

## **CHAPTER 3. REAL EXCHANGE RATE AND COMMODITY EXPORTS' PRICES**

### **3.1 Introduction**

Many studies that have been conducted on the behaviour of the real exchange rate in developing countries emphasised the importance of the movements in the terms of trade in explaining variation in the real exchange rate. Despite this, it is naturally assumed that changes in the real commodity prices have the potential to explain a greater part of the changes in the real exchange rates for developing countries. This is due to the fact that most developing countries rely on the export of commodities, and in some cases, on a single commodity for their foreign exchange revenues. Cashin, Liang and McDermott (2000) classify developing countries based on the composition of their exports. The IMF similarly classifies countries based on the composition of exports. Countries whose commodities account for a significant share of total export are classified as commodity exporting countries.

Namibia is a commodity exporting country since its export is dominated by two main commodities. In 2003 and 2004, diamonds accounted for 41 percent of the total export and fish accounted for 20 percent. Other minerals products such as copper, uranium, zinc, gold accounted for 15 percent of total exports. Although Namibia is a commodity exporting country there is no study investigating the relationship between real exchange rate and real commodity prices. This chapter will examine whether prices of commodity exports are key determinants of the real exchange rate of Namibia. The chapter start with a review of the theory and empirical studies on the relationship between the real exchange rate and prices of export commodities. It then discusses the empirical model to be applied for Namibia. It is important to note that the purpose of this chapter is not to develop a model, but review the existing empirical and theoretical models and suggest the appropriate one for Namibia. The chapter is organised as follows. Section 3.2 discusses

the literature and empirical studies. Section 3.3 presents the empirical model for Namibia and Section 3.4 concludes.

## 3.2 Literature and Empirical Studies

One of the topics that have caused a lot of disagreements in international economics is the relationship between the real exchange rate and its fundamental determinants. This demonstrated a number of empirical puzzles such as that of purchasing power parity (PPP). The literature identifies numerous problems in linking the behaviour of the real exchange rate and shocks to its fundamental determinants. For example, Cashin, Cespedes and Sahay (2004: 240) states that:

*“ A variety of structural exchange rate models failed to forecast more accurately than a naive random walk model for both real and nominal exchange rates and their key findings have not been overturned in the succeeding three decades”.*

This demonstrates that if the real exchange rate follows a random walk, the shocks to it remain and time series can move without limits. This is not consistent with PPP. PPP which is also referred to as the law of one price states that any good should sell for the same price in different countries when prices are converted in the same currency (Rogoff, 1996). The controversial results of various models of the real exchange rate have shown that the PPP is not a good model for the long-run real exchange rate.

Numerous problems in linking the behaviour of the real exchange rate to shocks in fundamentals were identified. In an effort to deal with these problems, Taylor and Peel (2000) and Taylor (2001) incorporated non-linearities to model the dynamics of the real exchange rate. It has also been noted by Chen and Rogoff (2003) that if real shocks which are volatile can be found, these empirical problems could be potentially solved.

Rogoff (1996) points out some factors that can help to solve the PPP conundrum. Among these factors are real fundamentals such as the Balassa-Samuelson effect, differentials in interest rates and portfolio models. A large number of studies (such as Edwards, 1988a,

1988b; Elbadawi, 1994; Baffes *et al.* 1997; Aron *et al.*, 2000) emphasised importance of the fundamentals such as terms of trade, capital flows, openness, government expenditure in explaining movements in the real exchange rate. These studies emphasised that terms of trade is a key factor in explaining variation of the real exchange rate. However, it is important to note that most developing countries (including some developed countries such as Australia, Canada and New Zealand) export mainly commodities. The exports of these countries are dominated mainly by primary commodities. This implies that movements in the prices of commodities have a potential to explain more variation in the real exchange rate. Although terms of trade has been regarded as key factor in explaining the behaviour of the real exchange rate in developing countries, it is very broad and may not be an appropriate explaining factor. It is important to investigate how changes in commodity prices influence the real exchange rate in commodity exporting countries such as Namibia.

Empirical research on the mechanism through which changes in the real exchange rate is affected by the commodity prices is limited, but there are some notable studies that examine the link between the real exchange rate and commodity prices. Edwards (1985) was probably the first study that investigated whether the prices of commodities have an important effect on the real exchange rate. The investigation was done to test whether the price of coffee has an effect on the real exchange rate of Colombia. A model was developed to analyse the relationship between the price of coffee, creation of money, inflation and real exchange rate. The emphasis was on the link between the real exchange rate and the price of coffee. The model has the following assumptions. The first one is that there are three goods in the economy and these goods are coffee, nontradable and non-coffee tradable. The second is that the economy (Colombia) has a crawling exchange rate regime in which the nominal exchange rate is adjusted within a band according to some indicators. The third assumption is that capital controls are exogenous.

Edwards developed and tested this model for Colombia. The investigation confirmed that the prices of coffee have an important effect on the real exchange rate. A rise in the price of coffee leads to higher disposable income and the demand for tradable and notradable

goods will increase. This is the income effect of the increase in the prices of commodities (coffee) and it causes higher relative price of nontradable and appreciation of the real exchange rate. All this depends on the extent to which the price of other non-coffee tradable goods is given by the price in the world market and the exchange rate. Improvement in the price of coffee causes a surplus in the balance of payments and an increase in the level of foreign exchange reserves. According to Edwards, if the reserves are not sterilised completely it will result in the rise in the monetary base. An increase in the monetary base leads to high inflation and appreciation of the real exchange rate.

Chen and Rogoff (2003) studied the relationship between the real exchange rate and commodity prices for Australia, Canada and New Zealand. These three countries' exports are dominated by commodities and it is logical to think that the prices of commodities have a potential to explain variation in their real exchange rates. According to Chen and Rogoff, this could help to solve empirical PPP conundrum. Prices of commodities could be a missing link that has the potential to solve the PPP conundrum. Chen and Rogoff (2001, 2003) estimated the relationship between real exchange rate and the real prices of commodities as:

$$\ln RER_t = \gamma_0 + \gamma_1 \ln REALCOM_t + v_t \quad (7)$$

where  $RER_t$  is the real exchange rate,  $REALCOM_t$  is real commodity prices and  $v_t$  is the error term. Chen and Rogoff went further to include real commodity prices in standard monetary models to test if the addition of commodity prices variable affect the significance of some variables in the real exchange rate determination. Real commodity prices were included in the monetary standard models as follows:

$$\ln RER_t = \gamma_0 + \gamma_1 \ln REALCOM_t + \gamma_2 \ln REALDIFF_t + \gamma_3 \ln OUTDIFF_t + v_t \quad (8)$$

where  $REALDIFF_t$  is the differentials in real interest rate and  $OUTDIFF_t$  is real output differentials

The study found evidence of close relationship between the real exchange rate and prices of commodities. A rise in commodity prices causes real exchange rate appreciation. Although real commodity prices do not solve the entire PPP empirical conundrum, they play an important role in the determination of the real exchange rates of commodity exporting countries.

A recent model of real exchange rate and commodity has been developed by Cashin *et al.* (2002, 2004) to test whether the prices of commodities have an important effect in the determination of the real exchange rate for commodity exporting countries. To discuss the relationship between the real prices of commodities and the real exchange rate, a model of a small open economy that produces two types of goods is developed. These are nontradable and exportable goods. Production of the exportable good is associated with the production of the primary commodity. This primary commodity can either be agricultural or mineral product. The local economy has one sector responsible for producing a primary product and the other one producing a nontradable good. In this model, labour is the only input in these two sectors. There are two assumptions in this model. The first one is that production takes place in a competitive market where firms have access to constant returns to scale. The second assumption is that labour is mobile between sectors and hence wages are equal in all sectors and there is no arbitrage.

The local economy is characterised by consumers that are suppliers of labour inelastically. These consumers consume nontradable and tradable goods. It is important to note that the tradable good is sourced from the rest of the world and it is not produced locally. The primary commodity and the intermediate commodity (produced abroad only) are used jointly by foreign firms to produce a final tradable good. This final tradable good is consumed by foreign consumers. The algebraic details of this model are presented in Cashin *et al.* (2004: 261-264). This model can be referred to as the commodity price and relative productivity model. According to this model, the real exchange rate for a commodity exporting country is determined as follows:

$$RER = f(PROD / PROD^*, PROD_N^* / PROD_N, COM) \quad (9)$$

where  $RER$  is the real exchange rate,  $PROD / PROD^*$  is the differences in productivity between local and foreign tradable sectors,  $PROD_N^* / PROD_N$  represents the differences in productivity between foreign and local nontradable sectors and  $COM$  is the world prices of commodities. The variables  $PROD / PROD^*$  and  $PROD_N^* / PROD_N$  represent the Balassa Samuelson effect. In his famous article, Balassa (1964) claimed that deviation from the PPP is related to the relative productivity in one country to another. Taking GDP per capita as a proxy for productivity or technology the real exchange rate will appreciate in response to increase in GDP per capita. In other words, if a country is more productive it will experience overvaluation in its real exchange rate. The variable  $COM$  represents the effect of the real world prices of commodities on the real exchange rate. It is expected that a rise in real commodity prices result in higher wages and this will cause a rise in the prices of nontradable goods and the real exchange rate will appreciate.

Cashin *et al.* developed and applied their model to a number of developing countries and the results revealed evidence of close relationship between the real exchange rate and real prices of commodities as well as productivity for nearly half of the countries. Increase in both real commodity prices and productivity causes the real exchange rate to appreciate. Spatafora and Stavrey (2003) estimated the real exchange rate for a commodity exporting country, Russia using productivity and commodity prices (oil prices) as explanatory variables. The study found evidence that both commodity prices and productivity causes real exchange rate appreciation. These findings were confirmed by Koranchelian (2005) when the Cashin *et al.* model was applied to Algeria. Spatafora and Stavrey (2003) and Koranchelian (2005) found evidence in support of the Cashin *et al.* model.

Related studies such as Hatzinikolaou and Polasek (2005) investigated the link between the real exchange rate and commodity prices for Australia for the period 1984:1 to 2003:1. The investigation revealed that commodity prices have an important effect on the

exchange rate of Australia. A rise in the prices of commodities causes the real exchange rate to appreciate.

Bjørnland and Hungnes (2005) analysed the behaviour of the real exchange rate in Norway, which is a commodity exporting country. Oil accounts for more than 20 percent of Norway's exports and it can be expected to have a potential to explain a greater part of the variation in the country's real exchange rate. The equilibrium real exchange rate for Norway was estimated as a function oil prices. No cointegration was found between the real exchange rate and commodity prices. This prompted Bjørnland and Hungnes to examine further other variables that cause a sustained movement of the real exchange rate from PPP. Some more variables such as domestic interest rate, foreign interest rate, domestic and foreign prices were added as additional explanatory variables. When these variables were added, cointegration was obtained. The results indicate that the exchange rate appreciates when the price of oil is increasing, and depreciates when the price of oil price is decreasing.

In summary, all the reviewed empirical literature found evidence of a close relationship between the real exchange rate and commodity prices as well as productivity or technology. Therefore this study expects to find evidence that the real commodity prices and productivity cause the real exchange rate for Namibia.

### 3.3 Empirical Model for Namibia

The literature review in the previous section revealed that there are three main models for investigating the relationship between the real exchange rate and prices of commodities. These are Edwards' (1985) model developed and applied to Colombia, Chen and Rogoff (2001, 2003) and the Cashin *et al.* model (2004) that was developed and tested for a number of developing countries. Edwards' (1985) model included the creation of money and inflation in the determination of the real exchange rate. The model assumes that the country has a crawling exchange rate regime. This makes it inappropriate for Namibia,

because the country does not have a crawling exchange rate regime. The country's nominal exchange rate is not adjusted within a band of indicators as in crawling exchange rate regime. The nominal exchange rate of the Namibia dollar with respect to other currencies is determined by the South African Reserve Bank.

The Chen and Roggoff model is a monetary standard that include real commodity prices interest rate and productivity differentials. Since Namibia has pegged its dollar to the South African rand, a model that includes some short-run macroeconomic policy fundamentals such as monetary is not appropriate for Namibia. Pegging requires that monetary and fiscal policies are consistent with the chosen nominal exchange rate to maintain an equilibrium which is sustainable.

The Cashin *et al.* model has interesting features for a developing economy such as Namibia. It assumes a small open economy producing nontradable and exportable goods which are primary commodities. The final tradable good is consumed by consumers abroad. This model fits Namibia because the country is a small open economy producing primary products (such as uranium, copper, diamonds, fish) which are consumed abroad. Looking at the features of the three models, this study considers the Cashin *et al.* model as the suitable model to investigate the relationship between commodity prices and the real exchange rate for Namibia. The relationship between the real exchange rate and the prices of commodities for Namibia is estimated as:

$$LREER_t = \beta_0 + \beta_1 LRCOMP_t + \beta_2 LPERCAPI_t + \varepsilon_t \quad (10)$$

where  $LREER_t$  is the log of the real effective exchange rate,  $LRCOMP_t$  is the log real commodity prices,  $LPERCAPI_t$  is log of real GDP per capita which is a proxy for productivity or technology and  $\varepsilon_t$  is the error term. All variables are expected to be positively related to the real exchange rate. Hence,  $\beta_1 > 0$  and  $\beta_2 > 0$ .



### 3.4 Conclusion

This chapter discussed the relationship between real exchange rate and the prices of commodity exports. Despite the fact that the most developing countries rely on the export commodities, most studies used the fundamental approach to real exchange rate determination. They identified terms of trade as a key factor in explaining movements in the real exchange rate. However, terms of trade is very broad, and commodity prices could be a better explanatory variable for the changes in real exchange rates of commodity exporting countries. Three main models were identified to investigate the relationship between the real exchange rate and commodity prices. These models of real exchange rate and commodity prices suggests that since developing countries rely more on the export of primary commodities, commodity prices have a potential to explain a significant component of the variation in their real exchange rate. All reviewed empirical studies revealed that there is a close link between the real exchange rate and prices of commodities. The empirical model to be estimated later in this study is also expected to provide evidence that commodity prices have a significant effect on the real exchange rate for Namibia.

## CHAPTER 4. REAL EXCHANGE RATE MISALIGNMENT

### 4.1 Introduction

This chapter highlights the literature on the real exchange rate misalignment. It surveys the empirical literature on the impact of real exchange rate on economic performance, and the models or methodologies for testing the effect of real exchange rate misalignment on economic performance.

The rest of the chapter is organised as follows. Section 4.2 provides theory and literature. Section 4.3 reviews the literature, models and methodologies for assessing the impact of real exchange rate misalignment on economic performance. Section 4.4 discusses the measures to correct real exchange misalignments, and Section 4.5 presents the conclusion.

### 4.2 Theory and Literature

The real exchange rate responds to real and monetary variables, although the equilibrium real exchange rate is a function of real variables only. Since the equilibrium real exchange rate exists, it does not necessarily mean that the actual real exchange rate is always equal to this equilibrium value. Zhang (2001: 83) defines real exchange rate misalignment as the difference between the actual and equilibrium real exchange rate. The observed real exchange rate depends on the values of the fundamentals as well as aggregate macroeconomic pressures generated by an excess supply of money or a fiscal deficit, at any given moment.

Real exchange rate misalignments occur in both fixed and floating exchange rate regimes. Asfaha & Huda (2002:1) pointed out that in fixed and flexible exchange rate regimes, real exchange rate misalignment reflect poor policy fundamentals which prevents the exchange rate from responding to changes in the fundamentals. In floating exchange rate

regimes variables such as speculative attacks that move the exchange rate a lot relative to economic fundamentals are the primary cause of real exchange rate misalignments. According to Asfaha & Huda (2002: 1) a large real exchange rate misalignment can be attributed to poor policy fundamentals.

Real exchange rate misalignment has become a central issue in the analysis of macroeconomic policies in developing countries. As Kamnisky *et al.* (1997: 10) state, sustained or continuous overvaluation of the currency is seen as an early warning of a currency crisis. The real exchange rate misalignment has a detrimental effect on the performance of the economy. A real exchange rate misalignment can result in welfare and efficiency costs. According to Pfeffermann (1985: 17-18) and Edwards (1989:12) real exchange rate misalignment especially overvaluation hurts exports and can wipe out the agricultural sector. It can also cause capital flight which may be optimal from a private perspective but a substantial cost in terms of social welfare.

A real exchange rate misalignment, especially overvaluation undermines exports. It is well recognised that a dynamic export sector is important in the course of development. According Pfeffermann (1985: 18), real exchange rate misalignment such as overvaluation reduces other countries' incentive to import from the country with an overvalued real exchange rate, and this strikes at the core of the process of development. In addition to its contribution to total production, exports are important in most countries because the availability of foreign exchange is one of the main determinants of the overall level of economic activity. Even in countries where export accounts for a small percentage of the GDP, a shortfall in foreign exchange reserves can reduce economic growth. Misalignment undermines incentives to produce for exports and for import substitutes. This results from the fact that exports lose competitiveness, and imports become relatively cheaper because of misalignment (mainly overvaluation). This can happen if import restrictions have not been imposed. According to Pfeffermann (1985) if import restrictions are imposed, imports may not become relatively cheaper. Exports are discriminated against because of inefficiencies and the high costs associated with import

restrictions, and attempt to offset anti-export bias through subsidies may be unsuccessful because the budget deficit may be widened.

Since the real exchange rate affects the price of tradable goods, it is of immediate importance to farmers who will be influenced in deciding what part of their efforts is to be devoted to growing crops and what part will be destined for the market and what is to be retained for their own consumption. The effect of real exchange rate misalignment especially overvaluation on agriculture was given a special mention by Pfeffermann (1985: 18) because in the early stages of development and in many developing countries the agricultural sector is the key employer. The poorest people live in the rural areas and they are dependent on agriculture and a real exchange rate which is not realistic harms them. A realistic real exchange rate is conducive to rural prosperity and can have a positive effect on growth and the distribution of income.

According to Pfeffermann, where the internal terms of trade are biased against agriculture, causing migration to the urban areas, the need for imported foodstuffs rises and more pressure will be put on the balance of payments. If there are no adequate incentives on agriculture the impact on development can be negative, because there is a close relationship between agriculture and the overall economic development. This can happen even if agriculture accounts for a smaller share of the economy. Pfeffermann extends this argument to other resource-based activities, that misalignment undermines incentives in forestry, mining and agro-industries. If imports are made relatively cheaper, misalignment not only discriminates against the development of domestic technologies, it also encourages relatively capital intensive methods of production through cheaper imports of capital goods. This discourages employment creation.

Real exchange rate misalignment can also cause capital flight, which may be optimal from private perspective but a substantial cost in terms of social welfare. Although most analyses are more concerned about the impact of overvaluation, undervaluation of the currency can also affect the economy negatively through higher inflation and through discouraging consumption and investment. Kahn (1992: 13) argues that although

undervaluation results in a build up of reserves that can be used to repay previous debt or as a buffer against future adverse shocks, current account surpluses come at the expense of domestic absorption of resources. Consumption and investment are lower than they would have been. It is not a good development policy to run current account surpluses in order to finance private capital export. Development policy should focus on stimulating investment in the domestic economy instead of investing abroad. Kahn (1992) argues further that an undervalued real exchange rate has an impact on income distribution, in the sense that it redistributes income from labour to capital, but the extent of this would depend on how powerful trade unions are.

Through its impact on the competitiveness of the tradable sector versus the rest of the world and subsequent effect on investment, real exchange rate misalignment affects growth. A country is competitive if it is able to produce products at lower prices in comparison with other countries that are in the international market. Producing products at lower cost than competing countries plays a role in the determination of the external position of the country. The impact of real exchange rate misalignment on the competitiveness of the country can be a sustained problem and therefore it is crucial for those in policy making positions to regularly assess and adjust substantial real misalignments. This would help to avoid potential economic problems.

Misalignment of the real exchange rate can be a serious problem for economists in addition to the damage it causes to the economy (Devarajan, 1999: 359). If the real exchange rate is overvalued everyone turns to economists for a quantitative estimate of the degree of misalignment. This may suggest a multi-year research project to answer questions such as the magnitude of currency devaluation. Data and other information without the aid of a model or a consistency check to develop quick estimates of the real exchange rate misalignment have to be used. Devarajan (1999) illustrates this situation by stating that in the CFA Franc zone, prior to the 1994 devaluation, most observers agreed that the real exchange rate was overvalued but they disagreed on the extent of overvaluation. Data were scarce and robust estimates and formal models were hard to come by. This problem was made worse by the particular nature of the CFA franc zone in

the sense that it was fully convertible and there was no parallel market in foreign exchange which was often used as a guide for estimating real exchange rate misalignment.

Members (Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo-Brazzaville, Ivory Coast, Gabon, Mali, Niger, Senegal, and Togo) of the CFA Franc zone share the same currency across two monetary unions. The degree of misalignment could be different across the countries of the CFA Franc zone. According to Devarajan (1999: 370) the CFA has different representative countries. Some countries are high income and have a high component of primary products in their exports, while some are low income or the component of primary products in exports is low. Countries with a larger component or percentage of primary exports in total exports can experience high real exchange rate misalignments because of shocks that affect primary products. These countries are expected to have high overvalued real exchange rates compared to those with low share of primary products in total exports.

### 4.3 Impact of Real Exchange Misalignment on Economic Performance

A number of empirical studies investigate the effect of the real exchange rate misalignment on economic performance. Cottani, Cavallo & Khan (1990) was probably the first study to investigate the impact or effect of real exchange rate misalignment on economic performance. Cottani *et al.* (1990) examine the view that real exchange rate behaviour and economic performance are correlated, using empirical evidence from a cross-section of less developed countries. The impact of real exchange rate misalignment on economic performance was examined by regressing per capita growth on real exchange rate misalignment, and investment on real exchange rate misalignment as well as agriculture on real exchange rate misalignment. Export growth was also regressed on real exchange rate misalignment. The results showed a strong negative relationship between real exchange rate misalignment and these measures of economic performance.

However, Cottani *et al.* (1990) acknowledges that the results do not imply that real exchange rate behaviour is the main determinant of economic performance.

Dollar (1992) investigates the relationship between distortion in real exchange rate and GDP growth for the period 1976 to 1985. The investigation was done by running regression and correlation between real exchange rate distortion and economic growth for a cross-section of 95 developing countries (43 in Africa, 16 in Asia, 24 in Latin America, 12 in Europe/Middle East) and 22 developed countries. The investigation revealed that outward-oriented policies and exchange rate levels that encouraged export growth in East Asian countries generated a boost in their growth rates. Real exchange rate distortion has a negative impact on economic growth, and maintenance of stable real exchange rate can improve growth in many poor countries.

Ghura and Grennes (1993) examine the impact of real exchange rate instability and real exchange rate misalignment on economic performance for 33 countries in Sub-Saharan Africa for the period 1972 to 1987. The measures of economic performance were GDP per capita, export to GDP, import to GDP, investment to GDP and savings to GDP. The pooled time series and cross-section data confirmed that there is a negative relationship between real exchange rate misalignment and economic performance. Higher levels of real exchange rate misalignment are associated with higher levels of macroeconomic instability. Lowering real exchange rate misalignment and real exchange rate instability will improve economic performance.

Easterly, Loayza and Montiel (1997) estimated the growth equation for 81 Latin American countries for the period 1960 to 1993. The dependent variable was growth in real GDP per capita, and amongst others, real exchange rate misalignment proxied by black market premium was an explanatory variable. The estimation revealed that real exchange rate misalignment has a negative impact on real GDP per capita.

In studying the effects of real exchange rate misalignment on growth for Egypt, Jordan, Morocco, and Tunisia, Domac and Shabsigh (1999) constructed three alternative measures of real exchange rate misalignment. These are (PPP) measure, black market rate measure and a model based measure which captures policy-induced misalignment.

The first measure of real exchange rate misalignment is based on the PPP theory. The real exchange rate misalignment is computed as the deviations of the actual real exchange rate from some base year in which the real exchange rate is believed to have been in equilibrium (Domac and Shabsigh, 1999: 12). The average of the three highest values of the real exchange rate is used as a proxy for the equilibrium real exchange rate. According to Domac and Shabsigh, selecting the three highest values of the real exchange rate as a reference, one chooses the years of devaluation which may not necessarily be equilibrium years. The highest values are chosen because generally devaluation occurs during balance of payment crises and when the external sector is out of equilibrium. It is assumed that the real exchange rate is closer to its equilibrium value when devaluation takes place.

Misalignment calculated using the PPP is defined as (Domac and Shabsigh, 1999: 13):

$$RERMIS_{it} = \left( \frac{(\sum_j \max RER_{ij})/3}{RER_{it}} - 1 \right) \quad (11)$$

where  $RERMIS$  is real exchange rate misalignment,  $[(\sum_j \max RER_{ij})/3]$  ( $j = 1,2,3$ ) is the average of the three highest values of the real exchange rate for the  $i^{th}$  country. The PPP measure has a major drawback. It fails to capture changes in the sustainable equilibrium real exchange rate produced by changes in economic fundamentals such as terms of trade and commercial policies.

The black market exchange rate premium measure utilises the premium of the nominal black market exchange rate (B) over the official rate (E) as a proxy for real exchange rate misalignment. It is calculated as:



$$RERMIS_{it} = \left( \frac{B_{it}}{E_{it}} - 1 \right) \quad (12)$$

This black market exchange rate premium measures misalignment in the real exchange rate, distortion in the foreign exchange market exchange control and rationing of import in the economy.

The third measure of real exchange rate misalignment is based on the formal model of equilibrium real exchange rate determination which was developed by Edwards (1988b). The model-based measure has an advantage over the first two measures. It captures the effects of changes in the fundamentals and domestic macroeconomic, trade and exchange rate policies on the equilibrium real exchange rate. Empirically it can be obtained by using the link between actual real exchange rate and equilibrium real exchange rate (Domac and Shabsigh, 1999: 13). It is computed as:

$$\log_e RER_{it} \equiv \log_e (ERER_{it}) - [\log_e (ERER_{it}) - \log_e (RER_{it})] \quad (13)$$

where the term in square brackets on the right hand side of the identity indicates the gap between the actual real exchange rate (RER) and equilibrium real exchange rate (ERER), which is real exchange rate misalignment. Regression analysis are employed to determine the empirical relationship  $\log_e(RER_{it})$  and  $\log_e(ERER_{it}) - [\log_e(ERER_{it}) - \log_e(RER_{it})]$ .

After constructing the three measures of real exchange rate misalignment, Domac and Shabsigh (1999) investigate the impact of real exchange rate misalignment on economic performance in conjunction with other variables. The following equation was estimated to investigate the impact of real exchange rate misalignment on economic performance:

$$PCGR_{it} = \beta_0 + \beta_1 RERV_{it} + \beta_2 RERMIS_{it} + \beta_3 SIY_{it} + \beta_4 TOTG_{it} + \beta_5 POPG_{it} + v_{it}, \quad (14)$$

where  $PCGR$  is growth in real GDP per capita,  $RERV$  is real exchange rate variability,  $RERMIS$  is real exchange rate misalignment,  $SIY$  is investment to GDP ratio,  $TOTG$  is

terms of trade growth and *POPG* is population growth. The results showed that the real exchange rate misalignment has a negative impact on economic growth.

Bleaney and Greenaway (2001) used data from a sample of 14 Sub-Saharan African countries that are highly relying on the export of primary commodities for the period 1980 to 1995. The data were used to analyse the effects of real exchange rate volatility and real exchange rate misalignment on investment and GDP growth. The investigation revealed that real exchange rate volatility and misalignment have a negative effect on both investment and GDP growth.

Asfaha and Huda (2002) estimated the degree of real exchange rate misalignment and its effect on international trade competitiveness for the economy of South Africa using quarterly data for the period 1985 to 2000. The estimation was based on Edwards' intertemporal general equilibrium model of a small open economy. The error correction approach was used to estimate equilibrium real exchange rate and the resulting misalignment, and the impulse response and variance decomposition of the vector auto regression (VAR) have been established to test the impact of misalignment on trade competitiveness. International trade competitiveness was proxied by unit labour cost and export. The estimation showed that real exchange rate misalignment affects negatively South Africa's competitiveness accounting for 20 percent of the variation in competitiveness.

The growth effects of real exchange rate misalignment and their volatility were evaluated by Aguire and Calderón (2005). The evaluation was done for 60 countries for the period 1965 to 2003 using both time series and panel cointegration methods. After estimating real exchange rate misalignment indices, the impact on growth using dynamic panel data techniques, controlling for other traditional growth determinants, was evaluated. The evaluation found that developing countries have a higher degree of real exchange rate misalignment than the developed countries. There is a negative relationship between real exchange rate misalignment and economic growth. Real exchange rate misalignment was separated into overvaluation and undervaluation. The impact of overvaluation on

economic growth is more negative compared to that of undervaluation. Reducing overvaluation and undervaluation would improve economic growth.

In summary, all the above empirical studies regardless of the method used, pointed out clearly that real exchange rate misalignment has a negative impact on growth of both developing and developed countries.

#### 4.4 Correction of Real Exchange Rate Misalignments

The last section discussed the negative impact of real exchange rate misalignment on economic welfare and efficiency. This section discusses what should be done to correct real exchange rate misalignments. Correction of real exchange rate misalignment is discussed in detail by Edwards (1988a: 23-39).

In the case of macroeconomic induced real exchange rate misalignment the important step is to eliminate the source of macroeconomic disequilibrium, which is the inconsistency between macroeconomic policy and the nominal exchange rate. This policy can be supplemented with other measures or the authorities can simply wait for the economy to adjust on its own so that the real exchange rate returns to its own equilibrium value. As Edwards (1988) notes, this policy, which is referred to as disinflation with automatic adjustment, can be severe and has limitations under predetermined nominal exchange rate. The real exchange rate will differ from its equilibrium value even after policymakers have controlled the inconsistent macroeconomic forces which generate the macroeconomic induced misalignment.

If the real exchange rate is overvalued the country will lose its competitiveness in the international market. Under fixed exchange rate in this case a fast return to equilibrium requires a decline in the nominal domestic prices of nontradables. A fast reduction in these nominal prices is not likely under many situations. Hence an automatic adjustment could take a long time and prolong real exchange rate misalignments. According to Edwards (1988a), if nominal domestic prices and wages are not flexible an automatic

adjustment can generate additional unemployment and reduce domestic output. A cut in aggregate expenditure which results from the corrective macroeconomic measures will generate an excess supply for all goods and assets. This low demand for tradables will be reflected in a low current account deficit and reduction in net foreign indebtedness. Disinflation generates an excess supply of nontradables, and this will require a drop in relative prices to restore equilibrium. If nominal prices are sticky or inflexible, this relative price realignment will not happen and this will result in high unemployment.

Devaluation can also be used to correct real exchange rate misalignment. This concentrates on affecting the nominal price of nontradables to restore equilibrium real exchange rate by adjusting the domestic price of tradables. Since the real exchange rate is defined as the exchange rate multiplied by the ratio of prices of tradables to prices of nontradables ( $P_T/P_N$ ), devaluation aims at generating a higher real exchange rate through an increase in the price of tradables ( $EP_T$ ). Devaluation can help to sidestep the adjustment costs associated with automatic adjustment policies by affecting the real exchange rate directly and avoid the necessary reduction in the prices of tradables. It is important to note that monetary arrangements in the CMA make it impossible for Namibia to use devaluation for realigning the real exchange rate.

There are other policies that can have the effect similar to that of devaluation, but it is not easy to replicate all results of devaluation. These are import tariffs and export subsidies, and income policies (see also Edwards, 1989: 12-18). The combination of import tariffs and export subsidies replicates some effects of devaluation. Import tariffs increase the price of importables, while export subsidies increase the domestic price exportables. If import tariffs and subsidies are of the same rate the relative price between importables and exportables will remain unchanged, but their relative price with respect to nontradables will increase. As stated by Edwards (1989: 15), this is the same results as is achieved under devaluation. The difference between devaluation and import tariffs and export subsidies is that devaluation affects the visible and invisible trade as well as the domestic currency price of tradable goods, services and tradable assets. Import tariffs and export subsidies affect only the domestic price of tradable goods and services. The other

difference is that devaluation affects domestic interest rates if it generates expectations of further devaluations. Even if the capital account is closed partially some fraction of the expected devaluation will be passed onto the domestic interest rates in this situation. Tariffs and subsidies do not have any effect on interest rates. Devaluation does not have direct effects on the fiscal budget, while tariffs and subsidies have a general effect on fiscal imbalances. The problem with imposition of tariffs and subsidies is that they will encourage various interest groups to claim exemptions for their particular industry. According to Edwards (1989: 15) this is political and can be avoided by using devaluation.

Income policies can also be used to realign the real exchange rate. These policies attempt to control wage and price increases through some form of direct intervention. This policy can succeed if the domestic goods prices fall relative to those of foreign goods. According to Edwards (1989) income policies that are not accompanied by restraint on demand will fail to bring down inflation. Correcting real exchange rate misalignment through income policies is inefficient and very risky.

## 4.5 Conclusion

The purpose of this chapter was to review the literature and models for assessing the impact of real exchange rate misalignment on economic performance. The chapter also discussed measures to correct real exchange rate misalignment. Real exchange rate misalignment, which is a sustained departure of the real exchange rate from its equilibrium value, has now become a central issue in the economies of developing countries. It has a detrimental effect on the economy and can result in welfare and efficiency costs. It can cause reduction in export and can wipe out the agricultural sector. It can also cause capital flight. Countries that have exports dominated by primary commodities experience the highest real exchange rate misalignment compared to those with few primary commodities in their exports. The literature has come up with different methodologies and models that can be used to investigate the impact of real exchange

rate misalignment on economic performance. A number of studies test the impact of real exchange rate misalignment on economic performance and competitiveness. Regardless of which measure is used, real exchange rate misalignment has a negative impact on economic performance. Real exchange rate misalignment can be corrected through price and wage flexibility, devaluation and income policies.