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Abstract

Structural vector autoregression (SVAR) models were used in this study to investigate how unexpected increases in euro area bond yields and monetary stimulus are transmitted to the South African economy using data from January 1999 to June 2008. Firstly, evidence is found that this is consistent with the predictions of the capital flow effects on asset prices, which include depressed bond yields, evaluation of stock prices and exchange rate appreciation due to euro area monetary stimulus. Secondly, the perverse effects of a large economy’s monetary stimulus into a small open economy predicted by the Mundell–Fleming model was assessed. A significant drop was found in the growth of broad money supply, interest rates declined and the trade balance deteriorated. Thirdly, the study finds that a positive shock to euro area bond yields leads to an increase in nominal bond yields and a significant, but delayed, depreciation in the exchange rate of the rand. The results of a model that extended the sample to May 2011 to include the current period of economic instability and applying counterfactual analysis thereafter suggest that the exchange rate was overvalued between 2010 and 2011.

JEL classification: C32, E43, E44, E50, F41, F42
Keywords: Monetary policy, international transmission, macroeconomic interdependence, structural vector autoregressions
1 Introduction

This paper investigates the various channels through which an unexpected positive shock in euro area bond yields and expansion monetary policy are transmitted to South Africa using structural vector autoregression (SVAR) models. This investigation is motivated by the adoption of large-scale balance-sheet tools used by various central banks and the ongoing sovereign debt problems in the euro area. It is important for South African policymakers to understand how these effects are transmitted domestic economic conditions.

The literature on international spillover channels uses many models that try to quantify such channels. In this study we choose to focus on a few models that emphasise the linkages between domestic and foreign variables, for instance, exchange rate models such as the flexible monetary and Frankel real interest rate models expose the strong interaction between the exchange rate and the foreign interest rate, output and monetary stimulus. The portfolio balance model goes a step further and includes the bond market so as to capture risk perceptions. However, the basic Mundell–Fleming–Dornbush (MFD) model predicts that monetary stimulus in a large economy through expenditure-switching effects on exchange rate will increase domestic income as the trade balance improves. The MFD model suggests that the transmission would be negative to a small open economy, as the currency appreciation and lower transactions demand for money reduce interest rate and, ultimately, leads to a fall in income.²

There are strong motivations for studying the spillover effects of euro area shocks to South Africa. The euro area is South Africa’s biggest trading partner in manufactured goods. The International Monetary Fund’s (IMF) direction of trade statistics shows that the annual value of exports from South Africa to the euro area increased from US$6,01 billion in 1999 to US$17,7 billion in 2008. Similarly, the value of imports increased from US$8,28 billion in 1999 to

² The MFD predicts that domestic monetary expansion worsens the trade balance through the expenditure switching effect and output declines through beggar-thy-neighbour policies. The intertemporal model predicts that monetary expansion leads to a temporary increase in income, hence, through consumption smoothing the current account may improve, otherwise it worsens when investments increase substantially due to falling real interest rates.
US$23.1 billion in 2008. In addition, the weight of euro area trade is the highest in the calculation of the South African trade-weighted exchange rate.

Empirical vector autoregression (VAR) evidence lends credible support for the influence of large economies on small open economies, for example, Mackowiak (2007) concluded that United States (US) monetary policy shocks were not important for emerging markets relative to other kinds of external shocks. However, the study found that the impact of US monetary policy shocks on short-term interest rates and exchange rates in emerging markets is more pronounced. Moreover, Canova (2005) found that the interest rate channel is a crucial amplifier of US monetary disturbances. Evidence in this study also showed that trade played a negligible role. Kabundi and Loots (2010) used a dynamic factor model to test the transmission of positive demand and supply shocks from Germany to South Africa. We fill the gap in the literature by using the SVAR approach to assess the Mundell–Fleming model and the portfolio balance approach to determine the exchange rate.

Firstly, we find evidence consistent with predictions of capital flow effects on asset prices, which include depressed bond yields, stock price revaluation and exchange rate appreciations due to euro area monetary stimulus. These responses affirm the importance of the asset price channel in transmitting shocks from the euro area to South Africa.

Secondly, we assessed the negative effects of the large economy’s monetary stimulus in the small economy as predicted by the Mundell–Fleming model. We find a significant drop in the growth of broad money supply, a decline in interest rates and a muted trade balance reaction. Hence we conclude that there is weak evidence of the trade balance channel.

Thirdly, we find that a positive shock on euro area long-term bond yields leads to a significant, but delayed, effect on the exchange rate of the rand to the euro. Extending the sample to include the current period of global economic instability and applying counterfactual analysis show that the exchange rate was overvalued between 2010 and 2011.
The remainder of the paper is organised as follows: section 2 provides a review of empirical evidence and section 3 describes the methodology. Section 5 provides the data and section 6 the conclusion and policy implications.

2 Theory

This section focuses on the three models that are relevant to the research undertaken in this study. Firstly, the basic MFD model predicts that monetary stimulus in a large economy affects the exchange rate through expenditure-switching and, ultimately, will increase domestic income through the trade balance. However, the transmission will be negative to a small open economy, as the income falls because of lost net exports due to an appreciation in the currency which also leads to lower transaction demand for money and lower interest rates. The MFD model predicts that domestic monetary expansion worsens the trade balance through the expenditure-switching effect and output declines through beggar-thy-neighbour policies.

The second model explored in this study is the intertemporal model. This model suggests that monetary expansion leads to a temporary increase in income and, hence, through consumption smoothing the current account may improve otherwise it worsens when investments increase substantially due to falling real interest rates.

The third model explored is the portfolio balance model which looks at the equilibrium in domestic money markets, both domestic and foreign bond markets. The portfolio balance model assumes that individuals hold a portfolio of wealth comprised of money, and domestic and foreign bonds. The individuals altering the composition of their portfolios have an impact on the exchange rate, bond yields and money demand. Firstly, this model predicts that the domestic currency should depreciate when foreign interest rates, bond yields and output rise, but should appreciate when foreign money supply rises. Secondly, this model suggests a negative relationship between domestic money demand and foreign interest rates. A rise in foreign interest rates induces domestic participants to curtail their holding of domestic money and, instead, increase their holding of foreign bonds. Thirdly, the demand for domestic bonds is negatively related to foreign interest rate. This arises when foreign interest rates results in domestic
participants holding higher-yielding foreign bonds instead of domestic bonds. Therefore, a decrease in the demand for domestic bonds drives down the price of domestic bonds and leads to higher domestic bond yields. At the same time, the exchange rate depreciates because there are increased purchases of foreign currency by domestic participants as they acquire foreign bonds.

3 Literature review

Mackowiak (2007) found that spillover effects of US monetary policy shocks on non-Group of Seven (G7) countries are sizable and that this finding was aligned with the idea that emerging markets are more vulnerable to external shocks than large and developed economies. Mackowiak’s study also found that external shocks were more important for emerging-market economies irrespective of exchange rate regime relative to US monetary policy shocks. Kwark (1999) found that US country-specific shocks were the most important in explaining US output fluctuations but foreign output is largely explained by US country-specific shocks and worldwide shocks. The transmission of US shocks to foreign countries was significant, whereas the converse did not hold.

Canova (2005) studied how US shocks were transmitted into eight Latin American countries. He found that a US monetary policy shock affects Latin American interest rates very quickly and was very significant. In addition, evidence indicated that external shocks were important sources of macroeconomic fluctuations in Latin America. Moreover, US monetary policy shocks were more important for Latin America relative to US demand-and-supply shocks. The patterns of propagations differed from those reported for advanced economies because the US monetary shock induced a significant and instantaneous increase in Latin American interest rates, price increases and the depreciation of the real exchange rate. In all, US shocks accounted for a significant portion of the variability of Latin American macroeconomic variables.

Holman and Neuman (2002) found strong evidence that US monetary shocks affected real activity in the US and Canada. The Canadian monetary disturbances affected both countries’ real activity and many of these effects were similar in magnitude to the effects of US monetary shocks. Lastrapes and Koray (1990) examined the international transmission of aggregate shocks
under alternative exchange rate regimes for the US and UK, France and Germany, and found that the transmission of monetary shocks depended critically on the country in question.

Selover and Round (1996) focused strictly on output shocks, and found a significant transmission from Japan to Australia. Schmidt-Grohe (1998) explored alternative mechanisms for the transmission of US output to Canadian economic activity by looking only at US output innovations and not monetary innovations. The results suggest that for a wide class of international real business cycle models, the traditional channels of international transmission of business cycles through world interest rates and terms-of-trade variations could not explain the cyclical response of the Canadian economy to innovations in US output.

Burdekin (1989) examined the impact of US monetary policy, budget deficits and inflation on France, Italy, the United Kingdom and West Germany. The empirical results showed the interplay between domestic monetary and fiscal policy, augmented by a significant impact of US variables across all four countries in the sample. Kusczczak and Murray (1986) focused on the transmission of output, price and interest rate shocks on US and Canadian monetary variables and emphasised the importance of US variables in explaining the forecast error variance in Canadian variables.

Kim (2001) found a smaller positive transmission effect on foreign output and that foreign aggregate demand increased in response to expansionary US monetary policy. Schmidt (2006) showed that asymmetric price setting explained the fact that US monetary policy had positive international effects on both non G-7 output and aggregate demand. Grilli and Roubini (1995) suggest that non-US G-7 monetary policies strongly follow US monetary policy. Minianne and Rogers (2003) provide evidence of the effects of US monetary policy on a large set of countries and in different subperiods.
4 Vector auto-regression methodology

This paper adopts the small open-economy SVAR model in Li et al. (2010) to analyse the impact of euro area shocks on the South African economy. This model incorporates features of the Mundell–Fleming small open-economy and portfolio balance exchange rate model. However, in this study we use the trade balance ($TB$) as a logarithm of the ratio of exports to imports.\(^3\)

The model has seven variables and considers the wealth channel. The seven variables are (i) the trade balance, (ii) consumer price index ($Cpi_{SA}$), (iii) broad money supply ($M3$), (iv) money market interest rate ($SA\_R$), (v) rand–euro exchange rate ($Exr$), (vi) wealth and the (vii) euro area financial market variables. The real All-share (Alsi) stock price index or bond yields denote wealth measures ($Wealth$). These variables are standard in Mundell–Fleming-type models for open economies.

Equation 1 provides the baseline model with short-run restrictions based on the approach in Li et al. (2010).

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & g_{17} \\
g_{21} & 1 & 0 & 0 & 0 & -g_{26} & g_{27} \\
-g_{31} & -1 & 1 & g_{34} & 0 & 0 & 0 \\
0 & 0 & g_{43} & 1 & 0 & -g_{46} & 0 \\
g_{51} & g_{52} & g_{53} & g_{54} & 1 & g_{56} & g_{57} \\
g_{61} & g_{62} & g_{63} & g_{64} & 0 & 1 & g_{67} \\
0 & 0 & 0 & 0 & 0 & 1 & \end{bmatrix}
\begin{bmatrix}
u_{TB} \\
u_{SA\_CPI} \\
u_{M2} \\
u_{SA\_R} \\
u_{Wealth} \\
u_{Exr} \\
u_{Euro} \end{bmatrix} =
\begin{bmatrix}
e_{AS} \\
e_{AD} \\
e_{MA} \\
e_{MMR} \\
e_{Port} \\
e_{TRADE} \\
e_{Euro} \end{bmatrix}
\]

\(^{(1)}\)

Note: Euro represents either euro area M1 or long-term bond yields included separately in the model.

We characterise monetary policy by a feedback rule, which is a linear function relating the policy rate to information available to the central bank. The conditioning variables for the policy rate feedback include contemporaneous values of the money supply, the exchange rate and the lagged

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\(^3\) This study uses monthly data. Hence, we cannot scale trade balance by gross domestic product.
values of all variables included in the model. We use M3 as the measure of the monetary aggregate.

The policy reaction function is given by row 4 in equation 1. The policy reaction function indicates that monetary policy authorities consider currency depreciation as a factor that drives the inflationary process. We assume monetary policy shocks (MMR) are driven by preferences of the monetary policy authorities. The identification strategy also reflects the interaction amongst the goods market, money market, stock or bond market and the external sector. In this context, our model specifies the equilibrium conditions. The aggregate supply (AS) shock in equation 1 includes the effects of the exogenous changes in productivity, mark-ups and other supply-side factors.

An aggregate demand (AD) shock in equation 1 comprises of the exogenous impact of fiscal policy from the expenditure and revenue shocks and other demand-side factors. Therefore, the demand-side shock is a factor of the inflation rate and other lagged variables in the model. Firstly, we assume that domestic demand is determined by changes in price levels, foreign interest rates and the domestic exchange rate, including all other lagged variables in row 2. Secondly, we assume that the external demand for South African goods is partly dependent on the prevailing exchange rate and that the exchange rate ($Exr$) depends on all variables in the model except the real stock prices (row 6). The unexpected change in aggregate demand is transmitted through the unexpected movements in the exchange rates (row 6), this line of thought is largely based on empirical evidence pointing to the fact that, in open economies, the exchange rate is the main channel of transmission of external shocks (Li et al. 2010, Murchison and Rennison 2006). An unexpected decline in foreign demand for South African goods is expected to lead to an unexpected depreciation of the South African rand.

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4 These drivers include shifts in relative weights given to inflation and the exogenous variation arising from changes in the private agents’ inflationary expectations not necessarily linked to economic fundamentals and measurement errors in the real-time data available (Li et al. 2010).

5 Li et al. (2010) suggest that the inclusion of the oil price has a negligible impact on the variance decompositions of stock prices. Based on this, therefore, oil prices were used as an exogenous variable in the estimation.
Money demand (MA) shocks denote exogenous changes in the transaction velocity of money given by the standard quantity theory of money specification. However, real money balances are determined by real income and interest rate. Portfolio shocks (PORT) represent an exogenous change in the demand for equities or bonds, or a change in the premium on the two investment vehicles, which leads to portfolio imbalances and innovations in the time-varying risk premium. This specification suggests that equities or bond markets use all available public and private information but react contemporaneously to all variables in the model, including portfolio shocks. However, we emphasise that the external sector comprises two euro area financial variables which are used interchangeably in row 7.

5 Data

We show the trends of all variables in Figure 1, beginning in January 1999 and ending in May 2008. All data are sourced from the IMF international financial statistics database. Figure 1 shows the evolution of all variables over time. The South African real Alsi stock price index appreciated by 10 per cent between April 2003 and June 2008. For both countries, measures of money supply display an upward trend. The South African rand-per-euro exchange rate depreciated around 2008 compared to levels observed in periods between 2006 and 2007. The South African interest rates declined by 7.8 per cent from 17.2 in January 1999 to 9.5 per cent in February 2000 when the inflation-targeting framework was formally adopted. After reaching a low level of 6.43 per cent in May 2005, interest rates increased to around 10 per cent in June 2008. A general observation is that interest rates were more stable between late 2003 and 2006.

The rand–euro exchange rate depreciated by 52 per cent between June 2008 and July 2001. The rand depreciation was more pronounced between 2001 December and 2001 June when it depreciated by 40 per cent. The South African bond yields have been on a downward trend since 1999 and show greater stability after 2005. The euro area bond yields have risen in since 2007, having shown moderation in 2005.

We approximate the aggregate output using the logarithm of the bilateral ratio of exports to imports. This is motivated by the Mundell–Fleming small open-economy model implications for
the small country’s trade balance movements to a large economy’s shocks. We further separate the asset price variable into real stock prices and bond yields based on the likelihood that asset classes may respond in a different way to foreign developments, leading investors to reallocate their portfolio across these asset classes. For further insights into the bond markets, we replaced bond yields with South African-term spreads (SA-term spread). The SA-term spread is defined as the difference between long-term bonds and money-market rates. The objective is to capture the interactions between the short-term rates and long-term bond markets.

Figure 1: Plot of all variables

Note: The real stock variable is deflated by the consumer price index. SA = South Africa, euro = euro area. Interest rates, bond yields and the spread variable are expressed in percentages, while other variables have been log-transformed. The SA-term spread is the difference between government bond yields and Treasury bill rates.
6. Results

We estimate various SVAR models using data from January 1999 to June 2008, with variables in level form by ordinary least squares (OLS) method for reasons motivated in the literature, that is, the OLS method delivers consistent parameter estimates (Li et al. 2010) and parameters hold a super consistency property when the VAR is estimated in levels than in first differences in the presence of a cointegration relationship (Hamilton 1994). Moreover, the estimations done using first differenced variables result in misspecifications due to the omission of error-correction mechanisms (Li et al. 2010).

We express the trade balance as a logarithm of the bilateral ratio of exports to imports. The bond yields and interest rates are expressed in percentages. However, other variables are expressed in logarithms and multiplied by 100 to represent percentage deviations from their trends. Akaike information criteria (AIC) were used to choose lag lengths for each model. The various models are estimated using two to four lags based on AIC results, with the oil price used as an exogenous variable, including various dummies. The error bands around the impulse responses represent the 16 and 84 percentiles, with the median being the impulse responses.

While many impulse responses were generated, in order for us to retain our focus, we only report on and discuss the responses to euro area positive bond yields and monetary expansion shocks. The bottom of each column identifies the euro area shock. In addition, each column in each figure represents the effects of a 0.5 per cent increase expansion euro area monetary aggregate (euro area _MI) and euro area bond yield shock respectively.

6.1 An expansionary euro area monetary shock

Figure 2 shows the effects of the expansionary euro area monetary shock, representing, for example, an unexpected policy rate adjustment. According to the predictions of the two country small open-economy Mundell–Fleming model, the smaller economy is expected to experience a contraction in output, interest rate reduction, decline in money demand and a currency appreciation in response to the large economy’s monetary stimulus.
Firstly, we investigate the evidence consistent with predictions of the capital flow effects on asset prices, which includes bond yields, stock price and the exchange rate. Theory suggests that a monetary shock to the euro area that results in the widening of the yield differential between the euro area and a small open economy has the potential to stimulate capital flows into the small open economy, as investors in search of higher returns invest their capital into stock and bond markets in the small open economy.

**Figure 2: The effects of expansionary euro area monetary shocks**

![Graph showing the effects of expansionary euro area monetary shocks.](image)

**Note:** Each column shows impulse responses to a euro area financial shock (see the last row in each column). In addition, each column shows variables used in the estimation. SA = South Africa.
As shown in Figure 2, the increased demand for bonds due to capital inflows exerts upward pressure on bond prices and, inversely, downward pressure on bond yields. The South African nominal bond yield decline on impact (column 1). In addition, we find significant real stock price revaluations (column 4) which confirm the importance of the asset price channel in transmitting shocks into the South African economy. The real stock price revaluation is either due to capital inflows that increase the demand for South African equities or a reduction in interest rates, which reflect the discounting of real stock prices. We also find a significant appreciation in the rand–euro exchange rate (column 1) which is in line with predictions of the flexible monetary exchange rate model and the Mundell–Fleming model.

Secondly, we assess the negative effects of the large economy on the small economy as suggested by the Mundel-Fleming model. The Mundel-Fleming model predicts that the euro area monetary expansion will have negative effects on South African transmission through the trade and monetary channels. The trade balance channel shows a decline in South African income due to lost exports. However, the monetary channel assumes that lower transaction demand for money in South Africa leads to a decline in interest rates as there is a significant drop in the M3 growth. However, the basic trade balance is expected to improve following a reduction in interest rates and depressed income, as net exports are stimulated through the lower import component. Our results show that the trade balance improves on impact and remains muted thereafter. The muted reaction could reflect the opposing effects of exchange rate appreciation and lower interest rates on the trade balance.

Furthermore, we extend our analysis to explore the effects on bond spreads. The intention is to understand the extent of the instability induced by the euro area stimulus shock in terms of persistent deviations from pre-shock levels. The large decline in SA-term spread (column 3) on impact is not persistent. In both cases the stability in the spreads may be attributed to both the exchange rate appreciation and the deceleration in the consumer price inflation, which reduces the risk premium.
6.2 Euro area bond yield shocks

Figure 3 displays the effects of positive euro area long-term bond yields shock, alternatively, a decrease in bond prices. We include real stock prices to capture the spillover effects induced from euro area bond markets to other asset classes, in line with portfolio readjustment hypothesis. For a portfolio investor, a change in returns in one asset may trigger asset allocation adjustment.

**Figure 3: The effects of euro area bond yield shocks**

![Graphs showing the effects of euro area bond yield shocks](image)

**Note:** Each column shows impulse responses to euro area financial shock (see the last row in each column). In addition, each column shows the variables used in the estimation.

SA = South Africa.
The results show a transitory and significant real stock price revaluation and this weakly supports the portfolio reallocation driven by the change in the returns of other asset classes and possible hedging motives. Moreover, the significant, but delayed, rand–euro depreciation is in line with the predictions of the bond portfolio model of the exchange rate determination. The delayed and significant increase in consumer prices possibly signals nominal price rigidities, whereas, the transitory rise in trade balance on impact, *ceteris paribus*, could be indicative of increased European spending on South African goods due to expected goods price inflation in the future from anticipated euro currency depreciation.

We find evidence that South African nominal bond yields rise in response to euro area bond yields, suggesting the interconnectedness between these markets. This positive correlation between bond yields could indirectly be influenced by factors that affect the risk premium. Although the risk premium variable is not directly included, however, we can infer through examining inflation and exchange rate dynamics what induced its movements. We find persistent consumer price inflation and prolonged exchange rate depreciation, which point to an increased risk premium on bond yields demanded by investors. The hump-shaped SA-term spread response also reflects the presence of the term premia.

6.3 Robustness analysis

6.3.1 Selected euro area countries

We conduct robustness analysis in two ways namely (i) using selected country individual bond yields and (ii) extending the sample period to May 2011 to include periods of heightened economic uncertainty and volatility. We use the model to assess the concerns raised by policymakers that capital flows emanating from the balance-sheet operations of various Advanced economies central banks lead to the appreciation of exchange rates in most emerging-market economies. We use bond yields for Germany, France, Ireland and Italy. Germany and France are the two largest economies in the euro area, while Ireland and Italy experienced an upward spiral in borrowing costs. The main focus of the analysis is to assess the impact of unexpected high bond yields, and therefore to test the sensitivity of results from an individual country bond yield shock relative to the aggregate euro area shock (column 1 in Figure 3).
We find that consumer prices, M3, interest rates and bond yields respond in a similar way. However, M3 increases significantly in response to an Italian bond yield shock only. In addition, the rand–euro exchange rate does not depreciate significantly using French bond yields following an unexpected bond yield increase. Apart from these two outcomes, the results seem robust in response to each individual country’s bonds yields shocks.

**Figure 4: The impact of euro area individual country’s bond yield shocks**

![Graph showing impulse responses to euro area financial shocks.](image)

**Note:** Each column shows impulse responses to a euro area financial shock (see last row in each column). In addition, each column shows the variables used in the estimation.

SA = South Africa.
6.3.2.1 Robustness using the extended sample data

This section tests the robustness of the results through extending the sample period from June 2008 to May 2011. The extended period includes period of the recession, the euro area sovereign debt issues, and heightened uncertainty and volatility. Overall, the extension of the data set has isolated effects on the significance of variables and not the direction of the response. In Figure 5, we find that there are no significant dynamic changes in the trade balance, M3, consumer prices and the exchange rate responses. Despite the interest rate responding as predicted by the Mundell–Fleming model, the extension of the sample to include the period of the recession and heightened uncertainty has, however, eliminated the delayed significance (columns 1 and 2). In spite of significant declines on impact, both bond yields and SA-term spread show changes in the significance, suggesting that extending the sample period impacted on the significance of dynamic responses and not the expected responses.

Figure 5: The effects of expansionary euro area monetary shocks in an extended sample

Note: Each column shows impulse responses to a euro area financial shock (see the last row in each column). In addition, each column shows the variables used in the estimation.

SA = South Africa.
Figure 5 shows the sensitivity of the results of a shorter sample after extending the sample to 2011M5. The trade balance shows a muted contraction in the short run. The biggest change relates to a persistent consumer price increase rather than the delayed increase across all columns. In addition, real stock prices (column 3) decline significantly after four months, pointing to portfolio reallocation taking place after some lags in the extended sample. The M3 variables display similar trajectories without any significant reaction when wealth is measured by bond yields and SA-term spread but upward pressure on M3 when accounting for real stock prices. The bond yields rise significantly for eight months which is greater than what is achieved from shorter sample data. Lastly, we find that the rand-per-euro dynamics remained unchanged. Overall, the result suggests these findings are robust to the inclusion of periods of economic uncertainty until May 2011.

Figure 6: The effects of a positive euro area bond yields shocks in an extended sample

Note: Each column shows impulse response to euro area financial shock (see the last row in each column). In addition each column shows the variables used in the estimation.
SA = South Africa.
6.4 Counterfactual analysis using extended sample data

We apply the counterfactual analysis to the extended sample estimations to investigate what could have happened to South African real stock prices, the exchange rate and bond yields if euro area bond yields remained at levels observed in May 2005. It is worth noting that May 2005 represents the period of the lowest money-market interest rates in the sample period before the recession, heightened uncertainty and volatility. Three motivating factors for that are (i) the bond yields in euro area regions reached their highest rates, (ii) South Africa experienced an appreciation in the exchange rate and it was relatively cheaper for South Africa to raise funds in international markets. This counterfactual analysis is expected to reveal whether the model indeed captures these concerns. The counterfactual approach is based on a historical decomposition approach in which actual data can be recreated through adding the base forecast to sum of contributions of all components (Rats Manual 2011). Each individual contribution can inflate or deflate the base forecast values.

The chosen periods coincide with low money-market interest rates of 6.43 per cent in May 2005 in South Africa and euro area bond yields of 3.41 per cent in May 2005. We illustrate the usefulness of the counterfactual analysis by using three examples based on the extended sample.

In Figure 7 parts A and B, we shut off the euro area bond yield effects after May 2005 to see how the data for South African variables would have evolved. However, in part C we illustrate the effects of shutting off the euro area M1 on real stock prices and the rand–euro exchange rate.

The counterfactual paths in Figure 7 are represented by dotted lines, whereas solid lines refer to the actual path of the observed variable. The real stock prices (in parts B and C) were higher than the counterfactual path between 2007 and early 2009. However, between 2009 and early 2010 the counterfactual path suggests that real stock prices were undervalued, perhaps due to the South African recession and the negative effects of heightened global risk aversion. In addition, the bond yields (in part A) were actually higher than counterfactuals between the first quarter of 2009 and late 2010. This coincides with the period of heightened global uncertainty, volatility and risk aversion towards emerging-markets assets. We suggest the difference largely reflects the risk premium. Furthermore, the results for 2011 show little downward pressure in actual bond
yields relative to the counterfactual estimates. In all parts the actual rand–euro exchange rate path exceeds the counterfactual path throughout 2010 and early 2011, suggesting the currency was overvalued.

Figure 7: Counterfactual analysis using the extended sample

Note: Interest rate and bond yields are in percentage, while real stock prices and rand per euro are in logarithms.
We also tested the sensitivity of the findings with new counterfactual estimations starting at the end of 2007 to capture the effects during and after the euro area recession while retaining the assumptions and motivation stated above. The estimated trajectories are shown in Figure A1 in the (Annexure A). Generally, we arrive at the same conclusion when starting the counterfactual simulation from the start of the euro area recession.

7. Conclusion

We investigated the effects of two euro area financial shocks on the South African economy using SVAR models. First, we investigate evidence consistent with predictions of the effects of capital flows on asset prices due to a euro area monetary stimulus. Indeed, our evidence shows that South African nominal bond yields decline on impact, real stock price revaluations and a significant rand–euro exchange rate appreciation. All these responses confirm the importance of the asset price channel in transmitting shocks to the South African economy and are consistent with the predictions of the effect of capital inflows.

Second, we assessed the negative effects of the large economy’s monetary stimulus on the small open economy as suggested by the Mundel-Fleming model. This model predicts that the euro area monetary expansion (or the large economy) has negative effects through trade and monetary channels on South Africa (or the small open economy). We find a significant decline in M3 growth, while interest rates decline over the same period. In addition, we find a muted trade balance reaction, which possibly reflects the opposing effects of the exchange rate appreciation and lower interest rates on the trade balance.

Finally, we find that a positive euro area long-term bond yield shock leads to a significant, but delayed, rand–euro exchange rate depreciation. There is also evidence of a positive response of South African nominal bond yields to euro bond yields, which suggests interconnectedness between these markets and the role of the risk premium in South Africa. The persistent goods price inflation and prolonged exchange rate depreciation also point to increased risk premium demanded by investors to hold bonds.
Appendix A: Counterfactual analysis in extended sample

Figure A1: Counterfactual analysis using extended sample
References


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<table>
<thead>
<tr>
<th>n°</th>
<th>Year</th>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
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