent variable is LBRER

	Specification 1		*Specification 2*	
Regressor	Coefficient	T-Ratio[Prob]	Coefficient	T-Ratio[Prob]
LBRER(-1)	0.56286	9.8822[.000]	0.56358	9.9188[.000]
LBRER(-2)	-0.033202	-.49555[.621]	-0.034765	-.52071[.603]
LBRER(-3)	0.0038875	.060643[.952]	0.0032021	.050067[.960]
LBRER(-4)	0.20433	4.4188[.000]	0.20523	4.4519[.000]
RID	0.0018833	6.1043[.000]	0.0018826	6.1144[.000]
RID(-1)	-4.97E-04	-.99216[.322]	-4.97E-04	-.99295[.322]
RID(-2)	-9.23E-04	-2.2292[.027]	-9.29E-04	-2.2503[.025]
DCE	-6.25E-04	-4.2780[.000]	-6.18E-04	-4.2660[.000]
NFA	-0.010271	-.42465[.672]		
NOMDEV	0.015349	27.7094[.000]	0.01535	27.7660[.000]
NOMDEV1(-1)	0.00272	2.3572[.019]	0.0027224	2.3640[.019]
NOMDEV1(-2)	0.0037504	3.4500[.001]	0.0037867	3.5012[.001]
NOMDEV1(-3)	0.0034662	3.2295[.001]	0.003506	3.2856[.001]
NOMDEV1(-4)	-0.00080555	-2.0489[.042]	-7.83E-04	-2.0135[.045]
LGCGDP	-0.091841	-4.2006[.000]	-0.091128	-4.1888[.000]
LINVGDP	0.099887	1.2695[.206]	0.092966	1.2102[.228]
LINVGDP(-1)	0.10572	1.0618[.290]	0.11076	1.1227[.263]
LINVGDP(-2)	-0.23952	-2.3271[.021]	-0.24223	-2.3627[.019]
LINVGDP(-3)	0.026273	.24698[.805]	0.033202	.31648[.752]
LINVGDP(-4)	0.16002	2.0556[.041]	0.15831	2.0405[.043]
NXGDP	0.020766	3.6423[.000]	0.021034	3.7196[.000]
NXGDP(-1)	-0.0043901	-.51714[.606]	-0.0047835	-.56801[.571]
NXGDP(-2)	0.0040626	.47702[.634]	0.0043541	.51394[.608]
NXGDP(-3)	-0.011537	-2.1066[.036]	-0.011633	-2.1303[.034]
LOPEN	-0.049268	-2.1859[.030]	-0.049178	-2.1864[.030]
LOPEN(-1)	-0.062011	-2.7029[.007]	-0.060803	-2.6762[.008]
1991_Float	0.099832	6.6961[.000]	0.10339	8.3993[.000]
1998_Fix	0.12615	5.1456[.000]	0.13096	6.0366[.000]
2000:8_Dev	0.15541	8.6041[.000]	0.15681	8.8489[.000]
2003:2_Dev	1.1313	15.6375[.000]	1.1326	15.7004[.000]
2004:1_Dev	1.448	12.8844[.000]	1.4538	13.0617[.000]
C	1.4529	9.7450[.000]	1.4514	9.7571[.000]
R-Squared	0.98916		.99006	
R-Bar-Squared	0.98746		.98861	
F-stat	F(32, 203) 579.0563[.000]		F(30, 205) 680.8358[.000]	
DW-statistic	1.2388		1.2340	

DIAGNOSTIC TESTS

Test Statistics	LM Version	F Version	LM Version	F Version
A. Serial Correlation*	CHSQ(12) = 121.6835[0.000]	F(12, 191) =16.9424[0.000]	CHSQ(12) = 116.3467[.000]	F(12, 193) =15.6389[.000]
B. Functional Form	CHSQ(1) =13.8874[0.000]	F(1, 202) =12.6299[0.000]	CHSQ(1) =14.1712[.000]	F(1, 203) =13.0323[.000]
C. Normality	CHSQ(2) = 118.5207[0.000]	Not applicable	CHSQ(2) =80.1775[.000]	Not applicable
D. Heteroscedasticity	CHSQ(1) =11.6039[0.001]	F(1, 234) =12.1006[.001		

TABLE A4: Long-run ERER

	Specification 1		Specification 2	
Regressor	Coefficient	T-value[prob]		
RID	0.001766	2.9676[.003]	0.0017375	2.9516[.004]
NFA	-0.039185	-.42332[.673]		
DCE	-0.0023853	-3.8000[.000]	-0.0023522	-3.8020[.000]
NOMDEV	0.093394	8.8652[.000]	0.093556	8.9170[.000]
LGCGDP	-0.35038	-4.5267[.000]	-0.34682	-4.5273[.000]
LINVGDP	0.58134	7.8803[.000]	0.58234	7.9329[.000]
NXGDP	0.033961	10.3671[.000]	0.034145	10.5405[.000]
LOPEN	-0.42454	-5.1430[.000]	-0.41857	-5.1746[.000]
1991_Float	0.38087	7.9158[.000]	0.39348	10.4057[.000]
1998_Fix	0.48126	6.5111[.000]	0.49841	8.1383[.000]
2000:8_Dev	0.5929	8.3559[.000]	0.5968	8.5025[.000]
2003:2_Dev	4.3161	13.2118[.000]	4.3106	13.2786[.000]
2004:1_Dev	5.524	12.4880[.000]	5.533	12.5645[.000]
C	5.5429	15.1708[.000]	5.5236	15.3154[.000]

TABLE A5: Variable Addition Test (OLS case) for the Growth Model

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DRGDPG(-1)	.021664	.066343	.32654[.744]
DRGDPG(-2)	.034074	.065112	.52331[.601]
DRGDPG(-3)	.059247	.064357	.92060[.358]
DRGDPG(-4)	.059142	.064548	.91625[.361]
DRGDPG(-5)	.092283	.063468	1.4540[.148]
DRGDPG(-6)	-.025604	.064769	-.39531[.693]
DMIS(-1)	-.0011546	.0026777	-.43119[.667]
DMIS(-2)	.0013667	.0029383	.46515[.642]
DMIS(-3)	-.0017417	.0029474	-.59091[.555]
DMIS(-4)	-.0014149	.0029415	-.48102[.631]
DMIS(-5)	-.0068391	.0029077	-2.3520[.020]
DMIS(-6)	.0032546	.0028882	1.1269[.261]
DBRER(-1)	.029551	.062941	.46950[.639]
DBRER(-2)	-.083939	.068373	-1.2277[.221]
DBRER(-3)	.035520	.067208	.52851[.598]
DBRER(-4)	-.050717	.066396	-.76385[.446]
DBRER(-5)	-.15496	.065960	-2.3493[.020]
DBRER(-6)	.15874	.064778	2.4505[.015]
DBRERV(-1)	.021890	.013229	1.6547[.100]
DBRERV(-2)	.032308	.012886	2.5073[.013]
DBRERV(-3)	.015014	.012584	1.1931[.234]
DBRERV(-4)	.012031	.011743	1.0246[.307]
DBRERV(-5)	.0066492	.010374	.64095[.522]
DBRERV(-6)	.0096884	.0091884	1.0544[.293]
DROUGHT	-.16243	.047088	-3.4496[.001]
CRISIS	-.11136	.036413	-3.0581[.003]
C	.14694	.14967	.98175[.327]
RGDPG(-1)	-.23426	.041229	-5.6818[.000]
MIS(-1)	-.5876E-3	.6449E-3	-.91103[.363]
BRER(-1)	-.0071679	.043200	-.16593[.868]
BRERV(-1)	-.021052	.010443	-2.0158[.045]

Joint test of zero restrictions on the coefficients of additional variables:	
Lagrange Multiplier Statistic	CHSQ(4)= 33.6804[.000]
Likelihood Ratio Statistic	CHSQ(4)= 36.3910[.000]
F Statistic	F(4, 201)= 8.5339[.000]