“Is the South African Reserve Bank influenced by exchange rates when setting interest rates?”

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**ARTICLE INFO**
Rangan Gupta and Charl Jooste (2014). Is the South African Reserve Bank influenced by exchange rates when setting interest rates?. *Banks and Bank Systems, 9*(3)

**JOURNAL**
“Banks and Bank Systems”

**FOUNDER**
LLC “Consulting Publishing Company “Business Perspectives”

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Is the South African Reserve Bank influenced by exchange rates when setting interest rates?

Abstract

This paper analyzes the extent to which the South African Reserve Bank (SARB) uses the repo rate in response to exchange rate depreciations. We use a vector autoregression to model the simultaneous linkage between the real effective exchange rate and the policy rate. A combination of short-run and sign restrictions are used to identify the model. The authors’ results show that currency depreciation is important in monetary policy interest rate setting. The exchange rate also reacts significantly to changes in the repo rate.

Keywords: exchange rate, monetary policy, sign restricted VAR.
JEL Classification: E4, E580, C3.

Introduction

The debate regarding the appropriate response of monetary policy to exchange rate movements have been well studied. Unfortunately there is no clear consensus on how much weight monetary policy should place on influencing exchange rates or what the appropriate tools are for doing so. As a consequence streams of papers have tried to identify the monetary policy interest rate response when the exchange rate depreciates. With the assumption that shocks are correctly identified, many studies find that exchange rates do not have a small weight in the interest setting environment, even for inflation targeting countries.

The persistent South African exchange rate depreciation over 2011 to 2014 provides a reason to empirically analyze the South African Reserve Bank (SARB) interest rate response. Another motivation for this study is the use of a different identification scheme in specifying a model and comparing this to previous work. Abstracting from the use of reserves in influencing currency movements, we are mainly interested in analyzing whether, and by how much, the SARB weighs the exchange rate in setting interest rates.

There are justifiable reasons why inflation targeting central banks responds to exchange rate movements. Garcia et al. (2011) argue that interest rates should respond to exchange rates when it influences inflation expectations. However, if one were to measure inflation expectations correctly then the additional information provided by the exchange rate by explicitly accounting for it in a Taylor rule should be close to zero.

Ostry et al. (2012) show that, on average, a 10 percent exchange rate appreciation is accompanied by a 0.29 percentage points decrease in the policy rate. Ostry et al. (2012), however, argue that the central bank should only intervene by using reserves when the currency deviates from equilibrium, while the policy rate should mainly be used for inflation targeting.

Devereux et al. (2007) show that it is important to eliminate distortions due to price stickiness and show that monetary policy should attempt to produce an economy as though it had flexible prices. Their main argument is that sticky prices cause relative prices to be influenced by news about fundamentals that drive the exchange rate. Thus variations in the exchange rate (due to news about fundamentals) lead to inefficient price movements in the short run. Thus unexpected changes in the exchange rate (that which is not necessarily explained by fundamentals) provide justification for monetary policy intervention.

Leith et al. (2006) show that policy makers should be concerned about currency misalignment (from a welfare perspective). However, these channels are complicated and require correctly measuring sticky prices from both the tradable and non-tradable sectors. Cova et al. (2003) also evaluate the policy response to exchange rate movements from a welfare perspective using an open economy DSGE model. They show that it is optimal to respond to exchange rates when economies are small and face an elastic export demand curve. Internal price stabilization policies will lead to greater employment variability and uncertainty about marginal costs – when the central bank stabilizes prices, producers cannot respond to greater marginal cost variability by charging higher prices.

Gali et al. (2005) study the optimal monetary policy response in an open economy setup. They show that there exists a trade-off between the stabilization of exchange rates and that of inflation and output. Stabilization of both domestic prices and output induces larger volatility in real and nominal exchange rates. The converse is also true, and following an exchange rate peg induces more inflation and output volatility.

Many studies include the exchange rate in the Taylor rule. They estimate the weight that central banks place on exchange rate movements in setting interest rates. Ball (1999) estimates a Taylor rule that includes both contemporaneous and lagged exchange rate appreciation. He shows that it is optimal for monetary policy, in the long run, to relax interest rates by 2 percentage points when the exchange rate appreciates by 10 percent. Svensson (2000) estimates a similar model and
shows that the central bank should decrease rates in
respect to contemporaneous appreciations while in-
creasing rates to past appreciations – where the cut is
completely offset. The cut in interest rates negates the
negative output effects due to the appreciation, while
the offset is there to mitigate the effects on inflation
given the initial cut in interest rates – the appreciation
is temporary. In Svensson’s (2000) model the rule
reduces inflation variability, but increases the variance
in output.

Regarding South Africa, Gupta (2013) shows that
inflation would have been less volatile, at the expense
of volatile growth, if the SARB pursued a fixed ex-
change rate policy. Alpanda et al. (2010) using a small
open economy DSGE model, however, show that the
SARB puts almost no weight on exchange rate depre-
ciation in a Taylor rule specification. This is in con-
trast to the results from Ortiz et al. (2007) that estimate
the weight of the exchange rate in the Taylor rule also
in a DSGE framework. They show that the SARB
responds to exchange rate movements, although very
small. This response has also declined over time. A 1
percent appreciation leads to a 0.11 percentage points
decrease in the interest rate.

Finally Ellyne et al. (2011) estimate the weight of the
exchange rate in a Taylor-rule setup for South Africa
using single equation regressions. They show that on
average, the interest rate was reduced by 0.135 per-
cent points for any 1 percent appreciation in the ex-
change rate targeting (-0.03 percent decrease for a 1 per cent
appreciation).

Our methodology follows Bjornland et al. (2013) by
estimating the SARB’s response to exchange rates using
a VAR. Our hope is to shed somewhat more light on the interest rate response to exchange rates for
South Africa. This approach is slightly more flexible
in the sense that it does not impose an exact structure,
like a Taylor-rule, but estimate the response freely.

1. Methodology

Our variables include consumer price inflation, ($\pi$),
seasonally adjusted GDP in constant prices ($y_t$), for-
eign short-term nominal interest rate (proxied by the
fed funds rate) ($i_t^f$), domestic short-term nominal in-
terest rate (either the repo rate or 31 day Treasury bill)
($i_t$) and the log of the real effective exchange rate ($fx_t$).
All the data are sourced from the South African Re-
serve Bank and are in quarterly frequency. The data is
estimated from 2000q1 until 2013q4, with the starting
point corresponding to the SARB’s adoption of the
inflation targeting regime.\footnote{The data is estimated in levels. All the data is \(I(1)\) according to stan-
dard tests of stationarity. We have also estimated the results over a
longer sample. The results remain robust and can be obtained from the
authors.}

It is standard in the VAR literature to write the VAR
(if the matrix polynomial is invertible) in MA form:

\[ X_t = B(L)^{\pi} e_t, \]  

where \(X_t\) the matrix of variables and \(B (L^{\pi})\) is the ma-
trix polynomial using the lag operator \(L\).

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where \(X_t\) the matrix of variables and \(B (L^{\pi})\) is the ma-
trix polynomial using the lag operator \(L\). \(B (L) = \sum_{i=0}^{\pi} A_i L^i\) is the forecast errors which is assumed to be
normally distributed with a positive semidefinite covari-
ance matrix \(\Sigma\). Furthermore, \(e_t\) is linearly related to
\(e_t\), which are the structural shocks - \(e_t = \Lambda e_t\).

Replacing the linearly related shocks into (2) gives us
the MA representation in terms of structural shocks.

\[ X_t = D(L)e_t \text{where and} D(L) = C(L)A \text{and} e_t \sim 
\sim N(0, \text{diag}(I)). \]  

Bjornland et al. (2013) identify the monetary policy
impact (\(\epsilon_t^{MP}\)) and exchange rate impact (\(\epsilon_t^{FX}\)) by par-titioning the A matrix into two blocks \(A = [A^i A^r]\). \(A^r = \hat{A} Q\) is a \((5 \times 3)\) matrix that contains the contem-
poraneous impact from the structural shocks that are not
identified. \(A^{"} = \hat{A} Q^{"} = [\hat{a}^{MP}, \hat{a}^{FX}]\) is a matrix that
contains the contemporaneous impact from the
matrix that is identified. \(Q\) is an orthogonal matrix.

\(MP\) is the monetary policy shock while \(FX\) is the
exchange rate shock.

Like Bjornland et al. (2013) we place no restriction
on the interest rate given an exchange rate shock. The
exchange rate, however, is restricted to appreciate in
the event of a contracting monetary policy shock. The
sign restriction lasts for only one period, after which
the exchange rate moves freely. We also place con-
temporaneous restrictions on the response of infla-
tion, output and the foreign interest rate given a mon-
etary policy shock. Also, there is one period delayed
response of output and inflation given an exchange
rate shock.

From a robustness perspective the sign restriction of
the exchange rate response to monetary policy is rel-
axed and allows for the interest rate to respond im-
mediately to the exchange rate shock. The restrictions
can be written as follows:

\[ \begin{bmatrix}
  \epsilon_t^{MP} \\
  \epsilon_t^{FX}
\end{bmatrix}_{\text{strict}} = \begin{bmatrix}
  0 & 0 & \pi_t \\
  0 & 0 & y_t \\
  1 & 0 & i_t^f \\
  -1 & -1 & fx_t
\end{bmatrix}, \text{robust:} \begin{bmatrix}
  \epsilon_t^{MP} \\
  \epsilon_t^{FX}
\end{bmatrix} = \begin{bmatrix}
  0 & 0 & \pi_t \\
  0 & 0 & y_t \\
  1 & 0 & i_t \\
  0 & 1 & fx_t
\end{bmatrix}. \]  

2. Empirical results

Figure 1 highlights the response of interest rates and
exchange rates to different restrictions. The blue line
(darker) is based only on the Cholesky decomposition
while the green line (lighter) is the pure sign restric-
tion. Both restrictions could be justified on theoretical
grounds, but both of them yield different responses.
The exchange rate appreciates under the Cholesky
decomposition given a monetary policy shock while the interest rate decreases when the exchange rate depreciates. The converse is true under a pure sign restriction approach – the exchange rate appreciates when monetary policy tightens, while the central bank tightens rates when the exchange rate depreciates. The next set of results incorporates both sign and Cholesky restrictions.

The next set of results incorporates both sign and Cholesky restrictions.

Figure 2 shows the response of all the variables to a monetary policy and exchange rate shock – this represents the baseline case. The exchange rate appreciates immediately given an increase in interest rates. The response of the exchange rate is small and dissipates rather quickly. This is an outcome of the sign restriction.

The central bank responds quite strongly when the exchange rate depreciates – the contemporaneous impact is a 0.2 percentage point increase in the repo rate for every 1 percent depreciation in the exchange rate. The central bank interest rate response lasts about 6 quarters. However, there seems to be some evidence of a correction – the central bank decreases interest rates after six months. This could be based on the findings of Ball (1999) that include a lagged exchange rate term in the Taylor rule to account for the second round effects of the exchange rate on inflation. The VAR also seems to create a price puzzle – inflation increases in response to an increase in interest rates. The pass-through of exchange rates to inflation reaches a maximum of about 0.3 percentage points after 3 quarters.

The results are robust given our alternative set of restrictions. The results of Figure 3 closely match that of Figure 2 (see below). The exchange rate response to an increase in interest rates is somewhat stronger, while the price puzzle falls away – inflation decreases regarding a monetary policy shock. Exchange rate pass-through to inflation is still positive albeit slightly smaller. The monetary policy response, sign and magnitude, is preserved regarding exchange rate depreciation.

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1 We use 2 lags as given by the Schwarz information criterion (see page 33).
We use a VAR with both sign and short run restrictions to analyze monetary policy response to exchange rate movements. Our results are robust to alternative specifications. We show that monetary policy does not avoid altogether movements in the exchange rate in setting interest rates. We avoid using a Taylor rule in estimating the weight that the SARB puts on exchange rate movements, since this avoids other instruments that the SARB could use to intervene. Since our main aim is to analyze only the interest rate response to the exchange rate we avoided any restrictions on the interest rate regarding the exchange rate.

**Conclusions**

We use a VAR with both sign and short run restrictions to analyze monetary policy response to exchange rate movements. Our results are robust to alternative specifications. We show that monetary policy does not avoid altogether movements in the exchange rate in setting interest rates. We avoid using a Taylor rule in estimating the weight that the SARB puts on exchange rate movements, since this avoids other instruments that the SARB could use to intervene. Since our main aim is to analyze only the interest rate response to the exchange rate we avoided any restrictions on the interest rate regarding the exchange rate.

**References**