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The Real Exchange Rate and Growth in Zimbabwe: Does the Currency Regime Matter?

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ABSTRACT

The Real Exchange Rate and Growth in Zimbabwe: Does the Currency Regime Matter?[1]

Zimbabwe faces growth and external competitiveness challenges, as indicated by its low trend growth and investment, declining share in the world exports, high current account deficits, and external debt. The stock-flow approach to the equilibrium exchange rate reveals that the real exchange rate experienced periods of sizeable overvaluation, both prior to the 2008 economic collapse and under the current multicurrency regime. While overvaluation hampers GDP growth, as well as growth and employment in export sectors, we have not found that undervaluation would raise it. Replacing the multicurrency regime anchored in the US$ by the South African rand as the sole transaction currency would help reduce overvaluation and stimulate exports and growth. Under any currency regime, Zimbabwe needs to adhere to sound macroeconomic policies, avoid overspending on public wages, and create environment conducive for investment.

JEL Classification: F36, F41, C22, O11

Keywords: real exchange rate misalignment, growth, employment, currency regime, Zimbabwe

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I. Introduction

After its economy collapsed in 2008, Zimbabwe opted for a multicurrency regime anchored in US$.[2] The objective was to stabilize the economy and establish a credible nominal anchor.[3] The replacement of the Zimbabwean dollar by the multicurrency system brought the hyperinflation and the currency devaluation to a halt, laying foundations for economic recovery. The average annual inflation during 2009 – 2013 was 3.3 percent, while the real GDP grew on average more than 8 percent a year. While it may be tempting to consider these outcomes a success, a closer look at the overall economic performance reveals a number of challenges and open issues.

One of them is external competitiveness and the extent to which an overvalued currency has contributed to the sluggish growth. Concerns about the limited external competitiveness have prevailed for some time given the country's declining global export shares, widening trade deficits, and high concentration of exports to South Africa. The role of the real exchange misalignment in the 2008 currency crisis in 2008 was also underscored (Ndlela, 2012).

This paper aims to find out whether (i) currency overvaluation prevailed under the multicurrency regime introduced in 2008 and (ii) the overvaluation may have contributed to the Zimbabwe's long term weak external and growth performance. Further, some recent literature (Gala and Lucinda, 2006; Rodrik, 2008; Rapetti et al., 2012) posits that undervalued real exchange rates can stimulate growth, and we examine if this is the case in Zimbabwe. The stock-flow approach to the real equilibrium exchange rate reveals that Zimbabwe experienced large currency overvaluation relative to the South African rand both in the run up to the 2008 collapse and in recent years, with negative impact on GDP growth, exports and productive employment. We do not find a robust evidence that currency undervaluation would boost growth.

With South Africa as the largest trading partner, Zimbabwe would benefit from implementing internal devaluation (and in particular contain wage cost) and accelerating structural reforms to correct for the current overvaluation of bilateral real exchange rate (RER) with South Africa. Policymakers should also consider replacing multi-currency regime (anchored in US$) by the South African rand. Such reform would help prevent major future RER overvaluations, reduce transaction costs, improve price transparency, and stimulate growth and the agricultural sector.

The paper is organized as follows. After this Introduction, Section II discusses key external sector developments. Section III estimates the equilibrium exchange rate and discusses findings. Section IV makes the case for adopting South Africa rand. Section V concludes.

II. Growth and External Sector Performance of Zimbabwe

The weak economic performance of Zimbabwe has been analyzed from both microeconomic and macroeconomic perspectives. In this paper, we adopt the longer term macroeconomic perspective by examining links between the RER, productivity, net foreign liabilities and growth.

[2] The real GDP declined by 14 % in 2008, after a 40 % cumulative decline in 2000 – 2007. 70 % of the population needed food assistance in 2008. The government revenues and expenditures collapsed that year (IMF, 2009).

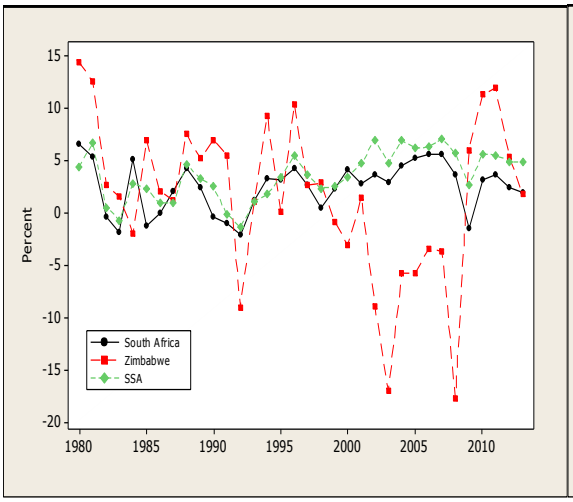
[3] The rand was to be the reference currency, but US$ became one. Budgets are prepared in US$ and 4/5 of non-cash transactions are carried out in US$. In cash transactions, rand is used in the south (Kramarenko et al., 2010).

a. Growth and its Drivers

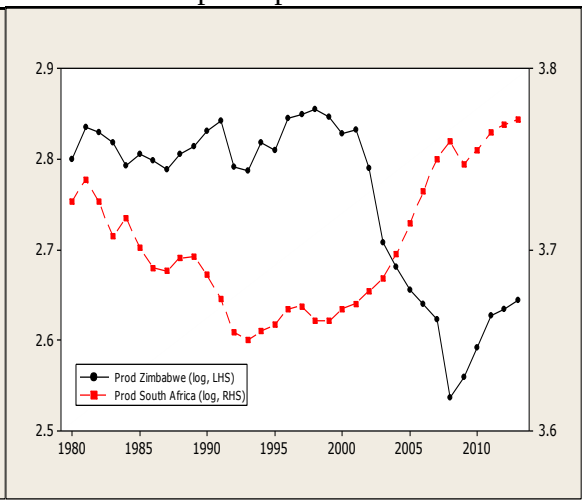
Since mid-1990s, Zimbabwe has been one of the slow growing countries in Africa. This track record followed a period of solid growth (about 4 percent a year on average) during the 1980s, with the rising share of manufacturing in exports. However, in part due to drought spells, the growth slowed to 1.9 percent a year on average during 1991 – 1996, with manufacturing contracting by 1.7 percent a year (IMF, 2001). Following the overall policy reversal in the late 1990s, growth became negative until 2008, and accompanied by hyper-inflation and currency crisis in 2008. During this period, the country's productivity gap with South Africa widened. Zimbabwe's growth performance was also well below the Africa continent (Figure 1).

Figure 1. Real GDP Growth and Real GDP per capita in Zimbabwe and South Africa

1a. Real GDP Growth



1b. Real GDP per capita



Source: Authors' calculations based on the AfDB database. **Note:** In Figure 1b real GDP per capita is measured as log of GDP in constant 2005 $. Due to the lack of employment data, productivity is proxied as real GDP per capita.

Among sectors, mining and services contributed the most to the real output growth during 1981 – 2012 (Table 1a). In contrast, contribution of agriculture and manufacturing was very limited. With the introduction of the multicurrency regime and stabilization of the macroeconomic situation, growth has become more broad-based. Still, growth of manufacturing has been lagging those of other sectors. As a result, the share of manufacturing declined steadily from 9 percent of total value added (in constant 2005 US$) to about 7 percent in 2012.

On the demand side, growth has been driven mostly by household consumption, with negative contribution from net exports. The contribution of gross exports was also negative for most of 1980 – 2012, but a notable turnaround occurred after 2008, with a strong revival of mining and commodity exports (Table 1a and 1b). The household demand continues to be fueled in part driven by public sector wages, which in 2014 are projected to amount to more than 16 percent of GDP and almost 2/3 of budgetary outlays (IMF, 2014). Remittances fueled household expanses in the past, but since most are sent by emigrants to South Africa, the weakened rand has eroded their purchasing power. The share of total investment in GDP is low, hampering trend growth.

Table 1. Drivers of real GDP growth, 1981 – 2012

1a. Sectoral Drivers of Growth (in percent of value added in 2005 US$)

	Growth	Agriculture	Mining	Manufacturing	Services
1981 - 2012	1.4	0.1	0.6	0.1	0.6
2001 - 2012	0.3	-0.3	0.8	0.0	-0.2
2009 - 2012	10.4	1.4	5.5	0.7	2.8

1b. Demand-side drivers of growth (in percent of GDP in 2005 US$)

	Growth	Household	Government	Investment	Net Exports	Gross Exports
1981 - 2012	2.1	2.9	0.3	0.0	-1.2	1.6
2001 - 2012	2.4	6.2	0.5	-0.1	-4.2	-4.2
2009 - 2012	10.5	14.6	2.7	0.3	-7.1	13.0

Source: Authors' calculations based on the AfDB database.

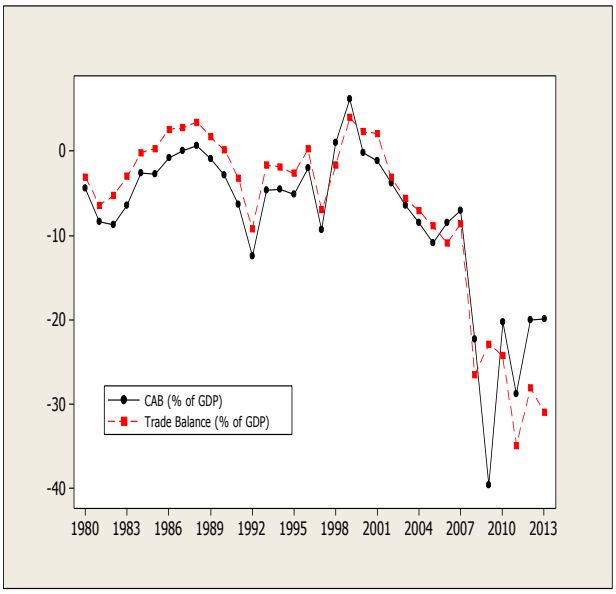
b. Export Performance

i. High current account deficits and external debt

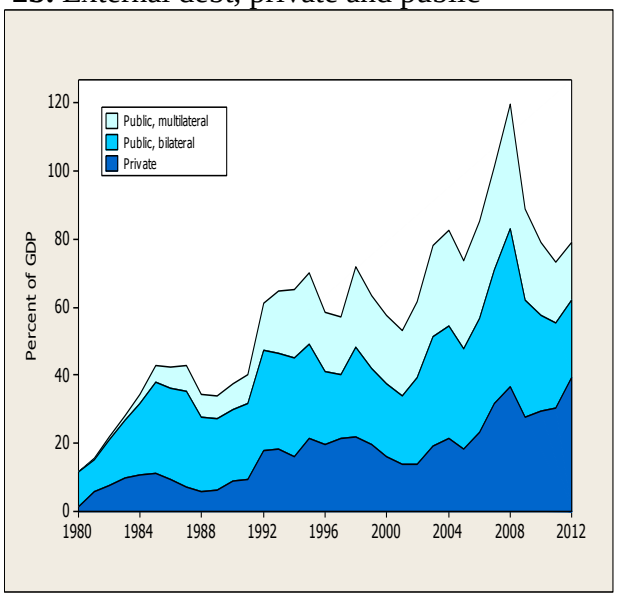
Zimbabwe's trade and current account deficits deteriorated from the early to mid-2000s, with a rapid worsening in the crisis year of 2008. The twin deficits remained very high in 2013. Trade has been driving the current account balance outcomes, underscoring the importance of external competitiveness. The current account deficit has been increasingly financed by short term private loans or arrears, leading to accumulation of private external debt and exacerbating the overall external debt and arrears challenge (Figure 2). At the same time, the reserve coverage has reach precarious levels, covering about 2 weeks of imports of goods and services.

Figure 2. Zimbabwe: External sector indicators (% of GDP)

2a. Trade and current account deficits



2b. External debt, private and public



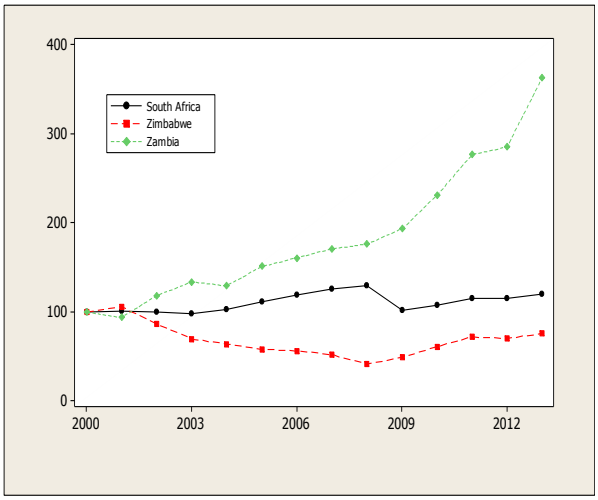
Source: AfDB and IMF WEO database. **Note:** Negative balance in 2a indicates deficit.

ii. Export growth and market share

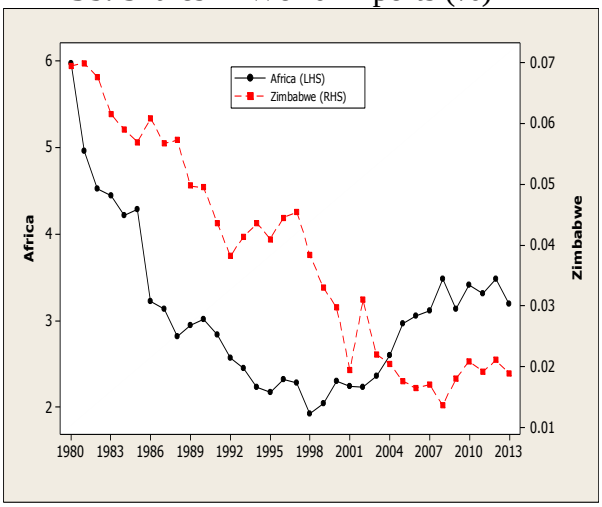
The total exports grew at high rate during the 1990s, but growth became negative since the early 2000s (Figure 3 and Muňoz, 2006). Between 2000 and 2013, volume of Zimbabwe's exports fell on average by 1.1 percent a year and by 15 percent cumulatively. Marked difference however emerged between the pre-reform (2000 - 2008) and post-reform (2009 – 2013) periods (Figure 3a). While export volumes declined in cumulative terms by almost 60 percent during the first period, they increased by more than 80 percent in the latter. Zimbabwe's performance boded well relative to most regional peers, which were impacted by the global financial crisis. Export post-2008 growth reflects rebound after years of decline, with slowdown in 2012 and 2013.

Figure 3. Zimbabwe: Export Growth and Share

3a. Export Volumes (Indices, 2000 = 100)



3b. Shares in World Exports (%)



Source: Authors' calculations based on WTO and IMF WEO databases.

As shown by the country´s low and even declining shares in global exports since 2000, Zimbabwe has been facing external competitiveness challenges (Figure 4b). Zimbabwe's performance in this area contrasts that of Africa, which has shown an increase in global share of exports. Low and declining export shares have contributed to subdued growth of the aggregate demand and the lack of 'productive' jobs in the export sectors and their suppliers.

iii. Diversification of exports

Zimbabwe's product composition of exports is more diversified than that of most other African countries in the region and at comparable level of development (LICs). However, share of mining in total Zimbabwe's exports has risen while the share of manufacturing has fallen over the past ten years, reducing the overall value added in exports. Regarding export destinations, South Africa has accounted for a disproportionate share of Zimbabwe's exports, reflecting geographical closeness and long-established economic ties (Table 2).

Exports were overly concentrated in low value added primary products, with crude materials accounting for more than 40 percent of exports during 2008 – 2012. At the same time, chemical

products, machinery and transport equipment accounted for more than half of imports during the same period (Statistics Zimbabwe, 2013).[4]

Table 2. Merchandise Export by Sectors and Destinations in 2012 (% of total exports) 1/

	Zimbabwe	South Africa	Mozambique	Zambia
Agriculture	33.3	9.5	17.8	8.7
Fuel, mining	36.8	39.3	56.5	78.2
Manufacturing	21.1	40.2	10.3	12.1
Destination 1	South A. (68.9)	EU (20)	EU (40.5)	Switzerland (48.9)
Destination 2	UAE (12.4)	China (11.7)	South A. (19.2)	China (16.7)
Destination 3	Moz. (7.3)	US (8.7)	China (18.4)	South A. (9.3)

Source: WTO database. 1/ Percent of total exports into the country of destination are in parentheses.

c. External price competitiveness

In Zimbabwe, the exchange rate regime has evolved from flexible towards fixed/multicurrency regime, as price stabilization and credibility of the monetary policy gained priority.[5]

The real effective exchange rate (RER) measures the relative price levels (domestic and foreign prices expressed in the same currency unit. In this paper, we focus on the bilateral CPI-based real exchange rate with South Africa, which is Zimbabwe's main trading partner. It is defined as $RER_t = e_t \frac{P_t^F}{P_t^D}$ where e_t denotes \$ per South African rand, P_t^F is the consumer price index of South Africa and P_t^D is the consumer price index of Zimbabwe.[6] Figure 4a depicts the evolution of this bilateral RER with South African rand and its components for the past three decades.

The real exchange rate experienced major real and nominal devaluations (and inflation-devaluation spiral) before the 2008 collapse (Hanke and Krus, 2012). The rate appreciated by about 30 percent between February 2011 and 2014 (Figure 4). The appreciation has occurred against the background of Zimbabwe's very low and even negative inflation, indicating that weakening of the rand to US\$ has out-weighted the evolution of the relative prices. It occurred on the back of continued high current account deficits and accumulation of net foreign liabilities, i.e. negative net foreign assets, but low investment. Against such background, the real appreciations typically imply a loss of external competitiveness, unless they are accompanied by improvements in productivity or other fundamental such as investment (Rogoff, 2007). Still, as Muňoz (2006) underscored, in Zimbabwe other factors such as poor governance or access to credit could limit impact of competitive RER.

[4] Due to the lack of data, the discussion in this section focuses on merchandise exports, while export of services is not analyzed. As Eichengreen and Gupta (2012) underscore, exports today increasingly encompass services, with modern services (e.g., communication, information) being strongly impacted by the RER.

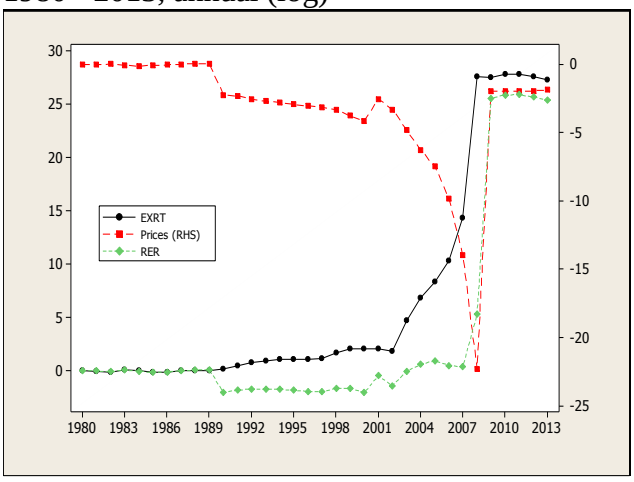
[5] The latest IMF Exchange Rate Report classifies Zimbabwe as having 'no separate legal tender'.

[6] Since South Africa is Zimbabwe's main trading partner, rand is used as the foreign currency in what follows.

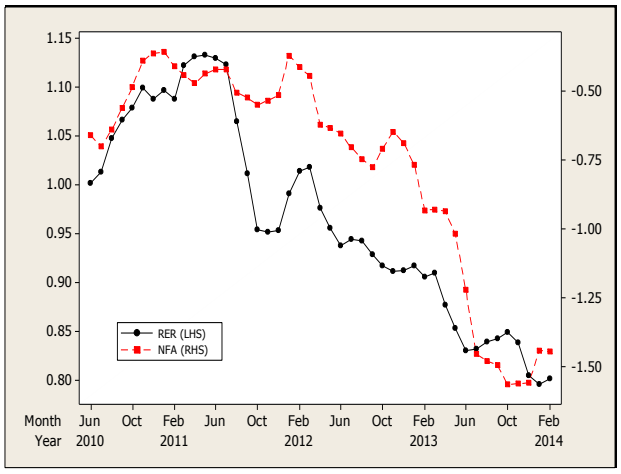
For Zimbabwe's policymakers, the key issue in this regard is to find out whether the real appreciation (i) reflects misalignment (overvaluation) of the RER relative to its equilibrium value and (ii) hampers growth and diversification of exports even under the multicurrency regime.[7]

Figure 4. Zimbabwe: Evolution of the Real Exchange Rate

4a. Real and nominal exchange rate, relative prices 1980 - 2013, annual (log)



4b. RER and NFA, Jun 2010 – Mar 2014, Indices, Jan 2010 = 100



Source: Authors' calculations based on the Reserve Bank of Zimbabwe and IMF databases. **Note:** Relative prices in Figure 1a and NFA in Figure 1b are plotted against right-hand scale.

III. Estimating the Real Exchange Rate Misalignments

Computing the real equilibrium rate helps us determine if the movements of the actual RER reflect mostly changing fundamentals or deviations from equilibrium levels, i.e. misalignments.

a. Modeling Framework

This section utilizes the stock-flow approach to the long run equilibrium real exchange rate. The approach incorporates both the balance-of-payment (e.g., macroeconomic imbalances) and the Balassa-Samuelson effect (e.g., relative productivity).[8] The equilibrium RER determination is linked to the productivity differential (PROD) and to net foreign assets (NFA). This approach is suitable for Zimbabwe, which has a large productivity gap with South Africa and the external debt overhang. The reduced-form equation becomes (where negative sign is RER appreciation):

$$RER = f(\overset{-}{PROD}, \overset{-/+}{NFA}) \qquad (1)$$

In emerging market and developing economies, the productivity *(PROD)* increase in the home country relative to trading partners typically leads to appreciation of the real exchange rate. In

[7] Muňoz (2006) found that while depreciation of the official real exchange rate stimulated exports, parallel rate depreciation led to increased smuggling. Among various sectors, mining was the most responsive to RER changes.
[8] Faruqee (1995) first applied this approach to advanced economies and Égert et al. (2004) and Alberola and Navia (2007) to transition economies. Brixiová, Égert and Essid (2014) utilized it for economies of North Africa.

countries with low international reserves such as Zimbabwe, persistent current account deficits, which translate into the stock of net foreign liabilities, tend to generate burden on the external account and may require RER depreciation (Annex I). However, if the targeted stock of net foreign assets is negative, the capital inflows may lead to RER appreciation.

To confirm that the RER depends mostly on (i) the net foreign assets and (ii) productivity, we include control variables in the empirical analysis such as trade openness and investment. Equations (1a) and (1b) show equation (1) augmented with these control variables:

$$RER = f(\overset{-}{PROD}, \overset{-/+}{NFA}, \overset{-/+}{OPEN}) \quad (1a)$$

$$RER = f(\overset{-}{PROD}, \overset{-/+}{NFA}, \overset{+/-}{INV}) \quad (1b)$$

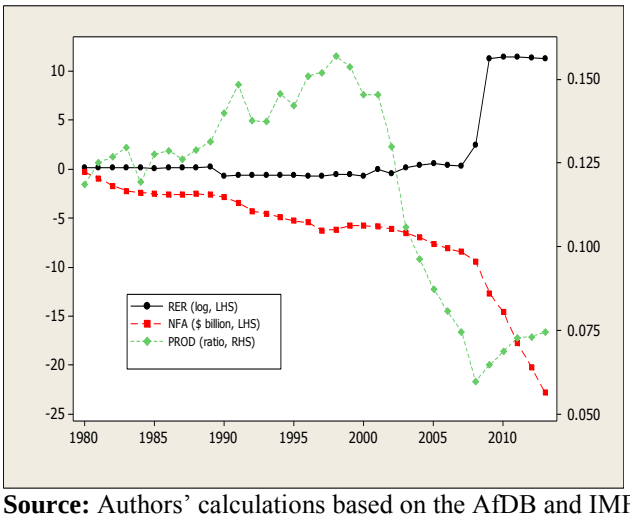
- Openness ($OPEN$) is the share of exports and imports in GDP. An increase in openness can lead to either RER appreciation or depreciation, depending on changes in the trade/current account balance. The typical interpretation is that tighter trade policy appreciates the RER in the long run (Baffes et al., 1997);

- The impact of investment as share of GDP *(INV)* depends on whether the investment releases supply side constraints (and hence raise productivity) in the tradable or non-tradable sector.

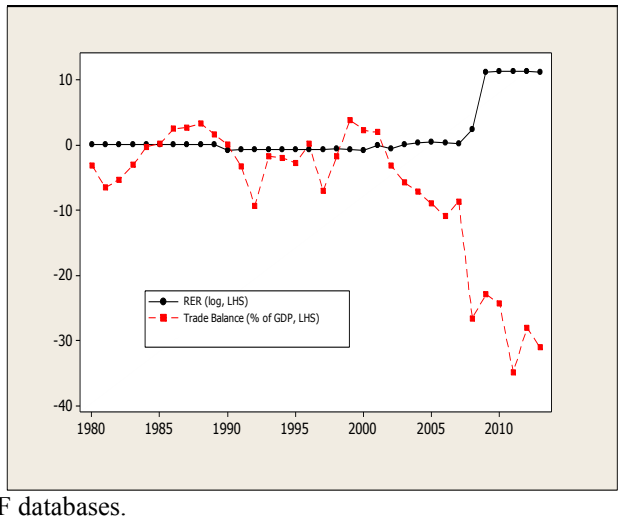
Figure 5 shows paths of the RER, NFA and productivity differential during 1980 – 2013, with the rapid widening of the productivity gap between Zimbabwe and South Africa from mid-1990s until 2009 and some turnaround after 2009. The Figure also depicts the rapid accumulation of net foreign liabilities during this period, driven by trade and current account deficits.

Figure 5. Zimbabwe: Evolution of RER and its fundamentals, 1980 - 2013

5a. RER, NFA and Prod. Differential



5b. RER and Trade Balance



Source: Authors' calculations based on the AfDB and IMF databases.

b. Data and Methodology

The empirical analysis utilizes annual data from 1980 to 2013, obtained from databases of the African Development Bank and IMF. Equation (1) is estimated using CPI-deflated real exchange rate (*RER*). *PROD* is the productivity differential between Zimbabwe and South Africa, measured as real GDP per capita. *NFA* is the ratio of net foreign assets to GDP. Since Zimbabwe accumulated major external debt, this ratio is negative (i.e. represents net foreign liabilities).

First, we examine the relation between the real exchange rate and the two core variables, productivity *(PROD)* and net foreign assets *(NFA)*. To check the robustness of results we add the openness ratio (OPEN), measured as total trade to GDP; and the investment to GDP ratio (INV).

Given that conventional unit root tests suggest that most of our variables are non-stationary in level, we carry out cointegration analysis. The long-term coefficients are estimated using the dynamic ordinary least square (DOLS) estimator, developed by Stock and Watson (1993), who showed that DOLS accounts for the endogeneity of the regressors and serial correlation in the residuals by incorporating lags and leads of the regressors in first differences:

$$Y_t = \beta_0 + \sum_{i=1}^{n} \beta_i X_{i,t} + \sum_{i=1}^{n} \sum_{j=-k_1}^{k_2} \gamma_{i,j} \Delta X_{i,t-j} + \varepsilon_t \qquad (2)$$

where k_1 and k_2 denote, respectively, leads and lags. Their length is determined on the basis of the Schwarz, Akaike and Hannan-Quinn information criteria (Annex II).[9]

c. Estimation Results

The baseline model linking the real exchange rate (RER) to productivity (PROD) and net foreign assets (NFA) was estimated using the dynamic OLS (DOLS) approach with one lag to one lead (DOLS(1,1)). Additional control variables, namely openness and investment, were added to the baseline model. The estimated results of the RER models are in Table 2a.

As a robustness check, we also use the Least Absolute Deviations (LAD) estimator to address the potential 'outliers' issue.[10] This method is well suited for our data, since after 2008 the RER and some explanatory variables (NFA) exhibit high volatility. Table 2b shows the results.

The coefficient estimates for the productivity differentials are statistically significant for the baseline model and the case with trade openness under both methods (DOLS and LAD). Under the LAD, the coefficient is also significant in the case with investment. The coefficients are of the expected sign, with a decrease in the productivity differential (i.e. widening productivity gap between Zimbabwe and South Africa) implying RER depreciation.[11] Our results indicate that in the long run, productivity differential has a robust negative relationship with the RER (Table 3a).

[9] Since the NFA series is I(2) process, it was de-trended.

[10] Least absolute deviations (LAD) is method that seeks to minimize the influenced of outliers. This type of robust regression is also called median regression, which has the advantage of diminishing the influence of the residuals.

[11] In other emerging markets, including new EU members, productivity is a key driver of RER movements.

Table 3a. The long-run determinants of the Zimbabwe's RER (DOLS)

Specification	Baseline	With trade openness	With investment
C	-15.22243***	-4.796220	-27.74584***
	(3.784424)	(1.447145)	(6.123713)
LOGDIFF_PROD	-7.210599***	-5.717963***	-11.10295***
	(3.585306)	(4.584548)	(7.260829)
NFA	-0.476500	-0.483460	0.002208
	(1.082305)	(1.169024)	(0.004887)
LOGOPEN		-1.820509***	
		(4.442108)	
LOGINV			1.705171**
			(2.249682)
AFTER2008	22.22376***	24.46813***	20.25245***
	(12.11876)	(22.13481)	(18.97835)
D2001	1.312620***	1.073231***	1.311790***
	(5.784610)	(4.129982)	(6.699468)
N	30	30	30
Adjusted R-squared	0.995061	0.997331	0.997500
Log likelihood	-20.79798	-7.102519	-6.085697
F-statistic	465.9453	660.3460	705.1699
Prob (F-statistic)	0.000000	0.000000	0.000000

Source: Authors' estimates. **Note:** Figures in brackets are standards deviations of parameters. (*), (**), (***) indicate the degree of statistical significance at 10%, 5% and 1% respectively.

Table 3b. The long-run determinants of the Zimbabwe's RER (LAD)

Specification	Baseline	Trade openness	Investment
C	-19.93814***	-4.041354	-32.78111***
	(2.974062)	(0.588780)	(3.753621)
LOGDIFF_PROD	-9.514373**	-4.828717*	-12.51211***
	(2.825623)	(1.853604)	(4.065186)
NFA	-0.572599	-0.073507	0.234597
	(0.989866)	(0.137325)	(0.287630)
LOGOPEN		-1.520882**	
		(2.452785)	
LOGINV			2.520989*
			(1.835886)
AFTER2008	21.04716***	25.64440***	19.57730***
	(9.223663)	(10.61416)	(10.39960)
D2001	1.385916*	0.631581	1.110357*
	(1.797750)	(0.867240)	(1.959982)
Adjusted R-squared	0.878212	0.904245	0.890671
Sparsity	1.492896	1.056508	1.090795
Prob(Quasi-LR stat)	0.000000	0.000000	0.000000

Source: Authors' estimates. **Note:** Figures in brackets are standards deviations of parameters. (*), (**), (***) indicate the degree of statistical significance at 10%, 5% and 1% respectively.

The coefficient estimate for openness is significant and negative under both methods (Table 3a and 3b). A greater openness thus leads to a real appreciation of the RER, indicating that the export revenues and imports strengthen the domestic tradable sector more than the non-tradable sector. In contrast, increased investment leads to RER depreciation, suggesting that it is mostly used to release supply-side constraints in non-tradable sectors.

Factors impacting the RER were also estimated with monthly data. Specifically, the productivity differential was proxied by (lagged) credit to the private sector (relative to credit in South Africa) and prices of key export commodities served as controls. In this case, an increase of credit in Zimbabwe relative to South Africa had a positive and statistically significant relation with the RER, i.e. credit expansion led to real deprecation of the RER, indicating that credit was geared more towards non-tradable sectors (Tables 1 and 2, Annex III).

d. Real Exchange Rate Misalignment

We calculate the misalignment in three steps. First we use data on the nominal exchange rate between $ and South African rand as well CPI indexes for Zimbabwe and South Africa to derive the bilateral real exchange rate:[12]

$$\ln RER_t = \ln(e_t P_t^F / P_t^D) \tag{3}$$

Second, we regress RER on NFA, $PROD$, and on control variables ($OPEN$, INV). We also introduce dummy variables for structural breaks after the land and currency reforms in 2001 and 2008. The RER misalignment (as % of the equilibrium rate) is difference between the actual real exchange rate (RER) and the long run real equilibrium exchange rate (ERER):

$$misalignment_t = \frac{RER_t - ERER_t}{ERER_t} \tag{4}$$

Given our definition of the RER, when misalignment is positive, the RER is undervalued. Conversely, when misalignment is below zero, the RER is overvalued.

In both methods (DOLS, LAD), the RER of Zimbabwe was found to be notably overvalued in the run up to 2008 crisis (between 70 and 100 percent of the equilibrium real exchange rate during 2006–2008). The sizeable misalignment in mid 2000s was a side-product of hyperinflation which in turn reflected heavy quasi-fiscal activities of the RBZ (Figure 6).

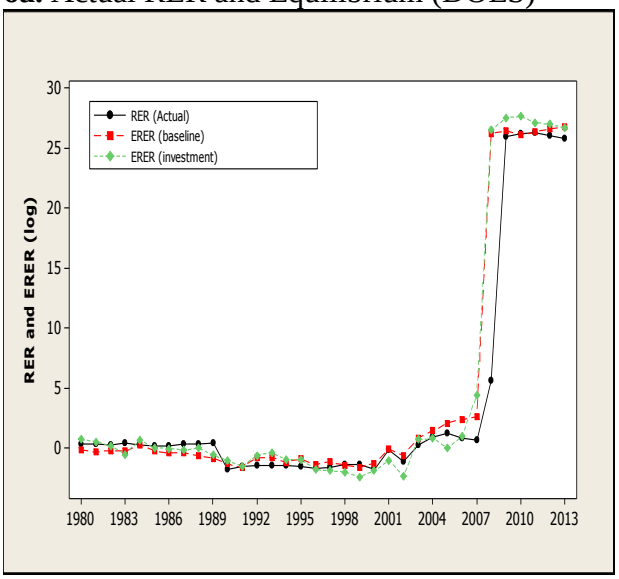
The currency overvaluation w.r.t. rand has re-emerged under the multicurrency regime. Specifically, the 2013 RER overvaluation w.r.t. South African rand ranged from 58 to 73 percent of the equilibrium real exchange rate. As with any model-based estimation, given the sensitivity or parameters and the underlying assumptions, the results should be understood as providing

[12] Until 2008, e_t was in terms of Zimbabwe dollars per one South Africa rand. After 2008 it was US$ per rand.

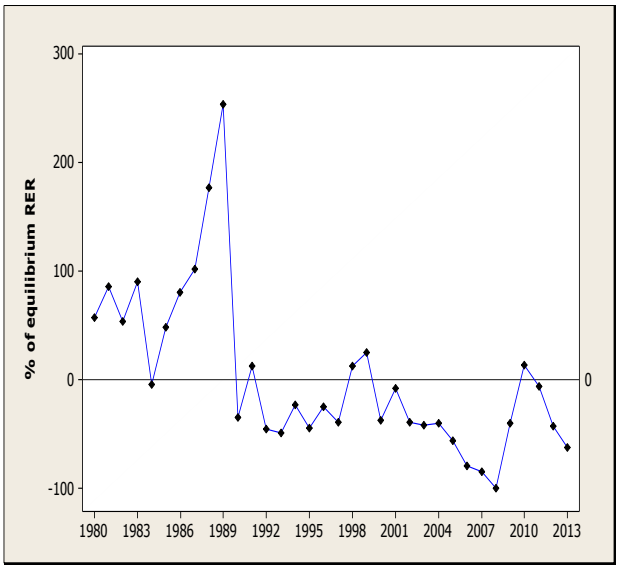
indication of sizeable overvaluation under the prevailing multi-currency regime relative to alternatives rather than the specific level of the real equilibrium exchange rate.[13]

Figure 6. Zimbabwe: Real Exchange Rate and Its Misalignment, 1980 – 2013

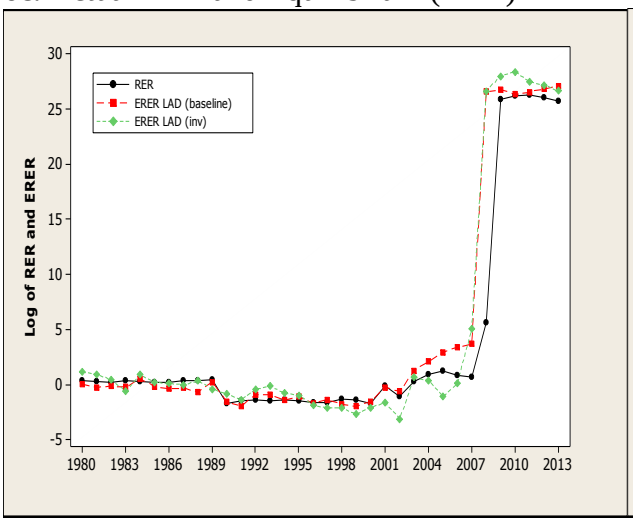
6a. Actual RER and Equilibrium (DOLS)



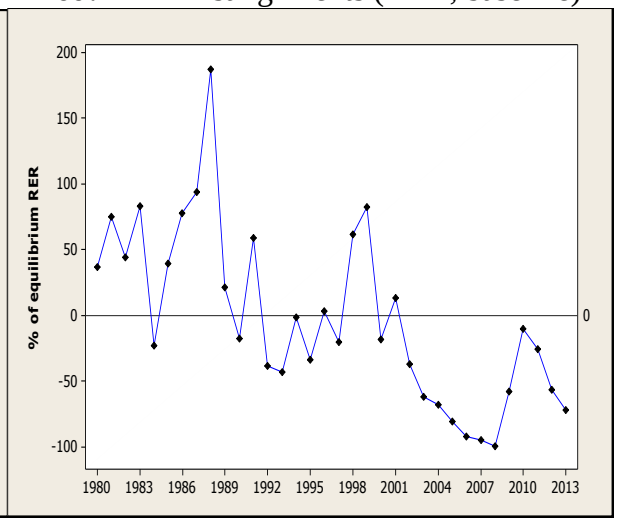
6b. RER Misalignments (DOLS, baseline)



6c. Actual RER and Equilibrium (LAD)



6d. RER Misalignments (LAD, baseline)



Source: Authors' calculations.

As a robustness check, misalignment of the actual RER from the equilibrium one was also computed with monthly data (Annex III, Figure 1). The currency overvaluation in 2014 ranged from 54 percent for the base scenario to 39 percent for the scenario with commodity prices as controls, suggesting once again that the Zimbabwean bilateral RER with South Africa has been significantly overvalued relative to its long run equilibrium value.

[13] The overvaluations derived with ARDL method (Figure 3, Annex III) are close to these values of overvaluation.

e. Comparison of Results with the Empirical Literature

Results of other studies on the RER misalignment in Zimbabwe are summarized in Table 4. Our findings, which point to past periods of sizeable overvaluation as well as a large overvaluation in 2013, are consistent with finding of other empirical studies on the topic.

Our estimates and the empirical literature suggest that Zimbabwe has been exposed to extended periods of sizeable RER overvaluation. With South African as the main trading partner, the persistent currency overvaluation has contributed not only to the weak trade balance and depleted foreign exchange reserves but also to low growth. Further, we have not found any evidence that undervaluation promotes growth. Hence eliminating sizeable RER misalignments – especially overvaluation -- is thus a key priority which will require internal devaluation and structural reforms. Further, replacing US$ with South African rand is an option to be seriously considered. We elaborate on advantages and drawbacks of this step below.

Table 4. RER misalignment in Zimbabwe and its impact — Summary of the literature

Study & authors	**Methodology**	**Results**
Ndlela (2012)	Behavioural equilibrium exchange rate (BEER)	RER (using ZWE dollar relative to US$ as nominal rate) was overvalued up to 95 % in 2003 – 2004; RER misalignment reduced GDP growth
Mohapatra (2005)	Short run, partial equilibrium approach	RER (real effective exchange rate) was overvalued by about 50 – 60 % in 2004 - 2005
Masunda (2011)	Fundamental equilibrium exchange rate (FEER) /macro balance	RER misalignment (both under and overvaluation) hampers growth
Masunda (2012)	Fundamental equilibrium exchange rate (FEER) /macroeconomic balance	RER overvaluation was an important factor for currency crisis (large depreciation)
IMF (2014)	Macroeconomic balance approach; external sustainability approach	RER is overvalued by 21 - 23 % relative to its equilibrium value

IV. Misalignment and Growth

The role of the real exchange rate (e.g. the relative price of tradables to non-tradables) in growth and the convergence of incomes of developing countries to those of developed economies remains debated. Our paper contributes to this debate with the case of Zimbabwe, a country that experienced several currency regimes, major misalignments, and slow economic growth.

Experiences of developing countries indicate that sizeable and protracted overvaluations are associated with slow growth (Edwards, 1988; Ghura and Grennes, 1993). What is less clear is whether undervaluation promotes growth (Galas and Lucinda, 2006; Rodrik, 2008; Rapetti et al., 2012), or is neutral/hampers it (Berg and Miao, 2010; Schöder, 2013). Haddad and Pancaro (2010) posit that since countries cannot maintain currency undervaluation indefinitely, it can be deployed as a growth tool only in the short term. Razin and Collins (1997) find nonlinearity in relation between RER misalignment and growth: High overvaluations are associated with lower growth, while low to moderate overvaluations tend to be associated with higher growth. However, large undervaluation seem to again hamper growth.

a. Misalignment and real GDP growth

First, we examine the misalignment – growth nexus in Zimbabwe. We utilize an empirical growth equation based on Solow's growth model, as in Schöder (2013):

$$growth_t = \alpha + \phi \ln rgdppc_{t-1} + \Psi_1 \ln over_t + \Psi_2 \ln under_t + \gamma dollar_t + \mu land_t + \theta wgr_t + \varepsilon_t \qquad (5)$$

where the dependent variable is real GDP growth ($growth_t$). The independent variables are the initial real GDP per capita, ($rgdppc_{t-1}$) as the convergence term, the world GDP growth (wgr_t), a dummy variable for the multicurrency regime introduced in 2008 ($dollar_t$), a dummy variable for the 2001 land reform ($land_t$), and the idiosyncratic error (ε_t). The value of undervaluation ($under_t$) is greater than or equal to zero, while the value of overvaluation ($over_t$) is less or equal to zero. We also consider some of the RER fundamentals utilized in estimating the equilibrium RER (NFA, investment and openness) since they are likely to impact growth.

A key difference of (5) from the approach adopted by, for example, Rodrik (2008) is allowing currency undervaluation affect growth differently than overvaluation, that is $\Psi_1 \neq \Psi_2$. Alternatively, misalignment can represent both overvaluation and undervaluation:

$$growth_t = \alpha + \phi \ln rgdppc_{t-1} + \Psi \ln misalignment_t + \theta wgr_t + \gamma dollar_t + \mu land_t + \varepsilon_t \qquad (5a)$$

(5a) assumes that RER undervaluation and overvaluation have equal and opposite impacts on growth. Under this assumption, $\Psi > 0$ implies that undervaluation raises growth.

Our choice of growth equation (5) reflects the observation that in Zimbabwe, the relation between misalignment and growth is non-linear (Figure 7). The real GDP growth (per capita) in Zimbabwe is lower under more overvalued currency and higher with undervaluation. The relation is non-linear (or piece-wise linear) with growth tapering off at higher levels of undervaluation. Overall, currency undervaluation is not systematically related to higher growth.

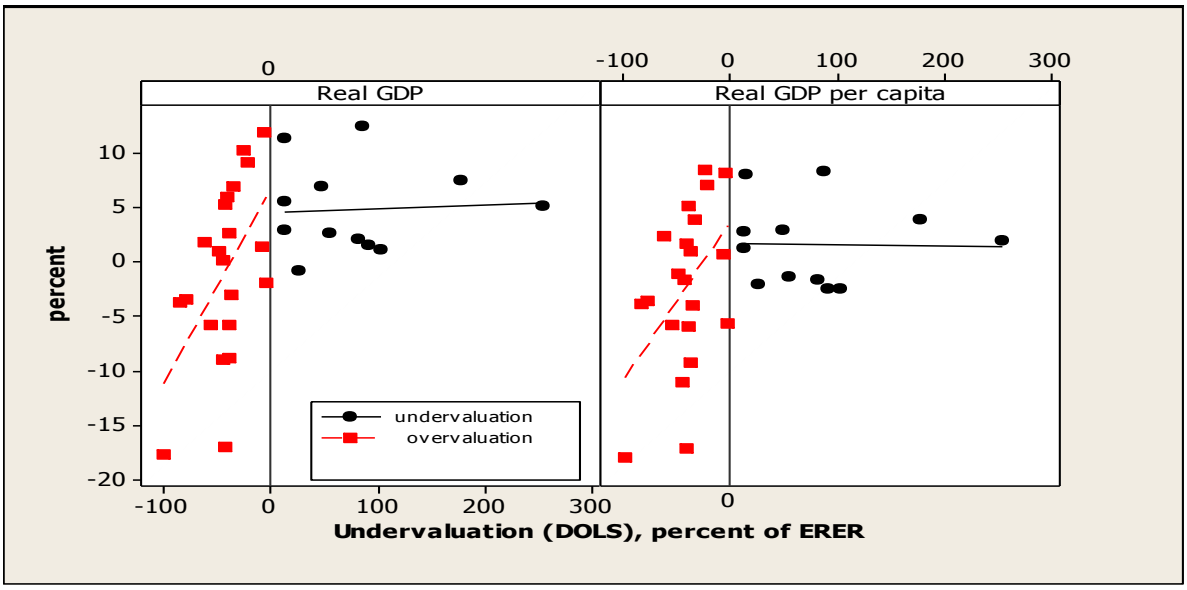
The varied impacts of undervaluation and overvaluation on growth are captured by parameters Ψ_1 and Ψ_2 (Table 5a). The coefficient estimates of the impact of misalignment on growth, captured by parameter Ψ in equation (5a). When examining misalignment only, the results would suggest a positive impact of undervaluation on growth (Tables 1a and 1b, Annex IV). When separate impacts of undervaluation and overvaluation on growth are considered, the regression exercise yields a negative and statistically significant relationship between overvaluation and growth (Table 3a). Put differently, in Zimbabwe a smaller overvaluation (with RER closer to its equilibrium value) is associated with higher growth.

Our estimates point to nonlinearity between misalignment and growth. However, we do not find robust evidence that more undervalued currency would be associated with higher growth. While the coefficient associated with undervaluation (Ψ_2) is positive, it is statistically significant only in

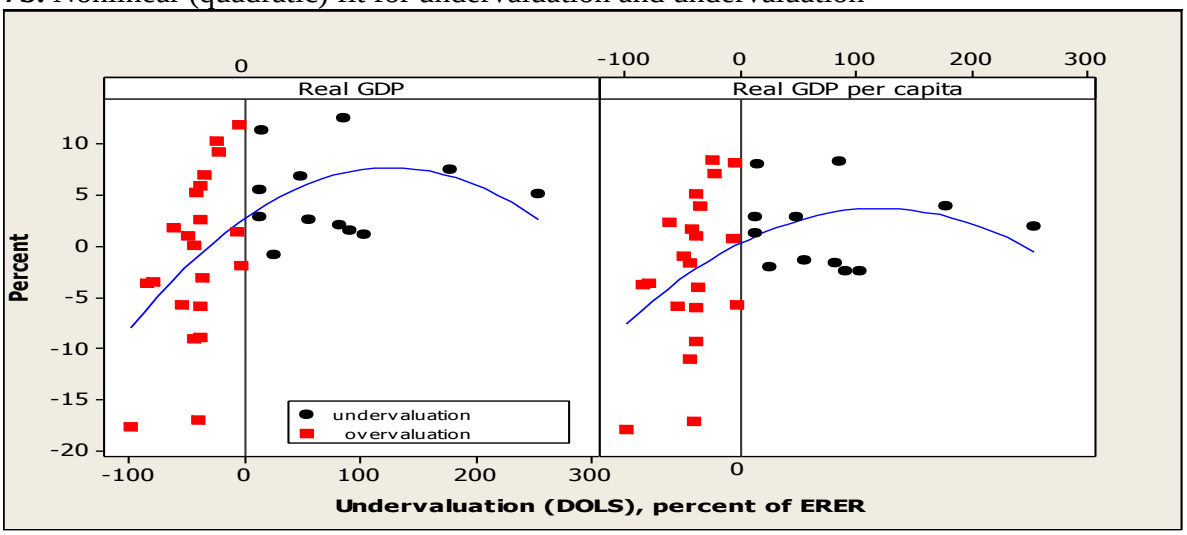
the baseline but becomes insignificant when various control variables are introduced.[14] In fact, Zimbabwe experienced some of its highest growth rates when the RER was only slightly undervalued (Figure 7).[15] These results are robust to various specifications of the basic empirical growth equation, with investment ratio, openness and net foreign liabilities as controls.

Figure 7. RER undervaluation and growth

7a. Piece-wise linear fit for overvaluation and udervaluation



7b. Nonlinear (quadratic) fit for undervaluation and undervaluation



Source: Authors' calculations**. Note:** Negative undervaluation represents overvaluation. In Figure 6a, correlation coefficient for growth of GDP per capita and overvaluation is 0.5063 (significant at 5%). Correlation coefficient for growth of GDP and overvaluation is 0.5375 (significant at 5%).

[14] Undervaluation is insignificant also when different estimates of ERER are utilized (Annex II).

[15] Annex IV presents symmetric treatment of misalignment (i.e. both undervaluation and overvaluation would hamper growth. In this specification, misalignment is not statistically significant.

b. Misalignment and sectoral impacts

Second, we aim to uncover the key channels through which the real exchange rate misalignment impacts growth. The sectoral growth models to be estimated are specified as follows:

$$gr\_\sec_{jt} = \alpha + \phi \ln rgdppc_{t-1} + \Psi_1 \ln over_t + \Psi_2 \ln under_t + \gamma dollar_t + \mu land_t + \theta wgr_t + \varepsilon_t \quad (6a)$$

$$cgr\_\sec_{jt} = \alpha + \phi \ln rgdppc_{t-1} + \Psi_1 \ln over_t + \Psi_2 \ln under_t + \gamma dollar_t + \mu land_t + \theta wgr_t + \varepsilon_t \quad (6b)$$

where $gr\_\sec_{jt}$ represents real growth of the sector j in period *t* and $cgr\_\sec_{jt}$ contribution of sector *j* to the overall growth of GDP at *t*, where sectors studied are manufacturing, mining and agriculture – the main export sectors in Zimbabwe. The other variables are as in Equation (5).

The sectoral decomposition of growth points to different impacts of RER overvaluation and undervaluation on key export sectors: mining, manufacturing and agriculture. While overvaluation reduces sectoral growth (with the coefficients Ψ_1 positive and statistically significant), undervaluation coefficients Ψ_2 – are positive for manufacturing and mining but negative for agriculture and are not statistically significant (Table 5b). Among the three sectors examined, overvaluation impacts the most growth of the agricultural sector, which accounts for more than half of the country's employment. When the contribution of various sectors to GDP is taken into account, the RER overvaluation had a high impact on growth via mining, which generated more than 40 percent of the country's real value added and almost 40 percent of goods exports in 2012. Mining has high elasticity of employment to growth, indicating that slowdown of growth in this sector leads to relatively (to employment in the sector) high job losses.[16]

V. Should Zimbabwe Adopt South African Rand?

The 'optimal' currency regime for the country has been a widely debated issue. When introduced in February 2009, the multicurrency regime was meant to last until 2012. The regime was, with no clear timeline for replacement. Even though the regime helped stabilize the economy from hyperinflation and stop quasi-fiscal financing, it presents challenges. One of them is persistent real exchange rate overvaluation illustrated above, another one is currency mismatch between wages and other expenditures payable in dollars and foreign earnings received mostly in rand. In cash transactions, shortages of small $ denominations have impeded trade, while South African capital account restrictions prevented wider circulation of rand.

Reintroducing the Zimbabwe dollar, while politically appealing on the grounds of national independence, raises concerns about credibility of macroeconomic policies, especially given the track record associated with the previous use of this currency. Rand meets most preconditions to be the anchor currency, (and in most aspects does so better than US$). Specifically, South Africa is Zimbabwe's largest trading partner, and was the destination for over 2/3 of exports in 2013; (ii) labor mobility from Zimbabwe to South Africa is high with more than 10 percent of

[16] Mining accounted for two percent of employment, but agriculture for more than half (ZimStat, 2006 and 2012).

Table 5a. Real GDP growth and RER under- /overvaluation, OLS

	(1) Baseline Model Eq. 5	(2) (1) with Investment	(3) (2) with NFL	(4) (2) with Openness	(5) (1) with land reform
Initial income of ZWE (log)	**-0.038474**	**-0.516290****	**-0.464162****	**-0.512462****	**-0.481189*****
	(0.132849)	**(0.201104)**	**(0.167855)**	**(0.208644)**	**(0.155811)**
Global real GDP growth	-0.057428	0.065205	0.400298	0.107689	-0.055443
	(0.499075)	´(0.473567)	(0.490335)	(0.534447)	(0.80763)
Multicurrency regime in 2008	0.081087**	-0.061951	-0.00053	-0.058391	0.058387**
	(0.035661)	(0.055274)	(0.065223)	(0.062704)	(0.025357)
Undervaluation (log)	0.078963*	0.05629	0.028346	0.053356	0.034984
	(0.042569)	(0.034188)	(0.028415)	(0.03566)	(0.02952)
Overvaluation (log)	**0.013276*****	**0.007509*****	**0.009170*****	**0.007475****	**0.012163*****
	(0.001035)	**(0.001466)**	**(0.001855)**	**(0.001434)**	**(0.000918)**
Investment ratio (log)		**0.149287*****	**0.123648****	**0.148245*****	
		(0.047287)	**(0.050655)**	**(0.049899)**	
Net foreign liabilities (log)			-0.078268		
			(0.048743)		
Openness ratio (log)				-0.015618	
				(0.072818)	
Land reform in 2001					**-0.108513*****
					(0.03549)
Constant	0.105639	1.276667**	1.201965***	1.293983**	1.381420***
	(0.37432)	(0.525717)	(0.426929)	(0.516465)	(0.446072)
Adjusted R-squared	0.393276	0.555035	0.571955	0.537695	0.595967
F-statistic	5.148462	7.652621	7.108352	6.3169	8.866913
Prob(F-statistic)	0.001917	0.000084	0.000103	0.000247	0.000026

Table 5b. Growth of export sectors and RER over/undervaluation (OLS)

	Manufacturing		Mining		Agriculture	
	growth	contr.	growth	contr.	growth	contr.
Initial income of ZWE (log)	**-0.781036*****	**-0.05510****	**-0.879719*****	**-0.29006*****	**-1.106820****	**-0.11202***
	(0.215381)	**(0.02141)**	**(0.213456)**	**(0.08087)**	**(0.469642)**	**(0.06288)**
Global real GDP growth	-0.403263	-0.03205	-1.435849*	-0.4151	-2.413199	-0.171
	(0.953999)	(0.07418)	(0.74181)	(0.2802)	(2.550639)	0.2179
'Dollarization' from 2008 on	0.043685	0.002022	0.030033	0.01434	-0.002116	0.00099
(values 1 or 0)	(0.056163)	(0.004626)	(0.057859)	(0.01748)	(0.082386)	0.01359
Land reform from 2001 on	**-0.108105*****	**-0.007332****	**-0.087216*****	**-0.02903****	**-0.174031****	**-0.019803****
(values 1 or 0)	**(0.030614)**	**(0.002906)**	**(0.030526)**	**(0.01098)**	**(0.075871)**	**(0.008537)**
Undervaluation (log)	0.044771	0.003862	0.027582	0.01125	-0.104493	-0.00965
	(0.03513)	0.003463	(0.02465)	(0.01308)	(0.080328)	(0.01017)
Overvaluation (log)	**0.008340*****	**0.0005337****	**0.011777*****	**0.0041939*****	**0.021915*****	**0.0023859*****
	(0.000938)	**(0.0002581)**	**(0.001223)**	**(0.0009749)**	**(0.001891)**	**(0.004)**
Constant	2.216262***	0.15642	2.532622***	0.8334***	3.272830**	0.3284*
	(0.620762)	(0.06126)	(0.610764)	(0.2314)	(1.339753)	(0.1799)
Adjusted R-squared	0.446	0.360	0.645	0.617	0.307	0.287
F statistics	5.15	3.90	10.39	9.31	3.29	3.08
Prob. (F-statistics)	0.001	0.007	0.000	0.000	0.0159	0.021

Source: Authors' estimates. Note: Figures in brackets are standards deviations of parameters. (*), (**), (***) indicate the degree of statistical significance at 10%, 5% and 1% respectively.

Zimbabwean labor force estimated to reside in South Africa; (iii) Zimbabwe could join SACU and tap into its transfer formula which benefits poorer countries (Kramarenko et al., 2010).

To illustrate further the benefits of rand as the transaction currency, a counterfactual exercise was carried out with rand as the anchoring currency since 2009. In this situation, the bilateral nominal exchange rate with South Africa is equal to one and the RER is driven by the relative prices. The counterfactual inflation rate for Zimbabwe under rand as transaction currency is derived as a combination of the South African inflation for imports and Zimbabwe's inflation for non-tradables: $CPI_{t,ZWE}^{counterfactual} = (1+\pi_{t,zwE}^{N})^{\alpha}(1+\pi_{t,zwe}^{N})(1+\pi_{t,SA}^{T})^{1-\alpha}$, where α=0.423 is the share of imports from South Africa in the CPI basket. In this case, the counterfactual RER would depreciate only marginally, in contrast to 10 percent appreciation of the actual RER since July 2011. The overvaluation would also be much lower than under the dollar as the anchor currency and would not exceed 3 percent of the equilibrium RER (Figure 2, Annex III).

In addition to substantial benefits of moving to the rand, many of the costs of ´dollarized´ economy, such as the loss of independent monetary and exchange rate policy have already been incurred with US$ as the legal tender. Further, with rand as the transaction currency, the currency risk would be below the current levels due to reduced currency mismatch. Moreover, if rand becomes the main medium of exchange, transaction (currency exchange) costs would fall. Interest rates on loans would also likely fall due to reduced risk premium.

One exception to the overall suitability of South African rand for Zimbabwe's economy has been the limited shock synchronization between the two economies. The standard policy recommendation for mitigating low synchronization are (i) availability of transfers (as would be the case if Zimbabwe joins CMA) and (ii) flexibility of labor and product markets. The low business cycle synchronization could be further offset by the high credibility of the South African Reserve Bank in conducting monetary policy and its relevance for the region.[17]

Since Zimbabwe has been using the US$ for over five years, switching to South African rand would change little – the country would still not be able to utilize monetary and exchange rate policy. The issues related to the lack of synchronization are thus similar. From the perspective of South Africa, given Zimbabwe size, admitting it to CMA would not constitute major cost. In fact it could help reduce fragility and possibility of costly conflict (Ncube at al., 2013).

In sum, in the case of Zimbabwe, introducing South Africa rand could mean reaping major benefits in terms of transaction costs, credibility of monetary policy, regional integration and last but not least exchange rate broadly aligned with its equilibrium value. The last point, while more likely with South African rand than $, is not automatic -- it is conditioned on Zimbabwe maintaining appropriate macroeconomic, and especially fiscal policies. Given the absence of devaluation of exchange rate as a policy tool, the country would need to rely more on 'internal devaluation'

[17] Further, Zimbabwe is poorly synchronized with both South Africa and US (Kramarenko et al., 2010). More specifically, empirical evidence indicates that shocks to Zimbabwe's output have not been correlated with those to the US economy. Evidence on output shock correlations of Zimbabwe with South Africa is mixed – shocks appear stronger during the relatively stable period of 1990s. Overall, correlation among GDP growth rates of economies in Southern Africa in the past three decades has been limited (Basdevant et al., 2014).

through containing wage bill to maintain RER competitiveness. Putting in place an enabling entrepreneurship framework to support competitiveness and job creation is also critical.

IV. Conclusions

This paper examined suitability of the multicurrency regime for Zimbabwe almost six years after its introduction and the challenges this regime has brought about. The approach adopted focused on misalignment of the real exchange rate and its implications for growth complements the existing literature which examines the issue from the optimal currency area perspective.

More specifically, the real exchange rate misalignment in Zimbabwe was first estimated utilizing the stock-flow approach to the real equilibrium exchange rate with both annual data for 1980 – 2013 and monthly data for January 2009 – March 2014 period, with several empirical methods. The main finding was that the country experienced persistent periods of sizeable real exchange rate misalignment, in particular overvaluation, both in the run up to 2008 crisis and under the current multicurrency regime anchored in US$. The misalignment has an asymmetric impact on growth: while overvaluation reduces growth of GDP as well as growth and employment in export sectors, we have not found robust evidence that undervaluation would increase it. Hence in Zimbabwe the real exchange rate does not appear to be a policy tool that could drive growth.

Regarding the current overvaluation, nominal exchange rate (e.g., external) devaluation is not feasible under the multicurrency arrangement. Zimbabwe thus needs to rely on internal devaluation, in particular fiscal expenditure control and management of the public wage bill, as well structural reforms that would raise the economy's flexibility. Creating an environment conducive to foreign investment inflows is critical for avoiding liquidity shortages.

The multicurrency regime served Zimbabwe well for stabilizing the economy. Nevertheless, with the weakening of the South African rand relative to the US$, correcting for currency overvaluation and preventing in the future will be challenging. Rather than relying on internal devaluation which is politically costly to introduce, Zimbabwe could replace the multicurrency regime, anchored in US$, with rand as the sole transaction currency. The rand meets the criteria of the optimum currency area better than the US$. Given the track record of South African monetary policy, credibility of this arrangement would be also strong, provided appropriate fiscal policies are implemented. Besides preventing reoccurrence of the past sizeable overvaluations of the RER, and hence boosting the export and GDP growth, adopting rand would facilitate financial integration. All these factors are key for resolving the debt issue as well as for raising growth and living standards of the population.

ANNEX I. STOCK-FLOW APPROACH TO THE REAL EQUILIBRIUM EXCHANGE RATE[18]

The stock-flow model encompasses the balance of payments and Balassa-Samuelson approach to the real equilibrium exchange rate. Besides productivity differentials, the RER in the long run is driven by NFA adjustment towards its targeted position. The stock-flow approach decomposes the RER into: (i) RER for tradables (the nominal exchange rate and the ratio of foreign and domestic tradable prices) and (ii) the ratio of domestic to foreign relative price of non-tradables:

$$q = ((e + p^{*T}) - p^{T}) - \left((1-\alpha)(p^{NT} - p^{T}) - (1-\alpha^{*})(p^{*NT} - p^{*T})\right) \quad (1AI)$$

where q denotes the real exchange rate, e is the nominal exchange rate, α (α^{*}) is the share of tradable goods in the domestic (foreign) CPI; p^{T} (p^{*T}) is the domestic (foreign) price of tradables, and p^{NT} (p^{*NT}) is the domestic (foreign) relative price of non-tradables. The second term in (1AI) shows changes in the RER due to different developments in prices of non-tradable goods relative to prices of tradable goods in the home and foreign country. In this definition, an increase (decrease) in q represents real depreciation (appreciation) of the domestic currency.

Focusing on the long-run external equilibrium (i.e. abstracting from short-term capital flows and business cycles) the change in net foreign assets can be described as:

$$\Delta NFA = CAB = TB(y - y^{*}) + r^{*} NFA \quad (2AI)$$

where *NFA* is net foreign assets, *TB* is trade balance, r^{*} is the world real interest rate, and *CAB* is the current account balance. The first component of (2AI) is the trade account and the second is the interest income from NFA, where the trade balance depends on the productivity differential between the home and foreign country. Under the uncovered real interest rate parity condition (where the difference between domestic and foreign real interest rates is the expected change in the real exchange rate), the path of NFA towards their targeted level, NFA^{D}, is described by:

$$\Delta NFA^{D} = \mu(NFA^{D} - NFA) + \lambda(r - r^{*}) = \mu(NFA^{D} - NFA) + \lambda E(\Delta q) \quad (3AI)$$

where ΔNFA^{D} can be interpreted as capital account, r is the real interest at domestic markets and $\lambda, \mu > 0$. Since over the long term $\Delta NFA^{D} = \Delta NFA$ and $\Delta NFA = 0$ in the steady state, combining (2AI) and (3AI) yields the following long-run RER, q^{lt}

$$TB(y - y^{*}) + r^{*} NFA = q^{lt} \quad (4AI)$$

The *RER* is linked to the productivity differential $y - \bar{y}$ (PROD) and to NFA:

$$RER = f(\overset{-}{PROD}, \overset{-/+}{NFA}) \quad (5AI)$$

[18] Faruqee (1995) first applied this approach to advanced economies and Égert et al. (2004) and Alberola and Navia (2007) to transition economies. Brixiová, Égert and Essid (2014) utilized it for economies of North Africa.

ANNEX II. UNIT ROOT AND STATIONARITY TESTS

Table 1. Stationarity tests (Augmented Dickey Fuller, ADF): 1980-2013

	Series	LOGDIFF_PROD	LOGGC_GDP	LOGOPEN	LOGRER	LOGTOT	INV	NFA	TRADE BALANCE
Level	No trend	-0.581	-2.184	-1.336	0.171	-2.035	-1.431	6.462	-0.460
	Trend	-1.535	-3.083	-3.819	-0.955	-2.662	-1.262	4.219	-1.696
1st difference	No trend	-3.956***	-4.767***	-6.096***	-4.509***	-3.205***	-5.156***	-0.3234	-6.373***
	Trend	-4.000***	-4.693***	-5.908***	-4.753***	-	-5.239***	-2.358	-3.830**
2nd difference	No trend	-	-	-	-	-	-	-8.258***	-
	Trend	-	-	-	-	-	-	-8.626***	-

Table 2. Conclusion ADF test

	Series	LOGDIFF_PROD	LOGGC_GDP	LOGOPEN	LOGRER	LOGTOT	INV	NFA
Level	No trend	Unit root	Unit root	Unit root	Unit root	Unit root	Unit root	Unit root
	Trend	Unit root	Unit root	Unit root	Unit root	Unit root	Unit root	Unit root
1st difference	No trend	Stationary	Stationary	Stationary	Stationary	Stationary	Stationary	Unit root
	Trend	Stationary	Stationary	Stationary	Stationary	Stationary	Stationary	Unit root
2nd difference	No trend	-	-	-	-	-		Stationary
	Trend	-	-	-	-	-		Stationary

Table 3. Stationarity tests (Philip Perron, PP): 1980-2013

	Series	LOGPROD	LOG GC_GDP	LOGOPEN	LOGRER	LOGTOT	INV	NFA	TRADE BALANCE
Level	No trend	-0.551	-2.290	-1.068	-0.055	-1.671	-1.747	4.419	-0.472
	Trend	-1.595	-2.345	-3.891**	-1.030	-2.586	-1.598	3.022	-1.659
1st difference	No trend	-4.022***	-5.138***	-7.834***	-4.465***	-6.198***	-5.176***	-1.083	-6.335***
	Trend	-4.082**	-4.982***	-7.696***	-4.852***	-6.166***	-5.251***	-2.200	-6.733***
2nd difference	No trend	-	-	-	-	-	-	-8.257***	-
	Trend	-	-	-	-	-	-	-10.397***	-

Table 4. Conclusion Philip-Perron test

	Series	LOGDIFF_PROD	LOGGC_GDP	LOGOPEN	LOGRER	LOGTOT	NFA
Level	No trend	Unit root	Unit root	Unit root	Unit root	Unit root	Unit root
	Trend	Unit root	Unit root	Unit root	Unit root	Unit root	Unit root
1st difference	No trend	Stationary	Stationary	Stationary	Unit root	Stationary	Unit root
	Trend	Stationary	Stationary	Stationary	Unit root	Stationary	Unit root
2nd difference	No trend	-	-	-	Stationary	-	Stationary
	Trend	-	-	-	Stationary	-	Stationary

ANNEX III. ESTIMATING THE EQUILIBRIUM RER WITH MONTHLY DATA

Table 1, Annex III. Determinants of ERER (monthly data): DOLS

Variable	B1	B2	B3
C	4.057742***	5.169584***	4.405097**
	(0.201107)	(0.953598)	(1.620099)
NFA100	-0.005081	-0.036313	-0.068072
	(0.049229)	(0.050403)	(0.057713)
LOGRELATIVE_CREDIT	0.216422***	0.091572**	0.090169**
	(0.043395)	(0.040966)	(0.043233)
LOGTOBACCO price		-0.271217	-0.115913
		(0.193035)	(0.337751)
LOGCOTTON price		0.151523***	0.159722***
		(0.032803)	(0.037021)
Seasonal dummies	NO	NO	YES
Number lag/lead short run dynamics	1	1	1
Adjusted R-squared	0.683230	0.801658	0.790838
F-statistic	22.20917	18.03328	9.579919
Prob(F-statistic)	0.000000	0.000000	0.000000

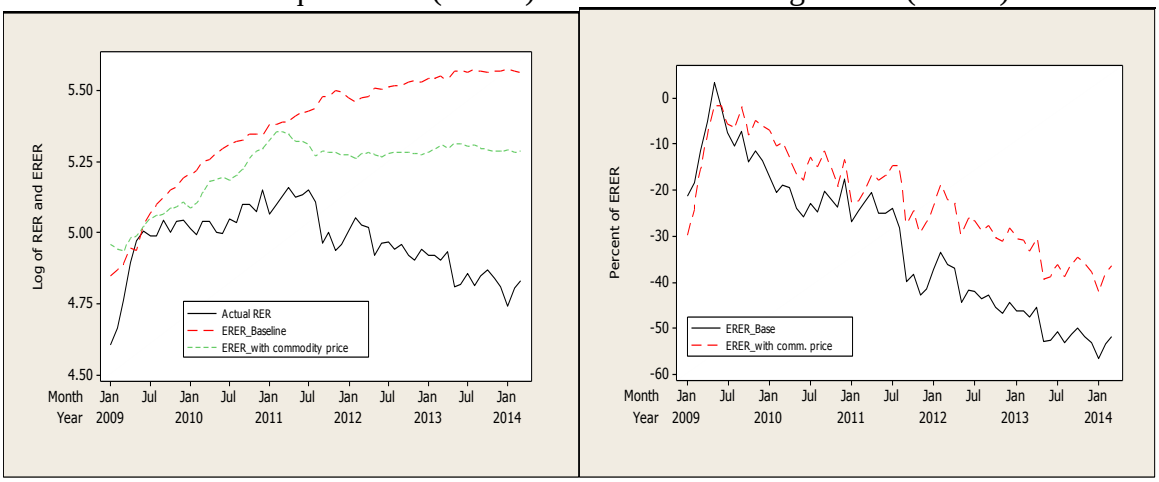
Table 2, Annex III. Determinants of ERER (monthly data): LAD

Variable	B1	B2	B3
C	4.020831***	4.551734**	3.717184*
	(0.318295)	(1.702828)	(2.114121)
NFA100	-0.018193	-0.031893	-0.107188
	(0.078026)	(0.106421)	(0.104726)
LOGRELATIVE_CREDIT	0.221207***	0.108168*	0.101636
	(0.066149)	(0.064726)	(0.061815)
LOGTOBACCO price		-0.141998	0.027457
		(0.356221)	(0.440625)
LOGCOTTON price		0.138598**	0.149759**
		(0.058529)	(0.058148)
Seasonal dummies	NO	NO	YES
Number lag/lead short run dynamics	1	1	1
Adjusted Pseudo R-squared	0.431899	0.521793	0.500662
Sparsity	0.162093	0.119459	0.097756
Prob(Quasi-LR stat)	0.000000	0.000000	0.000000

Source: Authors' calculations.

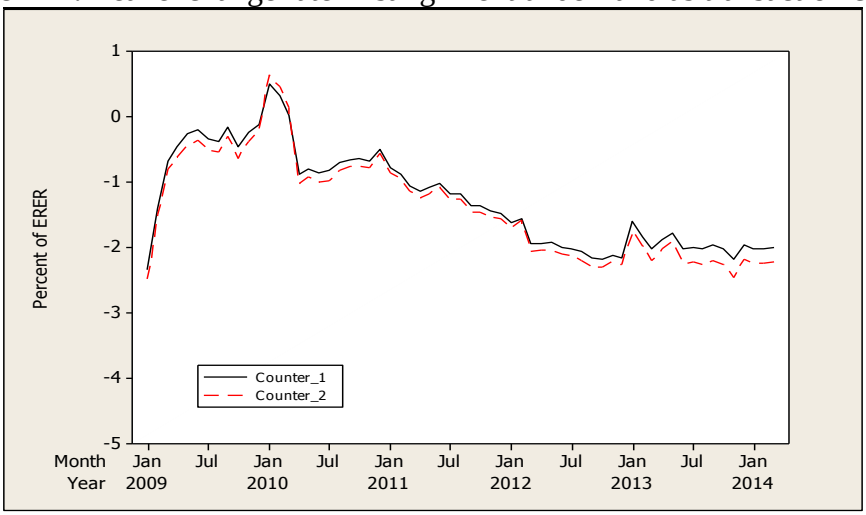
Figure 1, Annex III. Zimbabwe: Real Exchange Rate Misalignment, Jan 2009 – March 2014

1a. Actual RER and Equilibrium (DOLS) **1b.** RER Misalignments (DOLS)



Source: Authors' Calculations based on the data of the Reserve Bank of Zimbabwe.

Figure 2, Annex III. Real exchange rate misalignment under rand as transaction currency



Source: Authors' calculations based on the data of the Reserve Bank of Zimbabwe.

ANNEX IV. MISALIGNMENT AND GROWTH

Table 1, AIV. Empirical evidence (OLS) on growth impacts of undervaluation in Zimbabwe
Dependent variable: Real GDP growth in Zimbabwe

	Baseline model (Eq. 5a) – (1)	**(1) With inv. Ratio – (2)**	**(2) With NFL (3)**	**(3) With openness –(4)**
Initial income of ZWE (log)	0.028641	-0.498271**	-0.083512	0.008008
	(0.135551)	(0.216205)	(0.122029)	(0.130769)
Global real GDP growth	-0.153574	0.003278	0.563468	0.227089
	(0.609319)	(0.550886)	(0.458317)	(0.643961)
Multicurrency regime introduced in 2008 (values 1 or 0)	**0.082325****	**-0.070245**	**0.146693*****	**0.102294****
	(0.039283)	**(0.058764)**	**(0.039246)**	**(0.043118)**
Undervaluation (log)	**0.014051*****	**0.007701*****	**0.014561*****	**0.013172*****
	(0.001554)	**(0.001508)**	**(0.000976)**	**(0.001409)**
Investment ratio (log)		**0.158882*****		
		(0.047664)		
Net foreign liabilities (log)			**-0.139006****	
			(0.051367)	
Openness ratio (log)				-0.124497
				(0.102618)
Constant	-0.063830	1.228889**	0.309634	0.201354
	(0.389891)	(0.567486)	(0.351482)	(0.441990)
Adjusted R-squared	0.355830	0.538460	0.497315	0.367709
F-statistic	5.419084	8.466607	7.331626	4.721924
Prob(F-statistic)	0.002322	0.000064	0.000188	0.003156

Source: Authors' estimates. **Note:** Figures in brackets are standards deviations. (*), (**), (***) indicate the degree of statistical significance at 10%, 5% and 1% respectively.

The empirical equation for estimating the relationship between undervaluation and growth in Zimbabwe is a modified version of Rodrik (2008) and is specified in equation (5a). In Table 1b of this Annex, we added land reform of 2001 as one of the independent variables, as a robustness check. Coefficients on undervaluation are positive and statistically significant in all specifications of the model. However, and as discussed in the text, the positive and statistically significant coefficient on undervaluation (where negative undervaluation is overvaluation) needs to be interpreted with caution and should not lead to concluding that undervaluation would encourage growth in Zimbabwe. Dividing the misalignment variable into over- and under-valuation reveals that only coefficient associated with overvaluation is both positive and statistically significant (i.e., reducing overvaluation would stimulate growth).

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