

IS THE EXCHANGE RATE A SHOCK ABSORBER OR A SOURCE OF SHOCKS? EVIDENCE FROM SOUTH AFRICA

Trust R. Mpofu

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Is the Exchange Rate a Shock Absorber or a Source of Shocks? Evidence from South Africa

By

Trust R. Mpofu

School of Economics, Faculty of Commerce, University of Cape Town, Private Bag, Rondebosch, 7701, South Africa. Email: trust.mpofu@uct.ac.za

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Abstract

This paper investigates empirically whether the exchange rate in South Africa acted as a shock absorber or a source of shocks over the period 2000Q2-2019Q4 using the data sourced from the IMF's IFS and FRED. Finding the answer to this question is important because South Africa's exchange rate is more volatile relative to peers and such exchange rate fluctuations might be good or bad for the economy. The period of the study is to test the shock-absorbing properties of the flexible exchange rate regime following mixed empirical evidence. The study employs a Bayesian structural VAR using sign restrictions to identify supply, demand, and monetary shocks for a three-variable VAR, and supply, demand, monetary policy, and exchange rate shocks for a four-variable VAR. The results show that demand shocks explain most of the variance in the real exchange rate, while other shocks play a small role, which suggests that the exchange rate acted as a shock absorber. The results also show that demand shocks explain most of the variability in the prices. These results suggest that policymakers should monitor and stabilise fluctuations emanating from the demand side given the SARB's mandate of price stability.

Keywords: Exchange rates, Structural VAR, Shock absorber, Source of Shock, South Africa

JEL Classification: E42, F31, F41

1 Introduction

The question of whether the exchange rate is a shock absorber or a source of shocks is important because exchange rate fluctuations affect changes in other macroeconomic variables such as output, inflation, and current accounts, to mention a few. In short, exchange rate fluctuations affect changes in economic activity which can be in a positive way or a negative way. Finding out whether the fluctuation in the exchange rate is stabilising or destabilising is an empirical exercise as it depends on what is driving the exchange rate fluctuations which might differ among countries. The exchange rate regime followed by a country matters too as explained in the next paragraph focusing on the South African case.

The South African Reserve Bank (SARB) adopted an inflation targeting framework in February 2000, which changed the conduct of monetary policy, leading to transparency, much-refined communication and monetary credibility. By this time, the South African exchange rate system was already classified as a free-floating regime according to the International Monetary Fund's report on exchange rate arrangements and restrictions (IMF, 2009). With this information, this study examines whether the South African exchange rate acted as a shock absorber or a source of shocks to the economy. This is the objective of this study based on the notion that basic textbook macroeconomics shows that under an independent monetary policy and a floating exchange rate regime, the exchange rate will act as a shock absorber in the face of asymmetric shocks. Shocks that are commonly asymmetric require opposite responses of foreign and domestic monetary policy, while symmetric shocks should be accompanied by similar monetary policy. The intuition behind this is that it holds for the flexible exchange rate only (i.e., the impact of shocks is contained by automatic adjustment in the exchange rate) given that, by definition, the fixed exchange rate cannot absorb any shocks. Following the literature (see e.g., Clarida and Gali, 1994; Artis and Ehrmann, 2006; Lahiri et al. 2006; Farrant and Peersman, 2006; Dąbrowski and Wroblewska, 2016; De and Sun, 2020; Beckmann et al. 2024; *inter alia*), this study treats the exchange rate as a shock absorber if its variability is mostly driven by real shocks (i.e. supply or demand shocks).

However, a different situation might arise if the foreign exchange market fails to offer any stabilisation to the economy. For example, the exchange rate is an asset price and responds to asset market conditions. As such, exchange rate shocks could arise because of a time-varying risk premium in the exchange rate or movements in the exchange rate that are not explained by fundamentals. In such situations, the exchange rate may be an independent source of shocks. Buiter (2000) argues that market-determined exchange rates are a source of shocks and instability under a high degree of international financial integration. In addition, the exchange rate is also a source of shocks in the presence of capital controls, speculative attacks, and managed float exchange rate regimes. As for South Africa, although the official classification is that it has a free float regime, in practice, it has a managed float regime given that capital controls do exist, which might prohibit the exchange rate from absorbing shocks. Therefore, this study treats the exchange rate as a source of shocks when variability is mostly driven by nominal shocks (I use nominal shocks interchangeably with monetary shocks throughout the paper) for a three-variable VAR or the exchange rate shocks for a four-variable VAR. Two different models are estimated to avoid lumping together some shocks, especially in the three-variable VAR model, which might lead to imperfect identification of shocks.

Existing empirical work on whether the exchange rate is a shock absorber or a source of shocks focuses on developed countries, while there is limited work on the issue for transition and developing countries. Moreover, empirical evidence on the shock-absorbing property of the flexible exchange rate regime is mixed. Borghijs and Kuijs (2004) find that the exchange rates were a source of shocks in five emerging market economies (the Czech Republic, Hungary, Poland, the Slovak Republic, and Slovenia) over the period 1993Q1-2003Q2. Shevchuk (2014) confirms the results by Borghijs and Kuijs (2004) over the period 1999-2013. On the other hand, Dąbrowski and Wroblewska (2016) find that in Poland over the period 1998-2013, the exchange rate had a shock-absorbing effect, which is like the results by Stazka-Gawrysiak (2009) for Poland. Other studies (see e.g., Alexius and Post, 2008; Farrant and Peersman, 2006; Artis and Ehrmann, 2006; Bjornland, 2004; Clarida and Gali, 1994) analyse several countries at once and find mixed results, that is, some countries have their exchange rates as shock absorbers while others as the source of shocks. Some of these countries share some characteristics with the South African economy in terms of being small open emerging market economies (e.g. Czech Republic, Hungary and Poland).

To the best of my knowledge, there are two studies similar to this study that have been done in South Africa (i.e. Balcilar et al., 2016 and Soobyah and Steenkamp, 2019). Balcilar et al. (2016) use a time-varying parameter VAR over the period 1981-2013. However, this study does not analyse the forecast error variance decompositions for all the variables, which is vital to analyse whether the exchange rate is a shock absorber or a source of shocks. Soobyah and Steenkamp (2019) use a factor-augmented vector autoregression (FAVAR) model over the period 1992Q2-2017Q1. Similar to Balcilar et al (2016), Soobyah and Steenkamp (2019) do not show the forecast error variance decompositions for other variables and shocks. They claim that the rand is a shock absorber because the exchange rate forecast errors are mainly explained by shocks to the exchange rate itself. This contradicts the definition of the shock absorber as explained in the literature. Hence, this study contributes to the literature in developing countries by examining the insulation properties of the South African rand floating exchange rate to the South African economy. That is, whether the South African rand serves the South African economy as a shock absorber or a source of shocks.

Most studies in South Africa on exchange rate issues focus on the causes of either the exchange rate level¹ or exchange rate volatility (see e.g., Arezki, Dumitrescu, Freytag and Quintyn, 2014; Mpofu, 2016; Mavee, Perrelli and Schimmelpfennig, 2016; Mpofu and Peters, 2017; Mpofu, 2020). Some of the methods used by these studies, for example, Event studies, are unable to show the shocks behind output vs exchange rate variations, and the dynamics of exchange rate movements while it is possible to show this using a structural VAR as done in this study.

Furthermore, some researchers like Saayman (2007) state that the SARB and the government were under pressure between 2002-2006 to intervene in the foreign exchange market and devalue the currency to stimulate exports and job creation. Others like Balcilar et al. (2016) argue that the issue of whether the South African government should or could intervene remains an open debate. At the same time, studies like Alpanda, Kotzé and Woglom (2010), Peters (2016), and Ortiz and Sturzenegger (2007) indicate that the SARB does not target the

¹ See studies like Aron, Elbadawi and Kahn (1997), MacDonald and Ricci (2004), Frankel (2007), Saayman (2007), and Faulkner and Makrelov (2008).

exchange rate, especially after adopting inflation targeting in February 2000 using a structural general equilibrium model or a dynamic stochastic general equilibrium model with an exchange rate-augmented Taylor rule specification. Besides, the SARB claims they do not react directly to movements in the exchange rate but react to inflation with a lag. However, the exchange rate plays an important role in economic development in most developing countries. This might be used to stimulate economic growth. Thus, this study assists in ascertaining whether there is a need for the SARB to care about rand movements by finding out if the rand is a source of shocks or a shock absorber.

Such a study is important for a country like South Africa with one of the highest unemployment rates in the world and a currency that is volatile relative to its peers. Hence, knowing the shocks driving output and the exchange rate, and whether output was insulated against these shocks, will likely assist policymakers in enhancing output, which is likely to increase employment.

I employ a Bayesian structural VAR using sign restrictions to identify the shocks. Using the forecast error variance decompositions of the real exchange rate, the study finds that demand shocks explain most of the variance in the real exchange rate while other shocks play a small role. These results suggest that the exchange rate acted as a shock absorber in South Africa.

The rest of the paper is organized as follows: Section 2 presents a review of the literature. Section 3 defines the data and explains the model specification and estimation techniques. Section 4 presents the results, and Section 5 concludes.

2 Literature review

The empirical literature that analyses the role of exchange rate as a shock absorber or a source of shocks is based on theoretical framework that link the open economy IS equation, price-setting equation, LM equation and the interest rate parity condition with sticky prices as discussed by Clarida and Gali (1994) following the stochastic two-country open macro models of Obstfeld, Cooper and Krugman (1985) and Dornbusch (1976). In the spirit of these models, supply, demand, and nominal shocks affect the economy, and the exchange rate moves in response to these shocks to restore the equilibrium. Exchange rates deviate from their fundamentals to a large extent and persistently too. As such, Artis and Ehrmann (2006) state that such deviations of the exchange rate from their equilibrium values might lead to real adjustment in the economy and potentially cause destabilising effects. Using Blanchard and Quah's (1989) identification, Clarida and Gali (1994) find that demand shocks explain most of the variance in the real exchange rate and conclude that the exchange rate acts as a shock absorber. Therefore, whether the exchange rate is a shock absorber or a source of shocks depends on whether real shocks (supply or demand shocks) or nominal shocks explain most of the variability in the exchange rate.

Dąbrowski and Wroblewska (2016) use relative variables for Poland and Slovakia over the period 1998Q1-2013Q4 and find that real shocks explain more of the variance in the real exchange rate in Poland (a country that adopted inflation targeting in 1998) than in Slovakia and conclude that the exchange rate is a shock absorber in Poland. Their Polish results are like the study by Stazka-Gawrysiak (2009). Artis and Ehrmann (2006) do not use relative variables for Canada (vs the US), the United Kingdom (UK), Sweden, and Denmark (all three vs the euro) over the period 1974-1998 because this formulation (the use of relative variables) only identifies asymmetric shocks. They find that shocks are symmetric for Canada, Sweden, and

Denmark, which implies that the exchange rate has no stabilisation effect in these countries. Their results also show that shocks are asymmetric in the UK, which would give the exchange rate a potential role in absorbing the shocks, but the estimates of the exchange rate response to supply and demand shocks are insignificant. This implies that the exchange rate did not provide shock absorption in the UK. The exchange rate can act as a shock absorber only if an economy is hit by an asymmetric shock with respect to its trading partner. This suggests that whether the exchange rate is an important tool to stabilise an economy can only be judged when the knowledge of the frequency and the magnitude of shocks that necessitate exchange rate fluctuation is known (Artis and Ehrmann, 2006). Following Artis and Ehrmann's (2006) method, Yilmaz (2012) and Drummond et al. (2015) find that the exchange rate is a shock absorber in Turkey and the East African Community countries,² respectively. However, Artis and Ehrmann (2006) analyse both fixed and flexible exchange rate regimes, which might bias the results against stabilisation effects given that devaluations of fixed exchange rates are seldom direct responses to specific shocks.

Alexius and Post (2008) focus on the periods of floating exchange rates and inflation targeting for Sweden, Canada, Australia, New Zealand, and the UK, and find the shock-absorbing effects in Sweden and Canada only because supply and demand shocks explain most variability in the exchange rate. Bjornland (2004) finds that output is driven by labour supply and nominal shocks, while the real exchange rate is driven by real demand shocks for Norway over the period 1972Q1-1994Q4. Therefore, they assert that they find ambiguous results as to whether the exchange rate is a shock-absorber or a source of shocks. Finding that output and the exchange rate respond to different shocks does not always imply that the exchange rate is destabilising. Some researchers, for example, Alexius and Post (2008) and Artis and Ehrmann (2006), find that the exchange rate reacts mainly to its own shocks, which suggests that the exchange rate is a source of shocks. However, they also find that the disturbance does not transmit largely to the real economy (i.e., explain most variability in output and prices).

On the other hand, Farrant and Peersman (2006) use relative variables for the UK, Euro area, Japan and Canada (vs the US) over the period 1974Q1-2002Q4. First, they run a triangular long-run zero identification strategy following Clarida and Gali (1994) but with extended data series and find evidence of the exchange rate as a shock absorber (demand shocks explaining most variability in the real exchange rate). However, using the same three-variable VAR but with sign restrictions as well as extending the model to a four-variable VAR (making a distinction between monetary policy shocks and pure exchange rate shocks) and using sign restrictions too, they find evidence of the exchange rate as a source of shocks given an important role of nominal shocks in explaining real exchange rate fluctuations. Borghijs and Kuijs (2004) find that nominal shocks had a significant contribution to the variability of the exchange rate and conclude that the exchange rate acted as a source of shocks in five Central European countries, namely the Czech Republic, Hungary, Poland, Slovak Republic, and Slovenia over 1993-2003. Shevchuk (2014) confirms the results by Borghijs and Kuijs (2004) using the data from 1999-2013. However, the results by Shevchuk (2014) should be interpreted with caution given that the study uses a 2-variable VAR (output and exchange rate) and lumps the demand, financial, and monetary shocks into one. Such studies motivate the need to

² East African Community countries include Burundi, Kenya, Rwanda, Tanzania, and Uganda

investigate the role of the exchange rate as a source of shock or as a shock absorber using a framework with more variables and find out if the same conclusion is reached.

Reviewing empirical literature, it seems that most of the studies that analyse the role of the exchange rate as a shock absorber or a source of shocks focus on developed countries, while there is limited work focusing on transition and developing countries. As such, this paper complements the analysis of studies that investigate whether the exchange rate is a shock absorber or a source of shocks by focusing on South Africa, a developing country which has one of the highest unemployment rates in the world and a currency that is more volatile relative to its peers. The findings from empirical literature also indicate mixed results about whether the exchange rate is a shock absorber or source of shocks when an economy has a flexible exchange rate regime. Such findings motivate the need to do more empirical analysis. The next section explains the data and the methodology employed.

3 Data and methodology

This paper uses quarterly data from 2000Q2 to 2019Q4 obtained from the International Monetary Fund's International Financial Statistics and FRED. The period is chosen because it covers the period when South Africa has had an independent monetary policy and a floating exchange rate system. All variables except interest rates are in logarithms and represent a difference between home and foreign levels following Clarida and Gali's (1994) model³. The home country is South Africa while the foreign country is the United States. Two reasons motivate the use of the United States as the foreign country. First, South Africa has significant trade relations with the United States. Second, the United States dollar is the most liquid currency in the world⁴. This implies that the United States dollar is mostly used by South Africans as they trade with their most trading partners. In addition, Gopinath (2017) shows that the United States dollar drives global trade prices and volumes.

The variables are defined as follows: Output is measured as the difference between South Africa's real GDP and the United States real GDP. Both RGDP's are in US dollars using 2010 prices. Prices are measured as the difference between South Africa's consumer price index and the United States' consumer price index. Real interest rate differential is calculated as a difference between South Africa's real interest rate and the United States' real interest rate. Real interest rate for South Africa is the difference between the repurchase rate (repo rate) and the actual inflation rate, while for the United States, it is the difference between the federal funds rate and actual inflation. The last variable is the real exchange rate, which is calculated as follows:

$$RER = E * \frac{P^*}{P} \quad (1)$$

Where RER refers to the real exchange rate, E refers to the nominal exchange rate using domestic currency per foreign currency. Using this definition means that a rise in the nominal

³ This formulation identifies only asymmetric shocks. As mentioned earlier, the exchange rate has a potential role to absorb shocks only when the economy faces asymmetric shocks.

⁴ See page 10 of Bank of International Settlements (2013), "Triennial Central Bank Survey. Foreign Exchange Turnover in April 2013: preliminary global results" Monetary and Economic Department. Cited at <http://www.bis.org/publ/rpfx13fx.pdf>

exchange rate represents a depreciation of the home currency. P^* refers to the foreign producer price index and P refers to the domestic producer price index. With these definitions, Table 1 below shows the summary statistics of all the variables.

Table 1: Descriptive statistics

Variable	Obs	Mean	Std.Dev	Min	Max
RER	79	2.122	0.181	1.777	2.519
OUTPUT	79	-7.358	0.288	-7.873	-6.846
PRICES	79	-0.718	0.184	-0.995	-0.407
RIR	79	2.962	2.366	-1.954	11.337

Notes: RER refers to real exchange rate. RIR refers to real interest rate. All variables except interest rate are in logarithms and represent a difference between home and foreign levels. South Africa = home country and the USA = foreign country (see section 3 for detailed definitions). Obs = observation. Std.Dev = standard deviation. Min = minimum. Max = maximum.

In analysing whether the exchange rate is a shock absorber or a source of shocks in South Africa, I estimate a structural VAR identified using sign restrictions. Generally, the literature suggests three different identification strategies that have been applied to investigate the role of the exchange rate as a shock absorber or as a source of shocks. These identification strategies include: the long-run zero identification restriction (see e.g., Clarida and Gali, 1994; Bjornland, 2004; Borghijs and Kuijs, 2004; Shevchuk, 2014), the short-run zero identification restriction (see e.g., Artis and Ehrmann, 2000; Artis and Ehrmann, 2006; Yilmaz, 2012), and the sign identification restriction (see e.g., Farrant and Peersman, 2006; Peersman, 2011; De and Sun, 2020). Other studies use a combination of these identification restrictions. For example, Alexius and Post (2008) use the long-run and short-run zero identification restriction, while Dąbrowski and Wroblewska (2016) use the long-run zero and sign identification restriction.

This study uses the sign identification restriction, which means that different shocks are identified according to the direction of their impact on the variables in the system. I use this identification restriction because studies like Faust and Leeper (1997) show that substantial distortions in the estimations are possible due to small sample biases and measurement errors when using long-run zero restrictions. Farrant and Peersman (2006) argue that using zero restrictions can be misleading because some equilibrium growth models, for example, overlapping generations models, allow for permanent real effects of nominal shocks because they can affect the steady-state level of capital, yet long-run zero restrictions state that relative nominal shocks have no permanent effect on relative output and the real exchange rate (Borghijs and Kuijs, 2004). In addition, Farrant and Peersman (2006) argue that short-run zero restrictions are stringent and could be misleading when attempting to conclude the effects of nominal shocks, following Peersman (2005), who compares various identification restrictions and finds that several impulse responses based on zero restrictions are located in the tails of the distributions of all possible impulse responses. Ncube and Ndou (2011) state that different ordering of the variables does not change the results of the study being analysed when using sign restrictions because this identification method gives results independent of the chosen decomposition of the variance-covariance matrix.

Following the arguments in the literature review earlier, I estimate a three-variable and a four-variable VAR model. The structural VAR takes the form:

$$X_t = B(L)X_t + \varepsilon_t \quad (2)$$

Where X_t is a vector of endogenous variables, $B(L)$ is a matrix of lag polynomials and ε_t is a vector of structural shocks to be identified. The VAR models are estimated in first differences to avoid spurious results given the use of time series analysis. Table 2 shows the results applying the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests to find the order of integration of the variables. These results indicate that real exchange rate, output, and prices are integrated of order one [I (1)] while real interest rate is stationary in levels [I (0)] using the ADF test. Using the PP test, all the variables are I (1).

Table 2: Unit root tests

Panel A: Levels				
Variables		ADF		PP
	constant	constant&trend	constant	constant&trend
RER	-1.554	-1.977	-1.828	-2.324
OUTPUT	-1.439	-2.812	-1.519	-2.581
PRICES	-0.146	-2.262	0.027	-1.797
RIR	-3.688***	-4.435***	-2.504	2.770
Panel B: first diff				
RER	-6.960***		-6.989***	
OUTPUT	-6.592***		-6.583***	
PRICES	-3.215***		-3.173***	
RIR			-5.393***	

Notes: RER refers to real exchange rate. RIR refers to real interest rate. All variables except interest rate are in logarithms and represent a difference between home and foreign levels. South Africa = home country and the USA = foreign country (see section 3 for detailed definitions). first diff stands for first difference. ADF denotes Augmented Dickey-Fuller unit root test. PP denotes Phillips-Perron unit root test. The null hypothesis: Series has a unit root (*Mackinnon 1996 one-sided p-values). *** denotes rejection of null hypothesis at 1% significance level.

For a three-variable VAR model, $\Delta x_t = [\Delta y_t, \Delta p_t, \Delta q_t]$ where y_t is output, p_t is prices and q_t is real exchange rate, with three structural disturbances, $\varepsilon_t = [\varepsilon_t^s, \varepsilon_t^d, \varepsilon_t^m]$ where ε_t^s is supply shock, ε_t^d is demand shock, ε_t^m is monetary shock. For a four-variable VAR, $\Delta x_t = [\Delta y_t, \Delta p_t, \Delta r_t, \Delta q_t]$ where y_t is output, p_t is prices, r_t is real interest rate differential, and q_t is real exchange rate, with four structural disturbances, $\varepsilon_t = [\varepsilon_t^s, \varepsilon_t^d, \varepsilon_t^m, \varepsilon_t^q]$ where ε_t^s and ε_t^d are as before, ε_t^m is a monetary policy shock and ε_t^q is an exchange rate shock.

The restrictions I impose (which are based on a typical aggregate supply and aggregate demand diagram) are as follows. A positive supply shock should lead to an increase in relative output, a fall in relative prices, and the reaction of the real interest rate differential and the real exchange rate will be determined by the data. A positive demand shock will lead to an increase in relative output, prices, and the real interest rate differential, and an appreciation of the real exchange rate. A monetary policy shock is identified as a shock that has the opposite sign on the real interest rate differential with respect to relative output, relative prices, and the real exchange rate. This implies that a contractionary monetary policy shock (measured as a rise in the interest rate) does not cause an increase in output and prices. The positive exchange rate shock (depreciation of the exchange rate) increases relative output, relative prices, and the real interest rate differential. Table 3 shows the summary of these restrictions. The restrictions for a three-variable VAR are made by omitting a row with the real interest rate differential and a column with the exchange rate shock.

Table 3: Sign identifying restrictions

Variable\Shock	Supply	Demand	Monetary	Exchange rate
OUTPUT	+	+	+	+
PRICES	-	+	+	+
RIR	?	+	-	+
RER	?	-	+	+

Notes: ? means an unrestricted element

This study uses a Bayesian approach for estimation and inference following studies like Uhlig (2005,1999) and Farrant and Peersman (2006). The prior and posterior I use belong to the Normal-Wishart family. When using sign restrictions, each draw from the posterior gives an infinite number of admissible decompositions, as argued by Peersman (2005). As such, to draw the “correct candidate” from the posterior, I take a joint draw from the posterior for the usual unrestricted Normal-Wishart posterior for the VAR parameters obtained from a uniform distribution. I then construct impulse response functions. If all the imposed conditions of the impulse responses of the three and four different shocks are satisfied, I keep the draw. The draw that does not meet these conditions receives zero prior weight and is rejected. Based on the 1000 draws kept from the Monte Carlo integration, I calculate statistics and report the median responses as well as the 84th and 16th percentile error bands.

4 Results

I start the empirical analysis by finding the appropriate number of lags to use in the estimation of each of the VAR models. Employing the Schwartz Information criterion, Table 4 indicates that the appropriate lag length for both the three-variable and four-variable VAR models is one. To find whether the exchange rate is a shock absorber or a source of shocks, I decompose the variance in the real exchange rate from all the shocks. The forecast error variance decompositions enable the study of how much fluctuation in the real exchange rate can be attributed to each structural shock. If the supply or demand shocks contribute to a large portion of the total variation in the real exchange rate, I conclude that the exchange rate acts as a shock absorber and is stabilising. However, if most of the shocks originate from monetary shocks or nominal shocks for the three-variable VAR and from exchange rate shocks for the four-variable VAR, then the exchange rate acts as a source of shocks. The findings for the forecast error variance decompositions are shown in Table 5, at the one-quarter, one-year, and five-year horizons.

Table 4: VAR Lag Order Selection Criteria

3 VAR model			
Lag	AIC	SBC/BIC	HQ
0	11.02	11.12	11.06
1	10.45*	10.82*	10.58*
2	10.54	11.16	10.74
3	10.62	11.44	10.85
4	10.87	11.86	11.09
4 VAR model			
0	14.03	14.16	14.08
1	13.18	13.78*	13.39
2	13.40	14.42	13.70
3	13.43	14.76	13.73
4	13.03*	14.57	13.22*

Notes: * indicates lag order selected by the criterion. AIC = Akaike information criterion. SBC/BIC = Schwarz information criterion. HQ = Hannan-Quinn information criterion.

Table 5: Forecast error variance decomposition, 3-variable and 4-variable VAR model using RERPPI

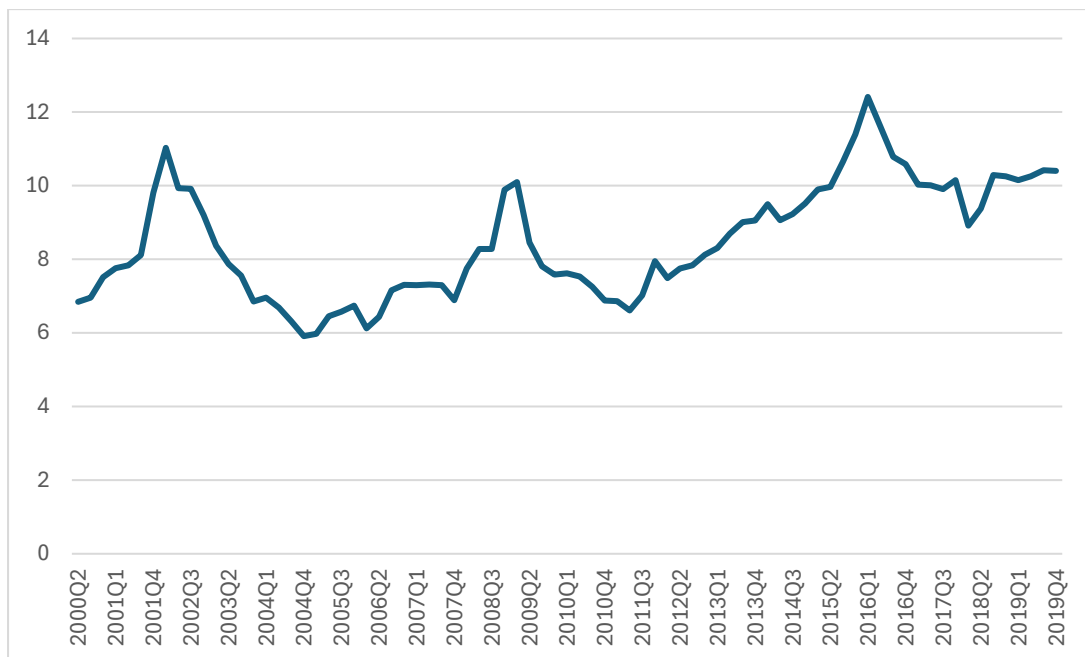
Variable	Model	Median	Supply		Median	Demand		Median	Monetary		Exchange Rate		
			16th	84th		16th	84th		16th	84th	Median	16th	84th
OUTPUT													
1q	3VAR	0.29	0.06	0.66	0.31	0.10	0.71	0.22	0.04	0.58			
	4VAR	0.40	0.08	0.67	0.26	0.09	0.54	0.12	0.02	0.38	0.05	0.01	0.23
1 year	3VAR	0.34	0.08	0.66	0.29	0.08	0.66	0.21	0.04	0.56			
	4VAR	0.42	0.10	0.70	0.20	0.05	0.46	0.15	0.03	0.44	0.05	0.01	0.21
5 years	3VAR	0.37	0.09	0.71	0.27	0.06	0.64	0.20	0.03	0.56			
	4VAR	0.44	0.08	0.76	0.15	0.02	0.44	0.17	0.03	0.50	0.05	0.01	0.21
PRICES													
1 q	3VAR	0.28	0.08	0.66	0.27	0.05	0.66	0.26	0.04	0.65			
	4VAR	0.20	0.05	0.58	0.32	0.07	0.54	0.30	0.05	0.55	0.03	0.00	0.16
1 year	3VAR	0.19	0.03	0.57	0.40	0.12	0.76	0.24	0.04	0.60			
	4VAR	0.13	0.02	0.52	0.38	0.12	0.63	0.27	0.06	0.53	0.03	0.01	0.16
5 years	3VAR	0.16	0.02	0.53	0.45	0.15	0.80	0.22	0.03	0.58			
	4VAR	0.11	0.01	0.58	0.41	0.13	0.67	0.25	0.05	0.53	0.04	0.00	0.17
RIR													
1 q													
	4VAR	0.04	0.00	0.26	0.03	0.00	0.10	0.65	0.40	0.87	0.15	0.04	0.39
1 year													
	4VAR	0.10	0.03	0.26	0.05	0.02	0.10	0.55	0.34	0.75	0.21	0.08	0.43
5 years													
	4VAR	0.11	0.04	0.26	0.06	0.02	0.12	0.53	0.33	0.73	0.22	0.08	0.42
RER													
1 q	3VAR	0.06	0.00	0.29	0.74	0.49	0.93	0.07	0.00	0.33			
	4VAR	0.04	0.00	0.25	0.55	0.37	0.76	0.00	0.00	0.03	0.26	0.07	0.51
1 year	3VAR	0.08	0.02	0.32	0.65	0.36	0.89	0.15	0.02	0.44			
	4VAR	0.06	0.01	0.23	0.53	0.30	0.77	0.05	0.01	0.13	0.24	0.06	0.49
5 years	3VAR	0.09	0.01	0.37	0.52	0.22	0.81	0.26	0.06	0.59			
	4VAR	0.06	0.01	0.24	0.48	0.19	0.76	0.11	0.03	0.25	0.21	0.04	0.49

Notes: All the variables are as previously defined (see note in table 2). q stands for quarter. Median, 16th and 84th are percentiles based on Monte Carlo integration.

Using the three-variable VAR model, the results show that relative demand shocks play a dominant role in the short-run, medium-run, and long-run. To be specific, relative demand shocks significantly explain 74% of the variance of the real exchange rate in the short-run (one-quarter), 65% in the medium-run (one-year), and 52% in the long-run (five years). Relative supply shocks are shown to play a negligible role at 6%, 8%, and 9% in the short-, medium-, and long-run, while monetary shocks contribute 7%, 15%, and 26% in the short-, medium-, and long-run, respectively. On the other hand, output variability is mostly explained by supply shocks, which contribute 29%, 34%, and 37% in the short-, medium-, and long-run, respectively. Demand and monetary shocks also play a role in explaining output variability, especially in the short-run and medium-run, but the contribution of these shocks declines as time passes. For example, demand shocks explain 31% in the short-run and 27% in the long-run, while monetary shocks explain 22% in the short-run and 20% in the long-run. Based on these results, the exchange rate in South Africa acted as a shock absorber. These results are similar to studies like Dabrowski and Wroblewska (2016) that use a different method but analyse an emerging market economy with an inflation targeting regime (the results for Poland). The results differ from studies like Borghijs and Kuijs (2004) and Shevchuk (2014) that also analyse emerging markets. One possible explanation is that their studies analyse a two-variable VAR which lumps some shocks together. Balcilar et al. (2016) do not analyse the forecast error variance decompositions for other variables to determine whether the rand acted as a shock absorber or a source of shocks. Thus, this study improves upon such studies by contributing to the literature on exchange rate issues in South Africa.

The findings that the exchange rate acted as a shock absorber are likely because the government, domestic corporation, and household sectors have relatively limited foreign exchange liabilities. Given this, the negative balance-sheet effects that are usually associated with large exchange rate depreciation (see Figure 1 below) that South Africa has experienced over the years are a limited issue, such that the movements of the rand exchange rate have been an effective absorber of shocks.

Figure 1: Trends of the South African rand per U.S dollar



Note: An increase in the exchange rate means a depreciation.

For relative prices, the results indicate that demand shocks explain most of price variability (27%, 40%, and 45% in the short run, medium-run, and long-run, respectively). Supply shocks explain most price variability in the short-run (28%) and contribute 16% in the long-run. These results are likely due to low productivity in South Africa given low average GDP growth rates. Monetary shocks explain most price variability in the short run (26%), and their contribution decreases as time increases.

Extending the model to a four-variable VAR which now shows the supply, demand, monetary policy, and exchange rate shocks, the results indicate that demand shocks still explain most of the variation in the real exchange rate, with magnitudes of 55%, 53%, and 48% in the short run, medium run, and long run, respectively. Supply shocks and monetary policy shocks play a negligible role in the variation of the real exchange rate. However, the exchange rate shock contributes the second highest, with 26%, 24%, and 21% in the short-, medium-, and long-run, respectively. On the other hand, the reaction of output variability is like the results in the three-variable VAR model, with supply shocks explaining most of the variability. Hence, I reach the same conclusion as in the three-variable VAR that the exchange rate acted as a shock absorber in South Africa over the study period. These results are different from Soobyah and Steenkamp (2019), who also do a study in South Africa. Their study shows that the exchange rate shock explains most of the variability in the exchange rate itself (see their Table 3) and that the exchange rate shock explains little variability in other variables (see their Table 4). However, they do not show other shocks that drive the variability of the exchange rate to tell which causes more variability in the exchange rate to judge whether the exchange rate is a shock absorber or a source of shocks.

The results also show that exchange rate shocks play a negligible role in output variation (5%, 5%, and 4% respectively for the short, medium, and long run), which suggests that the real exchange rate is not a problem in South Africa for the low output that the country has experienced. At the same time, monetary policy shocks play a little role in the variability of the real exchange rate. This result suggests that the South African Reserve Bank (SARB) policy of not influencing the rand has been achieved and, at the same time, has delivered in absorbing shocks.

I still find that variability in prices is mostly explained by demand shocks (32%, 38%, and 41% in the short, medium, and long run, respectively). As expected, monetary policy shocks explain most of the variation in the real interest rate differential. Exchange rate shocks contribute to price variability secondly while supply and demand shocks play a negligible role.

Next, I do some robustness checks on these results. I begin by using a different measure of the real exchange rate. This new measure uses consumer price indices (CPI and CPI*) for both domestic and foreign price indicators. For the three-variable VAR, the results still show that the demand shocks explain most of the variability of the real exchange rate, with magnitudes of 75%, 64%, and 47% in the short, medium, and long run, respectively. Supply and monetary policy play a negligible role. In addition, the results show that output variability is mostly explained by supply shocks and that demand and monetary shocks also play a role. The results for relative prices in Table 6 are similar to the results in Table 5.

Table 6: Forecast error decomposition, 3-variable and 4-variable VAR models using RERCPI

Variable	Model	Median	Supply		Median	Demand		Median	Monetary		Exchange Rate		
			16th	84th		16th	84th		16th	84th	Median	16th	84th
OUTPUT													
1q	3VAR	0.31	0.05	0.64	0.31	0.11	0.67	0.21	0.05	0.58			
	4VAR	0.40	0.07	0.68	0.27	0.10	0.55	0.13	0.02	0.42	0.04	0.01	0.20
1 year	3VAR	0.37	0.09	0.70	0.26	0.09	0.65	0.20	0.04	0.56			
	4VAR	0.43	0.09	0.70	0.20	0.06	0.44	0.16	0.03	0.48	0.04	0.01	0.18
5 years	3VAR	0.39	0.10	0.72	0.25	0.06	0.62	0.19	0.03	0.57			
	4VAR	0.43	0.08	0.76	0.15	0.02	0.43	0.18	0.04	0.54	0.04	0.00	0.16
PRICES													
1 q	3VAR	0.31	0.09	0.64	0.25	0.05	0.60	0.30	0.06	0.65			
	4VAR	0.19	0.05	0.56	0.34	0.09	0.56	0.28	0.05	0.54	0.03	0.00	0.16
1 year	3VAR	0.22	0.04	0.54	0.42	0.16	0.76	0.22	0.04	0.55			
	4VAR	0.12	0.02	0.50	0.44	0.16	0.69	0.23	0.06	0.49	0.03	0.00	0.14
5 years	3VAR	0.19	0.02	0.49	0.50	0.21	0.82	0.19	0.02	0.49			
	4VAR	0.10	0.01	0.46	0.48	0.19	0.75	0.19	0.03	0.46	0.04	0.00	0.16
RIR													
1 q													
	4VAR	0.04	0.00	0.25	0.03	0.00	0.11	0.64	0.39	0.85	0.17	0.05	0.39
1 year													
	4VAR	0.11	0.03	0.26	0.05	0.02	0.10	0.52	0.31	0.72	0.25	0.10	0.46
5 years													
	4VAR	0.11	0.04	0.26	0.07	0.03	0.14	0.49	0.30	0.69	0.25	0.11	0.45
RER													
1 q	3VAR	0.06	0.00	0.25	0.75	0.49	0.93	0.07	0.00	0.28			
	4VAR	0.04	0.00	0.23	0.50	0.34	0.75	0.00	0.00	0.03	0.33	0.10	0.52
1 year	3VAR	0.08	0.02	0.29	0.64	0.35	0.87	0.19	0.03	0.46			
	4VAR	0.07	0.01	0.24	0.50	0.29	0.74	0.08	0.02	0.17	0.26	0.07	0.49
5 years	3VAR	0.10	0.02	0.35	0.47	0.19	0.77	0.32	0.08	0.64			
	4VAR	0.07	0.01	0.25	0.46	0.18	0.73	0.16	0.05	0.31	0.20	0.03	0.47

Notes: All the variables are as previously defined (see note in table 2). q stands for quarter. Median, 16th and 84th are percentiles based on Monte Carlo integration.

Extending the model to a four-variable VAR, the results still show that demand shocks explain most of the variation of the real exchange rate while supply and monetary policy shocks play a small role. The impulse response functions (not shown here given that the forecast error variance decomposition assists in answering whether the exchange rate acted as a shock absorber or not) have the expected signs. Overall, the robustness checks indicate that the exchange rate in South Africa acted as a shock absorber.

5 Conclusion

This paper analyses whether the real exchange rate is a shock absorber or a source of shocks in South Africa. The results show that demand shocks explain most of the variance in the real exchange rate. Supply shocks and monetary policy shocks play a little role in the variation of the real exchange rate, while exchange rate shocks play a small role. On the other hand, supply shocks explain most variability in output, while exchange rate shocks play a small role in output variability.

These findings suggest that the exchange rate acted as a shock absorber. Given that exchange rate shocks play a small role in output variation, suggest that the real exchange rate is not a major problem for South Africa's low output to the extent that the South African Reserve Bank should be intervening in the foreign exchange market to influence the exchange rate with the hope of stimulating economic growth. The results also suggest that policies that focus on the demand side are required to control inflation given that demand shocks explain most of the variance in the relative prices. One limitation of the study is that the use of a structural VAR framework is backward-looking and an imperfect measure for a forward-looking analysis.

References

- Alexius, A. and Post, E. (2008). Exchange rates and asymmetric shocks in small open economies. *Empirical Economics*, 35(3), pp.527-541. <https://doi.org/10.1007/s00181-007-0177-7>
- Alpanda, S., Kotzé, K. and Woglom, G. (2010). Should central banks of small open economies respond to exchange rate fluctuations? the case of South Africa. *Economic Research Southern Africa, Working Paper*, 174.
- Arezki, R., Dumitrescu, E., Freytag, A. and Quintyn, M. (2014). Commodity prices and exchange rate volatility: Lessons from South Africa's capital account liberalization. *Emerging Markets Review*, 19, pp.96-105. <https://doi.org/10.1016/j.ememar.2014.01.001>
- Aron, J., Elbadawi, I. and Kahn, B. (1997). Real and Monetary Determinants of the Real Exchange Rate in South Africa, University of Oxford.
- Artis, M. and Ehrmann, M. (2006). The exchange rate—a shock-absorber or source of shocks? A study of four open economies. *Journal of International Money and Finance*, 25(6), pp.874-893. <https://doi.org/10.1016/j.jimonfin.2006.07.003>
- Artis, M.J. and Ehrmann, M. (2000). The exchange rate, a shock-absorber or source of shocks? A study of four open economies. CEPR Discussion Paper Series 2550.
- Balcilar, M., Gupta, R. and Jooste, C. (2016). The dynamic response of the rand real exchange rate to fundamental shocks. *Journal of Economic Studies*, 43(1), pp.108-121. <https://doi.org/10.1108/JES-08-2014-0148>
- Beckmann, J., Breitenlechner, M. and Scharler, J. (2024). Is the exchange rate a shock absorber? The shocks matter. *International Review of Economics & Finance*, 89, pp.114-130. <https://doi.org/10.1016/j.iref.2023.08.005>
- Bjørnland, H.C. (2004). The role of the exchange rate as a shock absorber in a small open economy. *Open economies review*, 15(1), pp.23-43. <https://doi.org/10.1023/B:OPEN.0000009423.30895.fe>
- Blanchard, O.J. and Quah, D. (1989). The dynamic effects of aggregate demand and supply disturbances, *American Economic Review*, 79: 655-673. <https://doi.org/10.3386/w2737>
- Borghijis, A. and Kuijs, L. (2004). Exchange Rates in Central Europe: A Blessing or a Curse?, International Monetary Fund, Working Paper 04/2
- Buiter, W. H. (2000). Optimal Currency Areas: Why does the Exchange Rate Regime Matter? With an application to UK Membership in EMU. *Scottish Journal of Political Economy*, 47(3), pp.213-250. <https://researchonline.lse.ac.uk/id/eprint/20178>
- Clarida, R. and Gali, J. (1994). Sources of real exchange-rate fluctuations: How important are nominal shocks?. In *Carnegie-Rochester conference series on public policy* (Vol. 41, pp. 1-56). North-Holland.
- Dąbrowski, M.A. and Wroblewska, J. (2016). Exchange rate as a shock absorber in Poland and Slovakia: Evidence from Bayesian SVAR models with common serial correlation. *Economic Modelling*, 58, pp.249-262. <https://doi.org/10.1016/j.econmod.2016.05.013>

De, K. and Sun, W. (2020). Is the exchange rate a shock absorber or a source of shocks? Evidence from the US. *Economic Modelling*, 89, pp.1-9. <https://doi.org/10.1016/j.econmod.2019.10.015>

Dornbusch, R. (1976). Expectations and exchange rate dynamics. *Journal of political Economy*, 84(6), pp.1161-1176. <https://doi.org/10.1086/260506>

Drummond, M.P., Aisen, M.A., Alper, M.C.E., Fuli, M.E. and Walker, M.S. (2015). *Toward a monetary union in the East African Community: asymmetric shocks, exchange rates, and risk-sharing mechanisms* (No. 15-16). International Monetary Fund.

Farrant, K. and Peersman, G. (2006). Is the exchange rate a shock absorber or a source of shocks? New empirical evidence. *Journal of Money, Credit and Banking*, pp.939-961. <https://www.jstor.org/stable/3838989?>

Faulkner, D. and Makrelov, K. (2008). Determinants of the equilibrium exchange rate for South Africa's manufacturing sector and implications for competitiveness. *Being a Draft of a Working Paper of the National Treasury of South Africa*. Cited at <http://www.treasury.gov.za>.

Faust, J. and Leeper, E.M. (1997). When do long-run identifying restrictions give reliable results?. *Journal of Business & Economic Statistics*, 15(3), pp.345-353. <https://doi.org/10.1080/07350015.1997.10524712>

Frankel, J. (2007). On the rand: Determinants of the South African exchange rate. *South African Journal of Economics*, 75(3), pp.425-441.

<https://doi.org/10.1111/j.1813-6982.2007.00130.x>

Gopinath, G. (2017). Rethinking Macroeconomic Policy: International Economy Issues. In *Rethinking Macroeconomic Policy Conference, Peterson Institute for International Economics, October* (pp. 12-13).

IMF. (2009). Annual Report on Exchange Arrangements and Exchange Restrictions. *Technical Report, International Monetary Fund*.

Lahiri, A., Singh, R. and Vegh, C.A. (2006). Optimal exchange rate regimes: Turning Mundell-Fleming's dictum on its head (No. w12684). National Bureau of Economic Research.

MacDonald, R. and Ricci, L.A. (2004). Estimation of the equilibrium real exchange rate for South Africa. *South African Journal of Economics*, 72(2), pp.282-304.

<https://doi.org/10.1111/j.1813-6982.2004.tb00113.x>

MacKinnon, J. G. (1996). Numerical Distribution Functions for Unit Root and Cointegration Tests. *Journal of Applied Econometrics*, 11(6), 601–618. [https://doi.org/10.1002/\(SICI\)1099-1255\(199611\)11:6<601::AID-JAE417>3.0.CO;2-T](https://doi.org/10.1002/(SICI)1099-1255(199611)11:6<601::AID-JAE417>3.0.CO;2-T)

Maveé, N., Perrelli, M.R. and Schimmelpfennig, M.A. (2016). *Surprise, Surprise: What Drives the Rand/US Dollar Exchange Rate Volatility?*. International Monetary Fund Working Paper No.16/205

Mpofu, T.R. (2016). The determinants of exchange rate volatility in South Africa. *Economic Research Southern African (ERSA) Working Paper 604, May (4)*.

Mpofu, T.R. and Peters, A.C. (2017). *The impact of Monetary Policy Announcements and Political Events on the Exchange Rate: The Case of South Africa* (No. 700).

Mpofu, T.R. (2020). The determinants of real exchange rate volatility in South Africa. *World Economy*, 00:1-22.

<https://doi.org/10.1111/twec.13013>*Digital Object Identifier (DOI)*

Ncube, M. and Ndou, E. (2011). *Inflation targeting, exchange rate shocks and output: Evidence from South Africa*, Working Paper Series No. 134, African Development Bank, Tunis, Tunisia

Obstfeld, M., Cooper, R.N. and Krugman, P.R. (1985). Floating exchange rates: experience and prospects. *Brookings Papers on Economic Activity*, 1985(2), pp.369-464. <https://doi.org/10.2307/2534443>

Ortiz, A. and Sturzenegger, F. (2007). Estimating SARB's policy reaction rule. *South African Journal of Economics*, 75(4), pp.659-680.

<https://doi.org/10.1111/j.1813-6982.2007.00146.x>

Peersman, G. (2005). What caused the early millennium slowdown? Evidence based on vector autoregressions. *Journal of Applied Econometrics*, 20(2), pp.185-207.

<https://doi.org/10.1002/jae.832>

Peersman, G. (2011). The relative importance of symmetric and asymmetric shocks: the case of United Kingdom and euro area. *Oxford Bulletin of Economics and Statistics*, 73(1), pp.104-118. <https://doi.org/10.1111/j.1468-0084.2010.00612.x>

Peters, A.C. (2016). Monetary policy, exchange rate targeting and fear of floating in emerging market economies. *International economics and economic policy*, 13(2), pp.255-281. <https://doi.org/10.1007/s10368-014-0300-0>

Saayman, A. (2007). The real equilibrium South African rand/US dollar exchange rate: A comparison of alternative measures. *International Advances in Economic Research*, 13(2), pp.183-199. <https://doi.org/10.1007/s11294-006-9075-6>

Shevchuk, V. (2014). Shock-absorbing properties of the exchange rates in transformation economies: SVAR estimates, Proceedings of the 8th Professor Aleksander Zelias International

Conference on Modelling and Forecasting of Socio-Economic Phenomena (Papież, M., and Smiech, S., eds) Foundation of the Cracow University of Economics, Cracow, pp.155-164.

Soobyah, L. and Steenkamp, D. (2019). *The role of the rand as a shock absorber*. Economic Research and Statistics Department, South African Reserve Bank.

Stazka-Gawrysiak, A. (2009). The Shock-Absorbing capacity of the flexible exchange rate in Poland. *Focus on European Economic Integration*, (4), pp.54-70.

Uhlig, H. (1999). What are the effects of monetary policy on output? Results from an agnostic identification procedure (No. 2137). CEPR Discussion Papers.

Uhlig, H. (2005). What are the effects of monetary policy on output? Results from an agnostic identification procedure. *Journal of Monetary Economics*, 52(2), pp.381-419.
<https://doi.org/10.1016/j.jmoneco.2004.05.007>

Yilmaz, E. (2012). The Exchange Rate: A Shock Absorber or Source of Shocks in Turkey? *International Economic Journal*, 26(1), pp.175-188.
<https://doi.org/10.1080/10168737.2012.65324>



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