

Trouble Every Day: Monetary Policy in an Open Emerging Economy

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Abstract

Four factors drive the high-frequency impact of monetary policy announcements in South Africa: affecting short-, mid-, and long-term yields, and country risk. Controlling for information effects, we build IVs for conventional monetary policy, forward guidance, term premia, country risk and information shocks. Conventional monetary policy has textbook contractionary effects. Policy communication, particularly forward guidance, has persistent effects on output and prices. Country risk is a novel and powerful channel of monetary policy communication in emerging markets. By defending its independence, restating its inflation target, and addressing external shocks, the central bank can mitigate country risk and generate expansionary effects.

Keywords: Monetary policy, Small Open Economy, Inflation Targeting, Exchange Rates.

JEL Classification: E5, F3, F4, C3.

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Introduction

The effects of the main instruments of modern monetary policy are relatively well understood – at least for the advanced economies, and the United States in particular, on which research has focused almost exclusively. By contrast, the central bank’s critical function of risk management – essential for stabilising economies and preserving policy credibility – remains largely unexplored (see [Greenspan, 2004](#)). This is perhaps unsurprising: the economies at the core of the literature have enjoyed relatively stable economic and institutional conditions, in which risk management is only rarely put to the test. Yet, emerging markets represent a potentially important and underexplored source of monetary policy insight. On the one hand, we know relatively little about how even the standard tools of monetary policy operate in these economies (see [Frankel, 2010](#) for a classic survey). On the other, their volatile environments and diverse policy frameworks make risk management an essential, everyday dimension of policymaking.

This paper makes headway on these questions by bringing high-frequency identification of monetary policy – the state-of-the-art methodology whereby asset price revisions triggered by policy announcements are used as instrumental variables to identify policy shocks – to bear on an emerging market, South Africa.¹

Post-apartheid South Africa has a special position among emerging markets, which we describe in Section 1. It shares many institutional characteristics with advanced economies: flexible exchange rates, an open capital account, deep financial markets, central bank independence, modern central banking and inflation targeting. Yet, it is undoubtedly an emerging economy, with unsteady growth, greater exposure to supply shocks and foreign spillovers, vulnerability to capital and trade flows, lower credibility with respect to both price stability and default risk, high inequality, and a contested institutional framework. These facts make the country an ideal setting to study the effects of monetary policy in an emerging market, with modern methods. Over the whole period covered by this study, from 2002 to 2025, the monetary policy framework has been relatively stable. The South African Reserve Bank (SARB) adopted inflation targeting in 2000, among the earliest central banks in emerging markets to do so, with a target band of 3-6% for headline consumer price inflation and the aim of keeping inflation close to the midpoint. In 2025, the SARB redefined its target in steps, first announcing in July its aim for the bottom of the band, and then adopting in November a symmetric $\pm 1\%$ band around 3%. The first

¹This approach, pioneered by [Kuttner \(2001\)](#) and [Gürkaynak et al. \(2005a\)](#), has been widely used in advanced economies to study how conventional and unconventional policy announcements affect market expectations and how these effects transmit to the economy (e.g., among many others, [Gertler and Karadi, 2015](#), [Nakamura and Steinsson, 2018](#), [Altavilla et al., 2019](#), [Jarociński and Karadi, 2020](#), [Cesa-Bianchi et al., 2020](#), [Lunsford, 2020](#), [Swanson, 2021](#), [Miranda-Agrippino and Ricco, 2021](#)).

announcement is an interesting policy episode in our sample; the second happens outside it.

Our analysis proceeds in five steps. First, Section 2 lays the intuition for our empirical methodology with an affine model of the yield curve in the spirit of [Ang et al. \(2007\)](#) and [Smith and Taylor \(2009\)](#), which we extend in an imperfect information setting to feature persistent inflation and shocks affecting the curve at different maturities.

Second, in Section 3, we construct daily measures of how the SARB’s policy announcements affect the prices of interest rate derivatives – forward rate agreements and interest rate swaps with maturities up to 10 years – and country default swaps, in what is a deep and liquid market. Following [Gürkaynak et al. \(2005a\)](#), we then identify four factors – capturing the commonality across assets – affecting respectively the short, the medium, and the long end of the yield curve, and the country risk premium. We analyse the effects of these monetary policy surprises on financial assets in an event study.

Third, in Section 4, we create informationally robust IVs to identify policy shocks. The recent literature has shown that central bank announcements are contaminated by the endogenous response of policy rates to economic conditions, and can deliver information about the state of the economy to markets (see [Nakamura and Steinsson, 2018](#), [Jarociński and Karadi, 2020](#), and [Miranda-Agrippino and Ricco, 2021](#)) – a concern all the more relevant here, since SARB policy announcements coincide with the disclosure of the bank’s macroeconomic forecasts and of its expectations on the path of the policy rate. Following [Miranda-Agrippino and Ricco \(2021\)](#), we thus clean the four factors from information effects by regressing them on a measure of the SARB forecasts. The procedure delivers four IVs identifying the multiple dimensions of policy actions and communication – conventional monetary policy, exogenous forward guidance, term premia and country risk shocks – plus an IV for the information component of the bank’s communication.²

Fourth, in Section 5, we interpret the identified factors (and the information component) by examining market expectations from the Bloomberg market survey, the SARB’s communication in the MPC statements, and the business commentary in the local financial press. The narrative of events allows us to read (i) the short-end factor as related to conventional monetary policy actions; (ii) the medium-term factor as an implicit forward guidance factor, capturing shifts in the perceived path of the repo rate; (iii) the long-end factor as connected to economic and policy uncertainty, as communicated by the bank; and (iv) the country risk factor as related to the

²In the rest of the paper, and in line with the current literature, we refer to the disturbances identified with this IV as ‘information shocks.’ However, these are better understood not as a specific structural shock originating from the central bank itself, but as a convolution of the shocks to which the bank responds via its reaction function, and about which its announcements convey information to the markets.

SARB’s communication about risks to the economy – due either to critical external events or to internal political and institutional challenges to its mandate.

Finally, we employ the five IVs as external instruments (see [Stock and Watson, 2012](#) and [Mertens and Ravn, 2013](#)) to study the propagation of these different dimensions of monetary policy. Section 6 describes our medium-scale monthly VAR model, incorporating both macroeconomic and financial variables, and assesses the relevance of the IVs. Section 7 studies the transmission of conventional monetary policy and of the other policy shocks onto macro and financial aggregates. Section 8 concludes.³

The key and novel finding of our analysis is that the primary channel through which the SARB influences macroeconomic conditions is by affecting perceived country risk. Among the identified monetary policy shocks, country risk shocks account for the largest share in the variance decomposition. These shocks have significant contractionary effects: they raise the country’s default risk premium, prompt global investors to reallocate their portfolios, and reduce stock market value; the South African rand depreciates sharply against the U.S. dollar and the euro, while industrial production declines. This channel highlights that the central bank can effectively manage risks to the country’s macroeconomic stability and independence, thereby altering the expected distribution of future events.

What kind of events do these shocks capture? Our narrative analysis of business commentaries reveals that spikes in the country risk factor are associated with the perceived credibility (or lack thereof) of the SARB’s response to either external shocks that increase economic risk, or internal events that threaten its independence and price stability mandate. An example of the former is the rise in country risk following the collapse of Lehman Brothers in 2008, caused by the SARB’s lack of response and apparent unawareness of the associated risks. An example of the latter is the large reduction in country risk after the SARB’s unexpected 25 bps rate hike in March 2016, amid political turmoil sparked by the state capture scandals of Zuma’s presidency and challenges to the bank’s independence. Markets read the hike as a strong reaffirmation of the SARB’s independence and its commitment to sound macroeconomic policies. The Business Day economic editor wrote:

This is not the time to take any chances with either policy credibility or the exchange rate. [...] the dramatic disclosures of the Gupta family’s influence on ministerial appointments have undermined SA’s credibility with investors further and put new downward pressures on the rand. [...] if the committee’s response was on the hawkish side [...], it cannot be faulted for acting to manage the risks as best as it can.

³Additional results, model derivations, and details of our analysis are provided in an Online Appendix.

This channel may seem surprising at first, since central banks in advanced economies are generally not supposed to affect country and default risks. Yet, Mario Draghi’s ‘whatever it takes’ announcement was possibly an event of this kind: a central bank communication that drastically reduced the perceived risk of euro area disintegration, induced a repricing of country spreads, and had large macroeconomic effects (see [Leombroni et al., 2021](#), on this point). In emerging markets, one could say, every day is a whatever it takes day for policymakers.

Our analysis also delivers a rich set of additional results. First, conventional monetary policy shocks have conventional contractionary effects, in line with results from advanced economies and with no evidence of ‘perverse transmission’ (see [Gourinchas, 2018](#), for a discussion on this). A 100 bps exogenous tightening lifts the short end of the yield curve more than longer maturities; stock prices fall, bank credit issuance contracts, the CDS spread increases, industrial production strongly contracts, and prices fall. Second, policy decisions often come to market participants as a surprise, as evident in the high correlation (72%) between repo changes and short-term policy surprises – unlike the Federal Reserve’s and the ECB’s policy rate announcements. At the same time, conventional monetary policy shocks explain a small share of the variance of prices and industrial production, at the lower end of the one found for advanced economies (see, for example, [Forni et al., 2023](#)). Together, these results indicate that the lower predictability reflects a more volatile environment, in which policymakers must balance controlling inflation against protecting macroeconomic stability, rather than a lower quality of policymaking and communication. An important consequence of these facts is that the high-frequency identification of conventional monetary policy shocks yields results indistinguishable from those of traditional recursive methods – in contrast to advanced economies, where the two approaches deliver qualitatively and quantitatively distinct results (see, for example, [Gertler and Karadi, 2015](#) and [Miranda-Agrippino and Ricco, 2021](#)). While not conclusive, this suggests that for emerging economies where high-frequency identification is not feasible, robust old-style recursive identification could suffice. Third, the macroeconomic effects of the information shock are consistent with the central bank responding to supply shocks that depress output and increase prices.⁴ This differs from advanced economies, where information shocks appear related to demand factors (see [Jarociński and Karadi, 2020](#) and [Miranda-Agrippino and Ricco, 2021](#)), and is in line with the prevalent role of supply shocks in emerging markets (see [Frankel, 2010](#)). Fourth, forward guidance shocks lift the medium part of the yield curve, while output and prices are persistently negatively affected – an interesting result, given that the SARB does not explicitly use forward guidance as a policy tool. By contrast, the term premium factor, although significant in explaining yield

⁴The exception is the COVID shock, which, as an information event, appears akin to a large demand shock.

responses to announcements, is a very weak instrument after the information correction. This suggests it is largely endogenous rather than a policy tool for the SARB, which indeed does not employ unconventional instruments at the long end of the yield curve. One telling event is the announcement of a lower inflation target in July 2025, when the term premium factor was the only one to exhibit significant repricing – pointing to a reduction in policy and inflation uncertainty following the Bank’s adoption of a lower tolerance for inflation.

Literature review. In emerging markets, modern methods to study monetary policy have seen relatively few applications ([Frankel, 2010](#) surveys earlier approaches) – this paper being among the first to deliver a full study of the different dimensions of monetary policy in an emerging economy with high-frequency identification.⁵ Some of the works using high-frequency approaches in emerging markets report puzzling responses of output, inflation or exchange rates to conventional shocks identified using monetary surprises. For example, [Witheridge \(2024\)](#), which employs exchange rate surprises and also considers South Africa, interprets the puzzles as arising from policy frameworks characterised by fiscal dominance. Our results indicate instead that, in South Africa as in advanced economies, the puzzles are likely due to information effects – although, unlike in advanced economies, these mainly convey information about supply rather than demand shocks – and highlight the need to correctly disentangle the bundle of shocks underlying observed surprises. Importantly, while conventional monetary policy operates in South Africa in broadly standard ways, our results point to country risk as a distinct transmission channel that has not been documented for advanced economies.

The ability of monetary policy to influence macroeconomic conditions by altering risk-taking and risk premia has long been recognised as the ‘risk-taking channel’ of monetary transmission (see, among others, [Ireland, 2015](#), [Borio and Zhu, 2012](#), and [Bauer et al., 2023](#)). [Cieslak and Pang \(2021\)](#) provide a detailed empirical analysis of the effects of Federal Reserve announcements on risk premia, while [Hansen et al. \(2019\)](#) analyse the effects of policy communication and uncertainty on the long end of the yield curve. The literature has also pointed to the importance of risk premia in emerging economies, where their movements can disconnect short-term market rates from policy rates, compromising the very first step of monetary transmission (see, among others, [De Leo et al., 2025](#)). Against this backdrop, our results indicate that SARB announcements affect the perceived sovereign default risk – a novel channel of monetary policy.

⁵Other important exceptions include [Checo et al. \(2024\)](#), which uses analysts’ forecasts of policy rate decisions to construct measures of conventional policy shocks for a panel of emerging markets; [Lakdawala and Sengupta \(2021\)](#), which applies high-frequency identification to monetary policy in India; [Shieh \(2024\)](#), [He et al. \(2024\)](#) and [Ma et al. \(2025\)](#), which construct daily surprises for China; and [Kohlscheen \(2014\)](#), [Witheridge \(2024\)](#), [Bolhuis et al. \(2024\)](#) and [Ha et al. \(2025\)](#), which provide exercises based on daily surprises across different pools of emerging markets. [Rebucci et al. \(2022\)](#) and [Carruthers \(2025\)](#) are among the very few studies on unconventional monetary policy in emerging markets.

While our analysis focuses on the business cycle effects of these shocks – which are large – we hypothesise that permanent shocks of this nature could have long-term effects on the growth rates of emerging economies by influencing the cost of capital and, consequently, investment. We leave this suggestion for future research.

Previous research on advanced economies has shown that establishing a credible inflation target and ensuring central bank independence anchors the long end of the yield curve and reduces its responsiveness to news (see [Gürkaynak and Wright, 2012](#), for a review) – as with the fall in long-term gilt yields upon the announcement, in 1997, of the Bank of England’s independence ([Gürkaynak et al., 2010](#)).⁶ The drop in the term premium factor that we document following the SARB’s announcement of a lower inflation target in July 2025 is in line with this evidence. Adding to these seminal contributions, our findings highlight the importance of policy framework credibility in determining the sensitivity of long-term interest rates to economic news and monetary policy announcements.

1 The policy framework in South Africa

South Africa is a small open economy with modern economic institutions: flexible exchange rates, an open capital account, deep financial markets, an independent central bank, and inflation targeting. Yet, it is an emerging economy with high exposure to capital flows and foreign shocks, high wealth and income inequality, and a potentially fragile institutional framework.

Our study covers roughly four periods of the country’s recent economic history over the sample 2002–2025. Before the 2008 global financial crisis, the SARB pursued its inflation mandate amid booming demand, rising inflation, an appreciating currency, and favourable external conditions. From the 2008 global financial crisis until the Federal Reserve’s tapering in late 2013, large external shocks forced a delicate balancing act between price stability and macroeconomic risks. The third period is marked by deteriorating growth, state capture under Zuma’s presidency, and mounting challenges to the SARB’s independence. The final period begins with the COVID pandemic in March 2020 and the global inflationary surge that followed, and features extraordinary capital market interventions in 2020, the June 2022 reform of the implementation framework towards a tiered floor system, and the adoption of a lower inflation target at the end of our sample.

⁶[Gürkaynak et al. \(2005b\)](#) document the excess sensitivity to news of the long end of the U.S. yield curve before the Fed formalised its 2% target in 2012.

1.1 The monetary policy framework

The independence of the central bank is enshrined in South Africa's democratic constitution, providing it a stronger foundation than in many advanced economies. Article 224 of the constitution defines the objective of the South African Reserve Bank as 'to protect the value of the currency in the interest of balanced and sustainable economic growth in the Republic', and states that 'the South African Reserve Bank, in pursuit of its primary object, must perform its functions independently and without fear, favour or prejudice'. Indeed, the independence of the central bank and its objective of price stability have been regularly reasserted in Monetary Policy Committee (MPC) statements, Governor speeches, and acts of Parliament.

South Africa adopted inflation targeting in 2000, one of the earliest emerging market economies to do so. The target for inflation – communicated by the Minister of Finance after consultation with the SARB – was defined as the band of 3-6% for the headline consumer price index, as calculated by Stats SA. Since 2017, the MPC has emphasised its aim to maintain inflation close to 4.5%, the midpoint of the target range, and since 2021 the SARB has argued in favour of targeting a lower rate of inflation. In July 2025, the Bank announced its intention to aim at a 3% inflation rate, corresponding to the lower bound of the existing target band. On 12 November 2025, the Minister of Finance reached an agreement with the SARB and formally announced the new 3% target, accompanied by a 1% tolerance band.

The SARB does not target the exchange rate and does not seek to affect its volatility, leaving the exchange rate free to float. In fact, the SARB's participation in FX markets is limited to the accumulation of foreign reserves, which constitute, alongside gold, almost the entire asset side of its balance sheet.

The MPC is responsible for formulating monetary policy to meet the SARB's price stability objective. It meets at least six times per year, with meetings held over two days, and sets the repurchase rate (repo rate), the main steering tool of monetary policy in South Africa. Decisions are taken by consensus, and the SARB's Financial Markets Department implements the interest rate policy as determined by the MPC.

The monetary policy decisions are communicated in the form of MPC statements, while the Governor delivers a press statement at a televised press conference, which includes a question-and-answer session with financial journalists. A statement usually gives an overview of important domestic and foreign economic developments, informs about the level of the repurchase rate as set by the MPC, and provides the reasoning for this choice. The MPC statement is published on the SARB website during the media briefing. Alongside the statement, the SARB releases

a report with up to two-year-ahead quarterly forecasts of key macroeconomic variables, such as the GDP growth rate, CPI inflation and the repurchase rate. The SARB also holds post-MPC meetings with domestic and international investors and analysts to further clarify its actions and outlook.

The MPC meeting dates vary from year to year, and are typically announced in the last MPC statement of the previous year. Since February 2000, when the SARB introduced the inflation targeting framework, the vast majority of MPC meetings have been scheduled – 153 out of 161 in total. Most unscheduled meetings occurred during the global financial crisis of 2008-2009 – i.e. in March, May, September and November 2009. With the exception of 2020, there have been six MPC meetings per year since 2010, held every other month.⁷

Until 2022 the SARB operated a classical cash reserve system, whereby a money market shortage was created by levying a cash reserve requirement on banks. In this system, banks refinanced their shortage at the SARB through weekly repo auctions, conducted every Wednesday with a maturity of seven days, at the prevailing repo rate as determined by the MPC.⁸ The SARB does not provide unsecured loans, and participating banks therefore have to provide eligible collateral as security for the funds received. In June 2022, the SARB moved from this standard corridor system to a surplus, or tiered floor, system. The SARB intervened to support the secondary government bond market only at the beginning of the COVID-19 pandemic; aside from this episode, no other unconventional monetary policy tools have been used.⁹

1.2 Financial markets

South Africa has a well-developed and relatively liquid financial market. The foreign exchange market's turnover is consistently among the top 20 in the world, with a daily average turnover of 78 billion U.S. dollars (in 2025), approximately 18% of annual GDP (see [BIS, 2025](#)). The stock market capitalisation is around 300% of GDP and the size of the domestic bond market is around 85% of GDP. The bond market is dominated by government debt instruments, mainly denominated in domestic currency, with an average maturity of 14.8 years (in 2020) compared to the emerging market average of 8 years. Non-resident trading in domestic securities is substantial, especially in the fixed income market, where foreign holdings of national government

⁷The MPC meeting dates are reported on the [SARB website](#). Starting from 2010, MPC meetings have been held in January, March, May, July, September and November of every year.

⁸During the MPC rate decision week, the main repo auction is conducted for two days (maturing on a Friday) and then again for five days (maturing on the next Wednesday).

⁹In response to the crisis, the SARB also introduced several measures to inject liquidity into the market, including an intra-day supplementary repo auction and a long-term repo of up to 12 months. These instruments were discontinued in December 2020 and March 2021, respectively, following a gradual return to normal money market conditions.

bonds reached a maximum of 43% in 2018 before receding to below 30% in 2022 (see [SARB, 2022b](#)).

The market for derivative instruments, which is important for this study, is also well-developed. The South African rand is the most traded emerging market currency in the OTC interest rate derivatives market. The daily turnover of rand-denominated interest rate derivatives exceeds 85 billion U.S. dollars, the seventh largest market in the world by volume. The bulk of these are interest rate swaps, with a daily turnover of 83 billion U.S. dollars, while the forward rate agreements' daily turnover was 2.1 billion U.S. dollars in 2025 (see [BIS, 2025](#)).

2 Surprises, information, risk and monetary shocks

To provide a framework for our empirical approach, we proceed in two steps. First, we write down an affine model of the yield curve in the spirit of [Ang et al. \(2007\)](#) and [Smith and Taylor \(2009\)](#), extended to feature persistent inflation and a range of shocks. Second, we embed the model in an imperfect information setting and derive the structure of monetary policy surprises. Details of the derivations are provided in the Online Appendix [A](#).

2.1 A term structure model with shocks

Let us consider an affine model of the yield curve in which the central bank targets inflation, and different types of shocks affect the interest rates:

$$r_t = \delta\pi_t + \sigma_{mp}u_t^{mp} + \sigma_{fg}u_{t-h|t}^{fg}, \quad (1)$$

$$i_t^{(n)} = -\frac{1}{n} \log P_t^{(n)}, \quad (2)$$

$$P_t^{(n+1)} = E_t \left[m_{t+1} P_{t+1}^{(n)} \right], \quad (3)$$

$$m_{t+1} = e^{-r_t - \frac{1}{2}\lambda_t^2 - \lambda_t u_{t+1}^\pi}, \quad (4)$$

$$\lambda_t = -\gamma_t - \psi\pi_t - \xi_t, \quad (5)$$

$$\xi_t = \rho\xi_{t-1} + \sigma_\xi u_t^\xi, \quad (6)$$

$$\gamma_t = \gamma_{t-1} + \sigma_\gamma u_t^\gamma, \quad (7)$$

$$\pi_t = \alpha\pi_{t-1} - \phi(r_{t-1} - \pi_{t-1}) + \sigma_\pi u_t^\pi. \quad (8)$$

In the model, the five shocks affecting the yield curve – inflation (u_t^π), monetary policy (u_t^{mp}), h -period-ahead forward guidance ($u_{t-h|t}^{fg}$), risk attitude (u_t^ξ), and level risk (u_t^γ) – are independent and identically distributed normal white-noise processes, $u_t^i \sim \text{i.i.d. } \mathcal{N}(0, 1)$ for $i \in$

$\{\pi, mp, fg, \gamma, \xi\}$.¹⁰

The Taylor rule in Eq. (1) has the short-term nominal interest rate r_t reacting to the inflation rate, with a policy response coefficient $\delta > 0$. Eq. (2) gives the yield to maturity of a zero-coupon bond with a face value of 1 that matures in n periods, where $P_t^{(n)}$ is the price of the bond at time t . Eq. (3) is a no-arbitrage condition showing that the price of an $n + 1$ period bond at time t must equal the expected present discounted value of the price of an n -period bond at time $t + 1$, where m_t is the stochastic discount factor.

The stochastic discount factor (Eq. 4) is modelled using a functional form that is standard in the affine term structure literature. The risk factor (Eq. 5) is important in our discussion. We model it as the sum of three terms: (i) a level risk-premium parameter, γ_t , which follows a random walk (Eq. 7); (ii) a time-varying risk-premium component that responds to changes in inflation with a constant parameter, ψ ; and (iii) a temporary disturbance to risk attitude, ξ_t , which follows an AR(1) process (Eq. 6). For the purposes of our discussion, we interpret permanent movements in γ_t as capturing the overall country risk perceived by investors, while ξ_t represents transitory increases in risk at business-cycle frequency, for example due to risk-on/risk-off shifts in investors' attitudes. Finally, Eq. (8) is the dynamics of inflation, which is a function of the lagged real interest rate and past inflation.

The model described by Eqs. (1–8) admits an affine term-structure solution. One limitation of this class of models, however, is that shocks to second moments – which may be relevant for our discussion, such as increases in policy uncertainty – cannot be incorporated easily while preserving the affine solution. A possible way to address this issue, while maintaining the tractability of the model, is to consider how changes in the variance of policy shocks affect the solution of the model above. This approach is equivalent to assuming that the volatility of policy shocks evolves according to

$$\sigma_{mp,t} = \sigma_{mp,t-1} + u_t^{\sigma_{mp}}, \quad (9)$$

yet agents do not price this source of risk, effectively treating volatility as constant when forming expectations. Once shocks to volatility are realised, however, agents update the pricing equations of the model, so that policy-uncertainty shocks are reflected in bond prices. Under these assumptions, we can derive the following results.

¹⁰The forward guidance shock, $u_{t-h|t}^{fg}$, is an exogenous disturbance in the policy equation that is announced at time $t - h$ and realised at time t .

Lemma 1. *The yield curve described by the model in Eqs. (1–9) is¹¹*

$$i_t^{(n)} = a_n + b_n \pi_t + c_n u_t^{mp} + d_n \xi_t + f_{(h),n} u_{t|t+h}^{fg} + g_n \gamma_t + h_n u_t^{\sigma_{mp}}, \quad (10)$$

with the coefficients of the disturbances being functions of the parameters of the model. Furthermore, the response coefficients of the yield curve

- (i) to an inflation shock decrease monotonically over the maturities;
- (ii) to the level risk premium and the monetary policy uncertainty shocks increase monotonically over the maturities;¹²
- (iii) to the risk attitude shock first increase and then decrease over the maturities, i.e. there exists n^* such that $\frac{\partial d_n}{\partial n} > 0$ for $n < n^*$, while $\frac{\partial d_n}{\partial n} < 0$ for $n > n^*$.

Under a standard calibration, an exogenous monetary policy shock raises the short end of the yield curve, depresses medium maturities, and dies out at the long end of the curve. The negative response of medium maturities reflects the endogenous reaction of the central bank to the contractionary effects of its own disturbances. An h -period-ahead forward guidance shock affects the yield curve in the same way as a conventional monetary policy shock, but with its effects shifted by h maturities, and equal to zero at shorter maturities.

These results show that different shocks affect the yield curve differentially at various maturities, conditional on their persistence and transmission – Figure 1 plots the responses for a reasonable set of parameters, similar to the one proposed by Smith and Taylor (2009). The figure also reports the effects of a policy shock that is autocorrelated and to which the central bank is assumed not to respond. This contrasts the effects of a policy shock that influences the yield curve both directly and through the endogenous response of the central bank, with those of a persistent exogenous tightening that involves no policy self-correction.

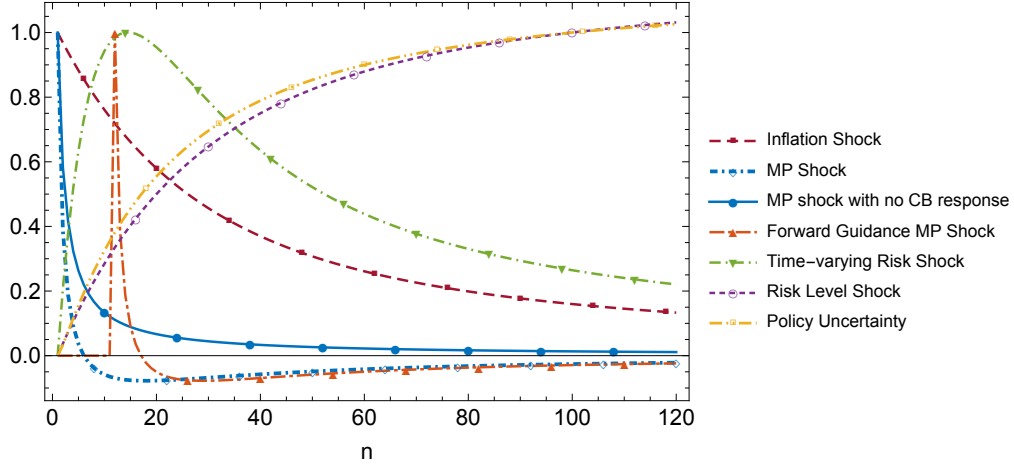
The dynamic heterogeneity of the yield curve response makes it possible to use restrictions on its maturity structure to extract meaningful policy surprises. However, and this is the key intuition delivered by the model, the mapping is not unique: several shocks generate broadly similar movements in the yield curve and therefore cannot be disentangled without additional information beyond that contained in yields alone. A few observations are in order.

First, the monetary policy shock lifts the short end of the yield curve and dies out at the long end, with the behaviour at medium frequencies shaped by its persistence and whether the central

¹¹If the bank provides forward guidance h horizons ahead at each point in time, the affine term structure would contain a sum over the forward guidance shocks announced between $t - h$ and t , i.e. $\sum_{j=0}^h f_{(j),n} u_{t-h+j|t+j}^{fg}$.

¹²The coefficient h_n of the response of the yield curve to policy uncertainty shocks is proportional to $\sigma_{mp,t-1}$.

Figure 1: Impact of shocks on the yield curve



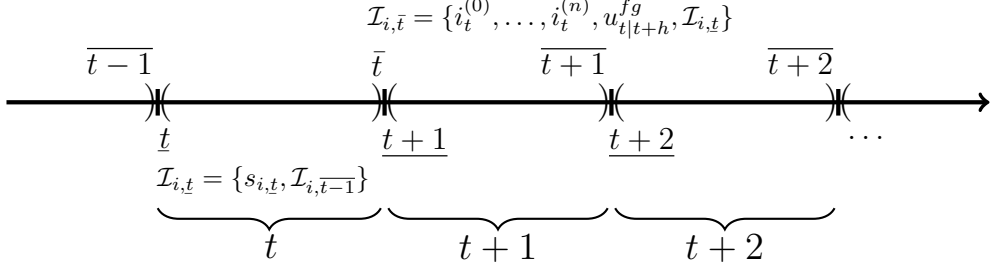
Note. Impact of shocks onto the yield curve at maturities between 0 and 120 months. Shocks are normalised to have impact equal to one at peak. The parameters are as follows: $\alpha = 0.95$, $\phi = 0.15$, $\delta = 1.5$, $\rho = 0.9$, $\psi = 0.25$, $\sigma_{\pi} = 0.25$, $\sigma_{\xi} = 0.25$, $\sigma_{\gamma} = 0.01$. In the baseline we select $\sigma_{mp} = 0.25$. The policy uncertainty shock doubles the variance σ_{mp} and its effects are normalised to have impact equal to one at peak, as the other shocks. The forward guidance shock is realised at horizon $h=12$, and $\sigma_{fg} = 0.25$.

bank reacts to the effects of its own shocks. An inflation shock can affect maturities similarly, but – conditional on its persistence – it may have more mass over the medium maturities. This implies that information effects due to the central bank’s communication and monetary policy shocks would be ‘unspanned’ by identification schemes using only the yield curve, a general insight that underpins different approaches to disentangle information effects from policy shocks using other assets as in [Jarociński and Karadi \(2020\)](#), or forecasts as in [Miranda-Agrippino and Ricco \(2021\)](#).

Second, an exogenous forward guidance shock shifting expectations about the forward policy path would affect the medium segment of the yield curve. Information about the expected forward path of inflation or other macro variables to which interest rates may respond (endogenous forward guidance) would have a similar impact. Beyond exogenous and endogenous forward guidance, the mid-segment of the yield curve can also be affected by a temporary increase in risk premia, such as the one we model. These three types of shocks would be ‘unspanned’ by identification schemes using only the yield curve, and hence forward guidance policy shocks could be confounded with information and risk shocks.

Third, long-run factors due to debt sustainability, confidence in the policy framework, political factors, etc. affect the country risk and hence the yield curve with an increasing profile over maturities, with the largest effects at the long end of the yield curve. Some of these factors may be country-specific, while others may relate to how policy communication shapes the risk attitude of markets conditional on global events. Also, increases in the perceived policy uncertainty

Figure 2: The information flow



Note. At the beginning of each period t , agent i receives a private noisy signal of π_t and updates their information set $\mathcal{I}_{i,\bar{t}-1}$. Agents observe the policy rate and update their information sets again at the end of the period.

– i.e. uncertainty about the policy path – steepen the yield curve by increasing the term premia and have similar effects to country risk shocks.

2.2 Information effects

We now embed the term structure model in an environment characterised by imperfect information, following [Miranda-Agrippino and Ricco \(2021\)](#). Markets are open at the beginning, $\underline{t}$, and at the closing, $\bar{t}$, of each period t . Agents form expectations given the signals they receive about the state of the economy and the policy rate that is announced during the period, and trade bonds of different maturities.

In particular, each agent i in the economy does not directly observe π_t , but receives a private noisy signal of π_t at the beginning of the time period $t = [\underline{t}, \bar{t}]$ (see Figure 2): $s_{i,\underline{t}} = \pi_t + \nu_{i,\underline{t}}$, $\nu_{i,\underline{t}} \sim \mathcal{N}(0, \sigma_{n,\nu})$. Given the signal, and conditional on their information set $\mathcal{I}_{i,\underline{t}} = \{s_{i,\underline{t}}, \mathcal{I}_{i,\bar{t}-1}\}$, agents update their expectations from the closing time of the previous period, $F_{i,\bar{t}-1}\pi_t$, and form expectations $F_{i,\underline{t}}\pi_t$ via the Kalman filter:

$$F_{i,\underline{t}}\pi_t = K_1 s_{i,\underline{t}} + (1 - K_1) F_{i,\bar{t}-1}\pi_t, \quad (11)$$

$$F_{i,\underline{t}}\pi_{t+h} = (\alpha - \phi(\delta - 1))^h F_{i,\underline{t}}\pi_t \quad \forall h > 0, \quad (12)$$

where K_1 is the Kalman gain which represents the relative weight placed on new information relative to previous forecasts.¹³ Given their forecasts, at $\underline{t}$, agents trade bonds of different maturities.

At opening time $\underline{t}$ the central bank observes a private noisy signal of the state of the economy

¹³If the signal were perfectly revealing then $K_1 = 1$, while in the presence of noise $K_1 < 1$. Thus, $(1 - K_1)$ can be seen as the degree of information rigidity faced by the agents.

in period t , $s_{cb,t} = \pi_t + \nu_{cb,t}$, $\nu_{cb,t} \sim \mathcal{N}(0, \sigma_{cb,\nu})$.¹⁴ Given this signal, the central bank updates its expectations, sets and announces the interest rate, following its policy rule

$$r_t = i_t^{(0)} = \delta F_{cb,t} \pi_t + \sigma_{fg} u_{t-h|t}^{fg} + \sigma_{mp} u_t^{mp}. \quad (13)$$

The bank can also announce future forward guidance actions, $u_{t|t+h}^{fg}$.

Agents observe the interest rate r_t at closing time $\bar{t}$ and update their expectations and trade bonds at different maturities. The policy rate is a public signal about the state of the economy to the agents. In fact, conditional on observing r_t and r_{t-1} (and knowing K_{cb} – the Kalman gain of the central bank –, and the previously announced forward guidance, $u_{t-h|t}^{fg}$), agents extract a public signal on π_t , i.e. $\tilde{s}_{cb,\bar{t}} = \pi_t + \tilde{\nu}_{cb,t}$.^{15,16}

At $\bar{t}$, conditional on this public signal, agents update their information set, $\mathcal{I}_{i,\bar{t}} = \{r_t, \mathcal{I}_{i,t}\}$, and their forecasts

$$F_{i,\bar{t}} \pi_t = K_2 \tilde{s}_{cb,\bar{t}} + (1 - K_2) F_{i,t} \pi_t, \quad (14)$$

$$F_{i,\bar{t}} \pi_{t+1} = (\alpha + \phi) F_{i,\bar{t}} \pi_t - \phi r_t, \quad (15)$$

$$F_{i,\bar{t}} \pi_{t+h} = (\alpha - \phi(\delta - 1))^{h-1} F_{i,\bar{t}} \pi_{t+1} \quad \forall h > 1, \quad (16)$$

where K_2 is the Kalman gain, as given by the noise in the public signal $\tilde{\nu}_{cb,t}$. Observing that from the point of view of the agents, it has to be true that $i_t^{(0)} = r_t = \delta F_{i,\bar{t}} \pi_t + \sigma_{mp} F_{i,\bar{t}} u_t^{mp}$, we obtain the following result.

Lemma 2. *The monetary policy surprises and the market revisions of expectations, i.e. the information effects, at different maturities are such that:*

$$i_t^{(0)} - F_{\bar{t}} i_t^{(0)} = (1 - K_1)(1 - K_2)(1 + \delta\phi)(i_{t-1}^{(0)} - F_{\bar{t}-1} i_{t-1}^{(0)}) + v_t, \quad (17)$$

$$i_t^{(n)} - F_{\bar{t}} i_t^{(n)} = b_n(F_{\bar{t}} \pi_t - F_{\bar{t}} \pi_t) + c_n F_{\bar{t}} u_t^{mp} + d_n \xi_t + f_{(h),n} u_{t|t+h}^{fg} + g_n \gamma_t + h_n u_t^{\sigma_{mp}}, \quad (18)$$

¹⁴It is generally assumed that the signal observed by the central bank is more precise than the one observed by agents: $\sigma_{cb,\nu} < \sigma_{n,\nu}$; however, this is not necessary for our discussion, and only the magnitude, not the type, of the effects would change.

¹⁵In South Africa, the central bank also discloses its forecasts. To the agents, they are a noisy public signal of the state of the economy in the same way the interest rate is. This observation does not change the substance of this discussion.

¹⁶The noise in the signal $\tilde{s}_t$ is coloured, and not orthogonal to the state. Hence, it does not fulfil the standard conditions under which the Kalman filter is derived. Unmodelled dynamics can degrade the filter performance. We abstract here from these considerations, which would require robust control methods.

$$\begin{aligned}
F_{\bar{t}}\pi_t - F_{\underline{t}}\pi_t &= (1 - K_1)(1 - K_2)(F_{\bar{t}-1}\pi_t - F_{\underline{t}-1}\pi_t) \\
&+ (1 - K_1)(1 - K_2)\phi(i_{t-1}^{(0)} - F_{\underline{t}-1}i_{t-1}^{(0)}) \\
&+ K_2 \left[(1 - K_1)\sigma_\pi u_t^\pi - (1 - K_1)(\alpha + \phi)\tilde{\nu}_{cb,\bar{t}-1} + \tilde{\nu}_{cb,\bar{t}} \right],
\end{aligned} \tag{19}$$

where v_t is a convolution of past and current shocks.

Our results provide insight through the following predictions about the content of monetary policy surprises. First, the presence of information frictions generates autocorrelation in policy surprises and predictability using past information. Second, monetary policy surprises at different horizons result from various combinations of information, conventional and forward guidance monetary policy shocks, and changes to risk premia. Third, and specifically, conventional monetary policy and information shocks dominate the response of the short end of the yield curve. The mid-segment of the yield curve reflects a mix of exogenous forward guidance shocks, information, and possibly transitory increases in risk premia. Changes to country risks and increases in monetary policy uncertainty dominate the long end of the yield curve. In our empirical analysis, we apply this insight provided by the model.

3 Monetary policy surprises in South Africa

The construction of the monetary policy surprises proceeds in the following steps: (i) we build daily price revisions of interest rate derivatives around monetary policy decisions; (ii) we extract four principal components from these price revisions that capture meaningful commonalities; (iii) we rotate the principal components to identify specific dimensions of monetary policy.

3.1 Market-based policy surprises

To construct measures of news contained in monetary policy announcements, we study interest rate derivatives' price changes as a proxy for markets' revisions of expectations triggered by the central bank policy communication, at different horizons. In doing so we think of the assets' values before the monetary policy announcement as reflecting the market's expectation about economic conditions and the policy rate decision to be made at the next MPC meeting, and the value after the announcement as capturing the reaction of the market to it, and their updated expectations. The difference between these values captures the 'news' delivered by monetary policy announcements.

We measure the price revisions over a daily window around the MPC. Specifically, we take

the difference between the closing value of each asset on the day of an MPC meeting and the closing value on the previous day:¹⁷

$$mps_{t_{MPC}}^{(i)} = P_{t_{MPC}}^{(i)} - P_{t_{MPC}-1}^{(i)}, \quad (20)$$

where $mps_{t_{MPC}}^{(i)}$ is the price reaction of asset i to the MPC announcement, $P_{t_{MPC}}^{(i)}$ is the end-of-day value of an asset i on the day of the MPC, t_{MPC} , and $P_{t_{MPC}-1}^{(i)}$ is the end-of-day value of an asset i on the day before.

We construct daily price changes on the days of monetary policy announcements, on the sample 2002M6-2025M8, for the following instruments: 3-month Johannesburg Interbank Average rate (Jibar); Forward Rate Agreements (FRAs) at different horizons – FRA1x4, FRA3x6, FRA6x9, FRA9x12, FRA12x15, FRA15x18, FRA18x21, FRA21x24; Interest Rate Swaps at different maturities – Sw1Y, Sw2Y, Sw3Y, Sw5Y, Sw10Y; and the 5-year country default swap (CDS) spread for South Africa (CDS 5Y).

The 3-month Jibar interbank rate is a widely used and accepted benchmark short-term rate at the South African financial market underlying various contracts and valuations. Jibar is constructed using quoted rates for Negotiable Certificate of Deposits (NCD) by Jibar contributing banks (SARB, 2022a). It captures the expected prevailing rate three months ahead.¹⁸ FRA contracts and interest rate swaps are interest rate derivatives based on the 3-month Jibar rate.¹⁹ The termination date of FRAs in the dataset ranges from 4 to 24 months, while the expiration of interest rate swaps spans from 1 to 10 years.²⁰ Hence, the maturity structure of the interest rate derivatives we employ can capture expectations about monetary policy and the economy up to a 10-year horizon. We include in the dataset the 5-year CDS spread for South Africa as a proxy of a sovereign default risk to detect the effect of SARB MPC announcements on the

¹⁷We do not use the intraday window, which is a convention in the literature on high-frequency identification of monetary policy shocks, for two reasons. First, the lower liquidity of the South African market as compared to markets in the U.S. or the euro area implies that price changes in a narrow window do not necessarily reflect the surprise component induced by policy announcements, since it may take longer for agents to find a transaction counterparty, and accordingly, it takes longer for market values to settle and reflect agents' views on fair asset valuations post-MPC meeting announcements. Second, the high-frequency (minute- and tick-) data are available to us starting from 2008 only, so resorting to an intraday window would reduce our sample by 6 years.

¹⁸For the 3-month Jibar, we use the difference between the end-of-day value on the day after the MPC meeting and the end-of-day value on the day of the MPC meeting: $mps_{t_{MPC}}^{3M \text{ Jibar}} = P_{t_{MPC}+1}^{3M \text{ Jibar}} - P_{t_{MPC}}^{3M \text{ Jibar}}$. This is due to 3-month Jibar interbank rate values being updated daily around 10:30 am (SARB, 2022a), such that post-MPC announcement values are published only on the next day after the MPC meeting.

¹⁹FRA1x4 is a 1-month ahead forward contract on the 3-month Jibar rate.

²⁰We convert forward rates indicated by FRA contracts to their swap rates' counterparts. This transformation ensures consistency of rates used for the principal components extraction, such that factor loadings are compatible and interpretable. Details of the conversion to swap rates are in the Online Appendix B.

country’s risk valuations.²¹

3.2 Factors in monetary policy surprises

We extract common components from the full set of daily price revisions around monetary policy decisions, using principal component analysis. In doing so we consider the surprises as having a factor structure of the form

$$X_t = \Lambda F_t + \varepsilon_t, \quad (21)$$

where X_t is the n -dimensional vector of the market-based surprises at time t across all of the assets considered, F_t is a k -dimensional vector of unobserved factors ($k < n$), Λ are factor-specific loadings, and ε_t captures the idiosyncratic components.

We estimate the number of factors in the model in Eq. (21) by testing for the number of unobserved factors using three leading methods in the literature: the criterion of [Bai and Ng \(2002\)](#), the test of [Onatski \(2010\)](#) and the procedure proposed by [Alessi et al. \(2010\)](#).²² Two alternative samples are considered: a short sample that excludes the COVID-19 pandemic and the subsequent period, covering 2002M6–2020M1, and a long sample spanning 2002M6–2025M8. The tests consistently detect four common factors in our dataset of asset price revisions for both samples (see Table II in the Online Appendix for the results). Given this evidence, we extract four factors using the principal component analysis (PCA) approach.²³

3.3 Identified monetary factors

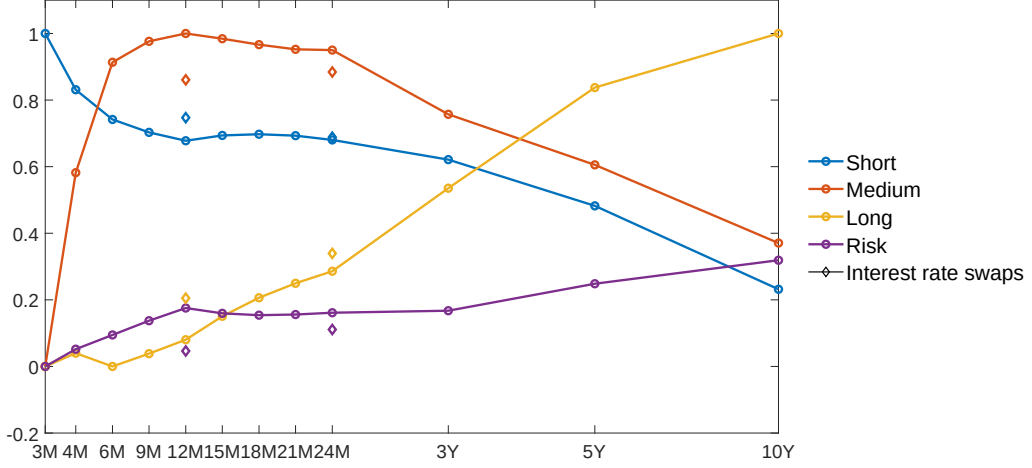
As discussed in [Gürkaynak et al. \(2005a\)](#), one has to transform the principal components extracted from high-frequency price revisions to identify specific dimensions of monetary policy and allow for economic interpretation. Technically, the issue is that loadings and factors in Equation

²¹CDS contracts are used by market participants to insure against the risk of sovereign default or debt restructuring (see, for example, [Longstaff et al., 2011](#)). We focus on five-year CDS contracts – the typical maturity in this market – which are also the only contracts available over the full sample.

²²The criterion proposed by [Bai and Ng \(2002\)](#) determines the number of factors under the assumption that all eigenvalues of the idiosyncratic covariance matrix are bounded as the cross-sectional dimension of the dataset increases. The approach of [Alessi et al. \(2010\)](#) extends the [Bai and Ng \(2002\)](#) criterion and is shown to yield more reliable estimates due to improved penalisation, thereby mitigating the sensitivity of the results documented by [Forni et al. \(2009\)](#). In contrast, the method of [Onatski \(2010\)](#) does not require the eigenvalues of the idiosyncratic covariance matrix to be bounded and performs well in settings where idiosyncratic components exhibit substantial cross-sectional correlation.

²³A reading of correlations between the common components and the individual assets provides useful preliminary information (see Table III in the Online Appendix). The first PC captures most of the variation in surprises at short and medium horizons. The second PC loads on the sovereign risk premium surprises and explains a substantial part of surprises at both long and short horizons. The third PC reflects the variation in sovereign risk and long-horizon interest rate surprises that is uncorrelated with surprises in the short-term rate. The fourth PC explains the remaining variation in the 3M Jibar surprises.

Figure 3: Identified factor loadings



Note. The ticks' location on the x-axis is scaled to improve readability at the short end of the curve. The factor loadings on forward rate agreements are marked with circles, while the loadings on interest rate swaps are reported with diamond-shaped marks. This to distinguish forward agreements and rate swaps with the same expiration dates, i.e. FRA9x12 and Sw1Y with one year expiration, and FRA21x24 and Sw2Y contracts with two years expiration.

(21) are identified only up to an orthonormal transformation: for any orthogonal matrix U such that $U'U = 1$, there exists a transformation $\tilde{F}_t = UF_t$ and $\tilde{\Lambda} = \Lambda U'$ that leaves X_t and ε_t unchanged. Hence, one has to use economic assumptions to provide meaning to the factors.

We identify a unique orthonormal matrix U^* by imposing a set of restrictions motivated by the model in Section 2. The orthonormality of U^* – i.e. the four factors having unit length and being orthogonal to each other – pins down ten restrictions on the elements of the four-by-four rotation matrix (see Section C.3 of the Online Appendix for details), leaving six degrees of freedom for U to be uniquely identified. First, we assume that the first factor – F1 or ‘short-term factor’ – is the only factor that loads on market surprises in the 3M Jibar interbank rate, the shortest horizon in our dataset. This amounts to three zero restrictions – for F2, F3 and F4 on the 3M Jibar surprise – thereby using three degrees of freedom, and is in line with the assumption proposed by [Gürkaynak et al. \(2005a\)](#) to identify what they call a ‘target factor.’ Second, we impose that the second factor (F2) and the third factor (F3) do not explain variation in CDS surprises, so that only the fourth factor (F4) does, making the latter a ‘country risk factor.’ This amounts to two more zero restrictions – for F2 and F3 on the CDS surprise – and uses another two degrees of freedom.²⁴ Finally, we assume that the second factor (F2) is a ‘medium-term

²⁴Section C.4, in the Online Appendix, reports a robustness test on the zero restrictions of F2 and F3 on the CDS surprise. In particular, we consider an alternative set of restrictions where F2 is constrained not to load on the 10 year maturity, F3 – not to load on the CDS, while the share of variation in CDS surprise explained by F4 is maximised.

Table 1: Variance contributions by identified factors

	3MJibar	FRA1x4	FRA3x6	FRA6x9	FRA9x12	FRA12x15	FRA15x18	FRA18x21
Short-term	96.9	66.9	53.3	47.9	44.5	46.6	47.1	46.6
Medium-term	0.0	16.8	41.4	47.3	49.6	48.1	46.3	45.0
Term premium	0.0	0.1	0.0	0.1	0.5	1.6	3.1	4.5
Country risk	0.0	0.3	0.9	1.9	3.1	2.5	2.4	2.4
Residual	3.1	15.9	4.4	2.8	2.4	1.1	1.1	1.6
	FRA21x24	Sw1Y	Sw2Y	Sw3Y	Sw5Y	Sw10Y	CDS5Y	
Short-term	44.8	54.1	45.9	37.4	22.5	5.2	0.3	
Medium-term	44.8	36.8	38.8	28.4	18.2	6.8	0.0	
Term premium	5.9	3.0	8.3	20.6	50.5	71.9	0.0	
Country risk	2.6	0.2	1.2	2.8	6.1	10.1	99.4	
Residual	1.9	5.9	5.7	10.8	2.7	5.9	0.3	

Note: The table reports the fraction of the variance explained by the short-term, medium-term, term premium and country risk factors in daily surprises around MPC announcements of instruments indicated in the first and the seventh rows in percentage points over the 2002M6-2025M8 sample. The row ‘Residual’ reports the fractions of the variance not explained by the factors.

factor,’ extracted to maximise the share of variation explained in 6M surprises, thereby affecting the mid part of the term structure and capturing cyclical dynamics. This maximisation exhausts the last degree of freedom. The third factor (F3), which in principle can explain a larger share of the variation at longer maturity, but not the CDS, is interpreted as a ‘term premium factor.’ Notably, any co-movement between the term premia and default risk on the MPC announcement day is attributed to the country risk factor due to the zero restriction for F3 on the CDS.

The identified factor loadings in Figure 3 and their explained variances in Table 1 show that the short-term factor lifts the short end of the yield curve, with decreasing effects at longer maturities – similarly to conventional monetary policy and short-term information. The medium-term factor presents a similar pattern with a shifted peak: it is prominent in explaining surprises at horizons from 6M to 36M and plays a smaller role beyond 5Y. While there is no explicit forward guidance in South Africa, the SARB discloses its macroeconomic forecasts – including the repo rate projections – at the moment of the MPC announcement, and the press conference provides further details on the Bank’s forward thinking.²⁵ This provides a rationale for interpreting the second factor as capturing changes in the markets’ expected policy path, as triggered by the Bank’s communication. The importance of the term premium factor increases smoothly over the maturities, in line with its interpretation as connected to risks to the economy and uncertainty about the policy path. Finally, the country risk factor is the main factor explaining surprises in the sovereign risk premium; its loadings increase over the maturities and flatten out roughly after the one-year horizon.

A falsification or ‘placebo’ test – whereby we construct factors applying the same methodology to daily price changes computed 2, 12 and 20 days before each MPC meeting – lends support to

²⁵The SARB started publishing the repurchase rate projections in 2017.

the identified factors correctly capturing the market response to MPC announcements.²⁶

3.4 Financial asset responses

How do the monetary policy surprises map into revisions along the yield curve and other financial assets? To investigate this question, and provide a sanity check for our surprises, we run an event study in the spirit of [Gürkaynak et al. \(2005a\)](#). Specifically, we look at the effects that policy surprises have on changes in money market rates, sovereign bond yields, stock prices, domestic currency exchange rate, sovereign risk premium and capital flows measures around monetary policy announcements.²⁷ To do so, we regress daily changes in financial market values around MPC announcements on the identified monetary policy factors (see Table 2).^{28,29}

The short-term factor lifts the short end of the yield curve, in line with the positive empirical relationship between the target rate and longer rates established by [Cook and Hahn \(1989\)](#), and with the expectations theory of the term structure. We estimate that a 1 percentage point surprise tightening in the 3M Jibar rate raises two-, five- and ten-year sovereign bond yields by 17.8, 17.7 and 6.3 bps, respectively. The stock market response is negative and statistically significant, reflecting both higher discount rates and the expected contractionary effect on demand, and hence on dividends. A positive short-term surprise also induces an appreciation of the South African rand against the U.S. dollar and the euro, consistent with uncovered interest parity and the widening of the interest rate differential.³⁰ Finally, it has a statistically significant, albeit small, positive effect on the sovereign credit risk premium as measured by the 5Y CDS spread, potentially reflecting risks to economic growth in a tight monetary policy environment. Overall, the effects of the first factor are similar, in sign and magnitude, to those of the target factor in the U.S. and the euro area, as documented in [Gürkaynak et al. \(2005a\)](#) and [Altavilla](#)

²⁶As reported in Online Appendix H, the ‘placebo’ factors are weak instruments: the first-stage F-statistics fall below conventional thresholds, and the VAR impulse responses are correspondingly uninformative. The exception is the short-term factor two days before the meeting. Since the relevance of the placebo factors vanishes at 12 and 20 days, we read this as some information about the forthcoming decision reaching the market shortly ahead of the announcement, rather than as evidence that our surprises are picking up non-monetary noise. Notice that in the placebo test we do not control for information effects.

²⁷In principle, factors could be extracted from different subsets of financial assets’ responses to policy announcements. Following [Gürkaynak et al. \(2005a\)](#), we extract them from the full term structure of forward rate agreements and interest rate swaps (together with CDS spreads), and then validate the resulting factors by verifying that they generate the expected responses in government bond yields and in other financial variables that are not included in the dataset used for factor extraction.

²⁸In the event study analysis, for the sake of interpretability, we rescale the factors such that the effect of the short-term, medium-term, term premium and country risk factors is unity on surprises in the 3M Jibar, FRA9x12, Sw10Y and the CDS spread, respectively. The horizon at which each factor is rescaled to have a unit effect is chosen according to its importance in explaining the respective price revisions, as shown in Figure 3.

²⁹We report results for the informationally-robust factors in Table VIII in the Online Appendix D.5. Results are overall unchanged by the information correction, indicating that markets in the short-term react to the news but do not fully disentangle the effects.

³⁰The appreciation of the South African rand against the euro is not statistically significant.

Table 2: Estimated effects of monetary policy surprises on financial markets

	Short-term	Medium-term	Term premium	Country risk	Constant	R ²	Obs
Overnight	1.063*** (0.12)	-0.722*** (0.23)	0.036 (0.15)	0.22 (0.31)	-0.014 (0.02)	0.7	115
1M Jibar	1.064*** (0.06)	-0.172 (0.11)	-0.032 (0.09)	-0.026 (0.11)	-0.020** (0.01)	0.88	143
3M Jibar	1.000*** (0.02)	0 (0.06)	0 (0.06)	0 (0.10)	-0.015*** (0.00)	0.97	143
12M Jibar	0.698*** (0.03)	0.758*** (0.06)	0.196*** (0.07)	-0.011 (0.07)	-0.014*** (0.00)	0.92	143
2Y bond	0.178*** (0.06)	0.352*** (0.06)	0.450*** (0.09)	0.093 (0.10)	-0.010** (0.01)	0.51	143
3Y bond	0.282*** (0.04)	0.646*** (0.12)	0.938*** (0.18)	0.634*** (0.10)	-0.002 (0.01)	0.86	91
5Y bond	0.177*** (0.03)	0.417*** (0.07)	0.755*** (0.12)	0.504*** (0.10)	-0.011*** (0.00)	0.76	143
10Y bond	0.063** (0.03)	0.261*** (0.06)	0.833*** (0.08)	0.485*** (0.07)	-0.013*** (0.00)	0.8	143
20Y bond	0.024 (0.03)	0.188*** (0.07)	0.895*** (0.08)	0.469*** (0.08)	-0.021*** (0.01)	0.74	143
30Y bond	0.036 (0.03)	0.150* (0.08)	0.863*** (0.09)	0.424*** (0.10)	-0.019*** (0.01)	0.69	143
5Y5Y forward	-0.116*** (0.04)	-0.027 (0.11)	0.908*** (0.08)	0.550*** (0.10)	-0.023*** (0.01)	0.57	143
JSE All shares	-1.553*** (0.48)	-1.127 (1.23)	-4.124*** (1.38)	-4.892*** (1.84)	-0.123 (0.10)	0.24	143
ZAR USD	1.106** (0.53)	0.505 (1.33)	-1.681 (1.19)	-3.951* (2.07)	0.066 (0.09)	0.12	143
ZAR EUR	0.714 (0.51)	-0.05 (1.24)	0.504 (1.10)	-2.613* (1.55)	-0.006 (0.08)	0.06	143
CDS 5Y	0.018*** (0.00)	0 (0.01)	0 (0.01)	1.000*** (0.02)	0.003*** (0.00)	0.997	143
EMBI+SA	-0.038 (0.056)	0.004 (0.074)	0.35 (0.218)	0.976*** (0.146)	0.002 (0.007)	0.46	135
NNP	0.046 (0.39)	0.499 (1.02)	-1.835** (0.77)	-4.140** (1.71)	0.106 (0.10)	0.08	143
NNPshares	-0.139 (0.31)	0.394 (0.77)	0.253 (0.84)	-2.056* (1.19)	0.005 (0.08)	0.03	143
NNPbonds	-0.03 (0.39)	0.613 (0.83)	-1.411** (0.71)	-4.488*** (1.42)	0.091 (0.10)	0.09	143

Note. Projections of financial market values on identified monetary policy surprises. Robust standard errors in parentheses. The dependent variable is the daily change in financial market values around the SARB MPC announcements in the sample 2002M6-2025M8. ‘Overnight’ is South African benchmark overnight rate. ‘1M Jibar’, ‘3M Jibar’ and ‘12M Jibar’ are 1-month, 3-month and 12-month Jibar/interbank rates. ‘2Y bond’, ‘3Y bond’, ‘5Y bond’, ‘10Y bond’, ‘20Y bond’ and ‘30Y bond’ are the government bond yields of the respective maturities as quoted on Bloomberg. ‘5Y5Y forward’ is a 5-year forward interest rate at a 5-year horizon. JSE All shares is a stock market index. ZAR USD and ZAR EUR are nominal exchange rates of South African rand (ZAR) expressed as ZAR prices in USD and EUR, respectively, i.e. the exchange rate increase is ZAR appreciation; this notation is used throughout the paper. ‘CDS 5Y’ and ‘EMBI+SA’ are measures of the country credit risk premium. ‘NNP’ is non-residents’ net purchases of South African shares and bonds, ‘NNPshares’ is non-residents’ net purchases of South African shares, ‘NNPbonds’ is non-residents’ net purchases of South African bonds. Capital flow variables are z-scores of their deflated values (GDP deflator index, 2015 = 100 is used for deflating nominal values). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

et al. (2019). The medium-term component of the policy surprises shifts the middle part of the yield curve, at maturities from one to thirty years (see Table 2) – possibly due to the signalling effect of policy communication, with the market anticipating the short-term rate to stay higher over the medium and long term. Increases in the term premium and country risk factors both steepen the yield curve and put downward pressure on stock prices. The country risk factor also

moves the country credit risk premium – the EMBI+SA index and the 5-year CDS spread.³¹ In line with the interpretation of this factor as related to country risk, the results point to a portfolio reallocation by international investors: non-residents reduce their net purchases of South African stocks and bonds upon an increase in the factor, consistent with the responses of the stock market and of long-term sovereign yields, which reflect the higher compensation required for holding South African assets. The statistically significant depreciation of the rand against the U.S. dollar and the euro captures the increased risk premium and the reduced demand for domestic financial assets.

4 Informationally robust monetary policy IVs

The factors plotted in Figure 4 combine monetary policy and risk shocks, and market revisions of expectations about the state of the economy. This is the information channel illustrated in the model in Section 2, which in the case of the SARB is due to both the announcement of the policy rate and the concurrent disclosure of the economic projection.

To control for the information channel in the monetary policy factors, following [Miranda-Agrippino and Ricco \(2021\)](#), we regress each of the identified factors on the SARB’s forecasts and forecast revisions of GDP growth and CPI inflation. These projections are produced for each MPC meeting and are a part of the policymakers’ information set during the MPC meetings, which is partially disclosed to the public during the policy announcements.³² Specifically, we run the following regression at the SARB MPC meeting frequency:

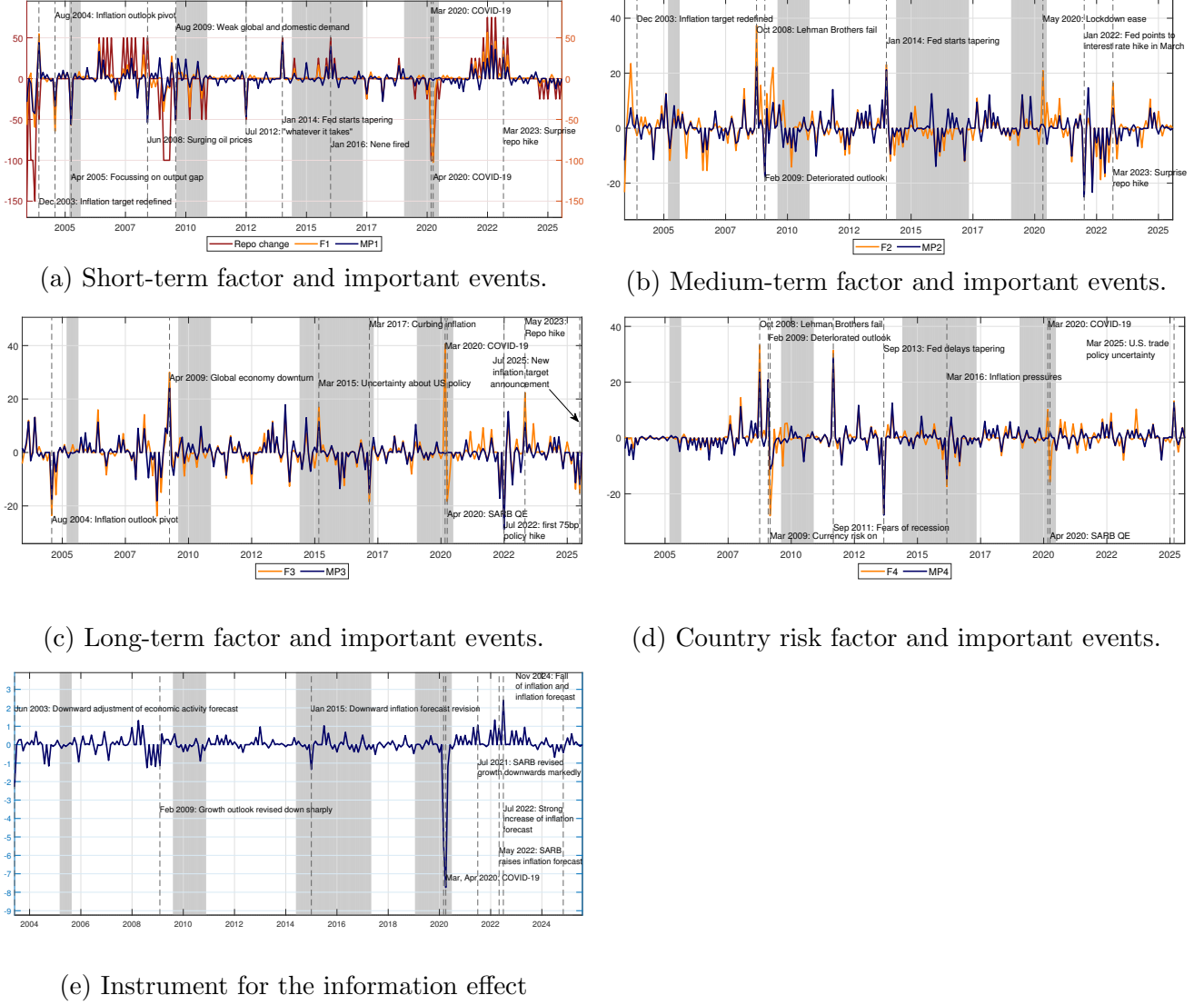
$$\begin{aligned} F_{t_{\text{MPC}}}^i = & \alpha_0 + \sum_{j=-1}^3 \theta_j \text{FC}_{t_{\text{MPC}}}^{\text{SARB}} x_{q+j} + \sum_{j=-1}^3 \eta_j (\text{FC}_{t_{\text{MPC}}}^{\text{SARB}} x_{q+j} - \text{FC}_{t_{\text{MPC}}-1}^{\text{SARB}} x_{q+j}) + \\ & + D_t^0 \left[\sum_{j=-1}^3 \beta_j^1 \text{FC}_{t_{\text{MPC}}}^{\text{SARB}} x_{q+j} + \sum_{j=-1}^3 \beta_j^2 (\text{FC}_{t_{\text{MPC}}}^{\text{SARB}} x_{q+j} - \text{FC}_{t_{\text{MPC}}-1}^{\text{SARB}} x_{q+j}) \right] + \text{MP}_{t_{\text{MPC}}}^i, \end{aligned} \quad (22)$$

where $F_{t_{\text{MPC}}}^i$ denotes the value of identified monetary policy factor i in MPC meeting t_{MPC} , $\text{FC}_{t_{\text{MPC}}}^{\text{SARB}} x_{q+j}$ is the real-time SARB forecast of a variable x – GDP growth or headline CPI inflation –, at horizon j available to the SARB before MPC meeting t_{MPC} , such that $(\text{FC}_{t_{\text{MPC}}}^{\text{SARB}} x_{q+j} - \text{FC}_{t_{\text{MPC}}-1}^{\text{SARB}} x_{q+j})$ denotes the forecast revisions for a variable x at horizon j between two MPC meetings at dates $t_{\text{MPC}} - 1$ and t_{MPC} . The dummy variable D_t^0 , which takes the value one over

³¹The EMBI+SA index is the JP Morgan Emerging Markets Bond Index Plus spread for South Africa, which measures the country-specific sovereign risk premium.

³²Before 2017 the SARB forecasts were produced with the macroeconomic Core model, and after 2017 the projections have been made using the Quarterly Projection Model (see [Botha et al., 2017](#)).

Figure 4: SARB monetary policy factors.



Note. The chart reports monetary policy surprises F1, F2, F3, and F4 (orange), together with their informationally robust counterpart MP1, MP2, MP3, and MP4 (blue). The repurchase rate of the SARB (red) is shown with the plot of F1 and MP1. The information IV is the first principal component of fitted information in Eq. (22) for the four monetary policy factors. Sample of 2003M6-2025M8. Shaded periods indicate recessions, as captured by the OECD recession indicator for South Africa.

the period 2020M3-2020M5 and zero otherwise, captures potential shifts in the strength of the information channel, the adoption of unconventional policy actions, and macroeconomic volatility during the COVID-19 pandemic crisis (see also Ricco et al., 2024 for a discussion of this approach in the euro area).³³

The SARB information disclosure appears to play an important role in explaining monetary policy surprises, especially for the short-term, medium-term and term-premium factors (see Table 3). This indicates that SARB's macroeconomic forecasts affect market expectations about the future path of monetary policy at the short, medium – 6 to 24 months –, and long – 3 to 10

³³See Section D.2 in Online Appendix D for details.

Table 3: Contribution of central bank information to policy surprises

	Factor 1	Factor 2	Factor 3	Factor 4
R^2 adj. 2002M6-2020M1	0.05	0.26	0.29	0.01
R^2 adj. 2002M6-2025M8	0.25	0.14	0.19	0.03
Linear R^2 adj. 2002M6-2025M8	0.17	0.13	0.00	0.03

Note. Each column shows adjusted R^2 of the regression model in Eq. (22) for the four monetary policy factors.

years –, horizons. Interestingly, the country risk factor is not affected by information effects.³⁴

4.1 IVs at monthly frequency

The residuals $MP_{t_{MPC}}^i$ of the regression model in Eq. (22) do not correlate with past and current shocks as captured by the SARB forecasts, by construction. Hence, they are both orthogonal to the SARB reaction function and unexpected by the markets. They can be employed to build IVs to identify different types of policy shocks. To do so, we aggregate them from MPC frequency to monthly frequency and remove any residual autocorrelation. First, the residuals of the identified monetary policy surprises are transformed from an MPC frequency to a monthly frequency. Specifically, for months with MPC meetings, $MP_{t_{MPC}}^i$ is taken as the value for the respective month; for months without MPC meetings, the factor value MP_t^i is set to zero.³⁵ Second, to account for the slow information absorption by market participants, the residuals at monthly frequency are cleaned from an autoregressive component.^{36,37} The residuals of this regression at monthly frequency are our informationally robust monetary policy IVs – $MP1_t$ (conventional monetary policy), $MP2_t$ (forward guidance), $MP3_t$ (term premium/policy uncertainty), and $MP4_t$ (country risk) – plotted in Figure 4.

4.2 Information effects

To study how macroeconomic variables respond to the information component of monetary surprises, we construct an instrument for the information effect of central bank announcements. First, we obtain the fitted values from Eq. (22) for each of four identified monetary policy factors. The SARB projections account for a substantial portion of their variance, see Table 3.

³⁴Table V in the Online Appendix reports full estimation results for Equation (22).

³⁵For the sample period considered, there is at most one MPC meeting held during each month.

³⁶Results are reported in Table VI in the Online Appendix. The autoregression is run using non-zero monthly observations of the dependent variable. In months without MPC meetings MP_t^i is equal to zero. This correction shortens the sample over which the instruments are available by 12 months, from 2002M6-2025M8 to 2003M6-2025M8.

³⁷It is worth observing that the autocorrelation of forecast errors and revisions is a trademark of imperfect information models (see Coibion and Gorodnichenko, 2012, 2015), and a key feature of the model in Section 2.

The SARB’s forecast revision of GDP growth for the quarter previous to an MPC meeting and two-quarter-ahead forecast of CPI inflation have the greatest predictive power for the short-term factor.³⁸ The medium-term factor is largely explained by the forecast of current quarter GDP and forecast revision of the two-quarter-ahead GDP growth, together with the current and one-quarter-ahead CPI forecast and one- and two-quarter ahead CPI forecast revision. Regarding the term premium factor, the previous quarter GDP forecast and forecast revision of growth for the current quarter contribute significantly to explaining it. Next, we extract the first principal component from these values and aggregate it to monthly frequency (see Figure 4e). In the time series, the COVID shock appears as a large outlier.

4.3 Spillover from external shocks

To gauge the role of shocks originating outside of South Africa in the monetary policy surprises, we regress the identified monetary policy surprises onto (i) the high-frequency U.S. monetary policy surprises around FOMC announcements – target, forward guidance, and large-scale asset purchases –, as built by [Gürkaynak et al. \(2005a\)](#) and [Swanson \(2021\)](#); (ii) the high-frequency ECB monetary policy surprises – target, timing, forward guidance, and QE –, as identified in [Altavilla et al. \(2019\)](#); (iii) the oil supply news shock as built by [Känzig \(2021\)](#); and (iv) the VIX index as a measure of global uncertainty.³⁹ The regressions are run at the SARB MPC meeting frequency on surprises registered between 2002M6 and 2025M8. Results reported in Online Appendix D.4 show a small but significant role of U.S. and euro area monetary surprises, and of the oil supply shocks. Overall, these results point to the importance of open market effects for South Africa but also confirm the prediction of the model regarding the surprises being convolutions of past and current shocks, beyond monetary policy, due to information effects.⁴⁰

5 A narrative of surprising events

In this section, we provide an interpretation of the identified monetary policy factors. For each meeting, we collect the market forecasts from the Bloomberg market survey, the text of the MPC statements, and the commentary appearing in the Business Day, the main local

³⁸GDP data are generally released with a one- to two-quarter delay, implying that real-time assessments rely on substantially lagged information.

³⁹The most recent values of the U.S. and ECB monetary policy factors before each SARB MPC meeting are used in projections.

⁴⁰We do not directly correct for the external shocks in the construction of the IVs due to the different sample sizes and the relatively small importance, especially post-information correction.

financial journal, on the days around the meeting.⁴¹ These materials allow us to assess whether market expectations were in line with the policy stance decided at the meeting, the SARB’s declared rationale for its decision, and the market’s interpretation of the policy decisions, MPC statements, and press conferences. In assessing the narrative, we refer to repo rate decisions as ‘anticipated’ when the median forecast of the Bloomberg market survey correctly projected the stance taken by the SARB, and as ‘unanticipated’ otherwise (see Figure XLV in the Online Appendix).

Our analysis points to the following narrative of the identified factors. First, the largest short-term surprises (F1) are related to unanticipated repo rate changes, allowing us to interpret the first factor as an instrument for unexpected changes to the policy stance, i.e. conventional monetary policy shocks. Second, the medium-term factor (F2) relates to MPC communication about the policy path, with large revisions associated with the market perceiving large shifts in the future policy stance – an implicit forward guidance factor, although the central bank’s signal may be unintentional. Third, the term premium factor (F3) relates to the perceived uncertainty about the bank’s assessment of the economy and hence its policy path, falling when the SARB clarifies its view and vice versa. Finally, the country risk factor (F4) relates to the SARB’s communication about risks to the economy – due either to critical external events or to internal political and institutional challenges to its mandate. The way markets perceive the central bank’s response to these risks determines the response of country risk: with its actions and words, the central bank shapes the perceived distribution of risky events for the country. Communications showing a careful balance of risks, or reaffirming the objective of price and macroeconomic stability and the central bank’s independence, reduce the country risk premium.

5.1 Conventional monetary policy and forward guidance

A few episodes of large surprises are particularly illustrative of these patterns. Let us start with the short-term factor (F1) which we connect to conventional monetary policy shocks:

- **Aug-04** – *MP Decision -50 bps; unanticipated; F1 -64.31 (MP1 -33.69), F2 -9.97 (MP2 -11.41), F3 -23.58 (MP3 -17.60) bps.* The Bank makes an unanticipated cut in the policy rate, given a more favourable inflation outcome, induced by significant appreciation of the domestic currency. The markets read the surprise move as a dovish shift of the bank due to political pressure: “The Reserve Bank’s monetary policy committee took a shock decision yesterday to

⁴¹In Section I, in the Online Appendix, we report all the episodes of large surprises (larger than two standard deviations for the short-term factor and one standard deviation for the medium-term, term premium and country risk factors) and the corresponding MPC and business commentary narrative.

cut interest rates, reversing its previous cautious tone on inflation in a move interpreted by some as bowing to pressure to weaken the rand” (Business Day).

- **Jun-08** – *MP Decision 50 bps; unanticipated; F1 -44.06 (MP1 -53.81) bps.* Another dovish surprise from the SARB. “Markets were caught off guard yesterday when Bank Governor Tito Mboweni announced a decision to raise the repo rate by half a percentage point to 12%, after a stream of hawkish rhetoric – mainly from him – had prompted them to price in a full percentage-point increase” (Business Day).
- **Aug-09** – *MP Decision -50 bps; unanticipated; F1 -51.34 (MP1 -51.17) bps.* Dovish surprise with a shift of attention to growth. “The Reserve Bank took markets and analysts by surprise yesterday, cutting lending rates despite stubborn price pressures in a bid to help jolt the economy out of recession” (Business Day).
- **Jan-14** – *MP Decision 50 bps; unanticipated; F1 44.07 (MP1 44.70), F2 23.11 (MP2 21.24), F4 9.58 (MP4 12.50) bps.* A hawkish shift from the SARB, “It was a credible move from a credible Bank – even if nobody in the market had seen it coming. [...] though yesterday’s rate hike might have been expected to strengthen the rand, it did quite the opposite, at least initially. Perhaps market players were so shocked that the Reserve Bank had spotted risks that they had failed to see that they (over) reacted by marking the rand down yet further” (Business Day).

This narrative evidence strongly supports the view that unexpected repo rate changes, perceived as shifts to a more dovish or hawkish stance generate short-term monetary policy surprises and allow us to identify the first factor as related to conventional monetary policy shocks (after the removal of the information component).

Similarly, the narrative around F2 is shaped by shifts in the SARB communication about the future path of rates. This allows to think of it as a forward guidance factor, albeit possibly not intentional.

- **Oct-08** – *MP Decision 0 bps; anticipated; F2 37.34 (MP2 22.56), F3 -23.80 (MP3 -18.08), F4 33.26 (MP4 23.54) bps.* After the Lehman Brothers bankruptcy, the Bank appears uncertain about the correct policy path but signals a rather hawkish stance. Markets anticipate the hold decision but are disappointed by the tone and revise up the expected policy path. “Bank governor Tito Mboweni said that [...] ‘The MPC is of the view that an unchanged monetary policy stance is appropriate at this stage.’ Interest rate cuts had not even been considered at the two-day policy meeting, he told reporters later. The Bank’s decision to keep rates steady was not a surprise, but disappointed local markets” (Business Day).

- **Jun-09** – *MP Decision 0 bps; unanticipated; F1 27.45 (MP1 19.56), F2 22.06 (MP2 9.34) bps.* The MPC keeps the rate unchanged against growing pressure for monetary easing. “You have to hand it to Reserve Bank governor Tito Mboweni and his colleagues on the monetary policy committee. Faced with all sorts of pressure to bend or change the rules, they have kept the inflation targeting faith [...] All of that suggests this is not the time to let go of the inflation fighting levers, and that the decision to hold rates was the right one. Mboweni’s own view is that there should be no further cuts.” (Business Day)
- **Jan-22** – *MP Decision 25 bps; anticipated; F1 20.93 (MP1 11.91), F2 -22.70 (MP2 -25.03) bps.* The MPC statement observes “Given the expected trajectory for headline inflation and upside risks, the Committee believes a gradual rise in the repo rate will be sufficient to keep inflation expectations well anchored and moderate the future path of interest rates.”

It is interesting to observe that this account of events does not lend support to a narrative compatible with temporary changes to risk premia, as per our model, albeit we cannot fully rule it out.

5.2 Term premium and country risk

The last two factors connect to communicated and perceived risk to the economy and the policy path. F3 appears to be related to uncertainty about the communicated forecasts of inflation and growth for South Africa and of the policy path. F4 is instead more clearly linked to the credibility of the response of the central bank to either large external shocks that put at peril the rand and the macroeconomic stability of South Africa, or to challenges to the central bank’s independence and its mandate in terms of price stability and sound macroeconomic policy.

Let us start from F3. Key episodes worth highlighting are the consecutive MPC meetings of May and July 2025, when the SARB took the decision and communicated its intention to target the bottom of the 3–6% target band.⁴² After years of public discussion, in May 2025 the MPC documentation included an alternative policy scenario with a 3% target, emphasising the benefits of this policy path. The subsequent MPC presented the 3% target as its central forecast and explicitly declared a preference for inflation towards the bottom of the target band. The actual inflation rate was already close to 3%. This allowed the Bank to change the target while still easing the monetary policy stance by 25 basis points at both meetings, with very limited market disturbance. The only noticeable effects were the F3 readings of -13.72 and -15.24 basis

⁴²The SARB preference for a 3% inflation target was known to the market. Governor Kganyago opened the discussion on a change in the policy framework in 2019 (Kganyago, 2019), and the South African National Treasury commissioned an external evaluation in 2021 that was largely supportive of such a change (Honohan and Orphanides, 2022).

points in May and July 2025 respectively, highlighting how clarification of policy and inflation uncertainty translated into an easing of the term premium factor.⁴³

A couple of other episodes are of interest for our discussion. The August 2004 decision, discussed above, involved a surprise rate cut combined with a strong signal of reduced inflation risks and potentially softening growth. This clarification of the policy stance delivered a sharp reduction in F3. Another interesting event is the following, which combined forward guidance and reduction of policy uncertainty:

- **Mar-17** – *MP Decision 0 bps; anticipated; F2 -12.09 (MP2 -11.82), F3 -18.46 (MP3 -15.20) bps.* The Bank follows the anticipated policy and signals that it is at the end of the tightening cycle. The comment from the Business Day reads: “The only surprise, in a week of such intense political uncertainty, was that one committee member voted for an interest rate cut.”

The last factor is possibly the most interesting one and points to the fact that the bank can effectively modulate risks to the country. One remarkable event happened in March 2016 with a surprise hike of 25 basis points that took place in the middle of political turmoil, the disclosure of high-profile scandals related to the state capture during Zuma’s presidency, and challenges to the bank’s independence. Markets read into the hike and the MPC communication as a strong signal that the SARB was reaffirming its independence and commitment to sound macroeconomic policies. The factor reading is F1 17.92, F2 -10.15, F3 -12.42, F4 -17.38 bps.⁴⁴ A very revealing quote is from the Business Day economic editor:

It is hard not to wonder whether the events of the past few days were the factor that tipped the monetary policy committee into opting for a 25-basis point hike rather than a hold. And rightly so. This is not the time to take any chances with either policy credibility or the exchange rate. But the battle lines that have been drawn between Finance Minister Pravin Gordhan and the Hawks,⁴⁵ and the dramatic disclosures of the Gupta family’s influence on ministerial appointments have undermined SA’s credibility with investors further and put new downward pressures on the rand. [...] if the committee’s response was on the hawkish side (in the monetary policy sense), it cannot be faulted for acting to manage the risks as best as it can.

⁴³On 12 November 2025, the Ministry of Finance announced the official adoption of the new inflation target of 3% with a 1% tolerance band, further reducing the residual uncertainty. This episode is outside our sample.

⁴⁴The robust factors read MP1 18.24 bps, MP2 -8.59, MP3 -9.47 bps, MP4 -14.68 bps.

⁴⁵The Hawks is the popular name of the Directorate for Priority Crime Investigation, a division of the South African Police Service tasked with investigating organised crime, corruption, and other national priority offences. It was established in 2009 to replace the Directorate of Special Operations (the Scorpions), a unit of the National Prosecuting Authority that had conducted high-profile investigations of senior ANC figures, including the future president Jacob Zuma.

The credibility of the bank (or the lack thereof) in responding to external critical conditions shapes other large movements in F_4 , as in the October 2008 episode mentioned above when the SARB appears to underestimate risks in the immediate aftermath of Lehman Brothers' bankruptcy. Other similar episodes are:

- **Feb-09** – *MP Decision -100 bps; anticipated; F_1 -39.98 (MP1 -27.23), F_2 -16.60 (MP2 -17.78), F_4 20.89 (MP4 20.89) bps.* The SARB reduces the policy rate as anticipated by 100 basis points. Markets get a clear message about the policy path (“Mboweni guns blazing for an even bigger cut”) but also large and increased risks. “Growth [...] is a real concern. And from the Bank’s point of view, given its mandate of price stability, the output gap suggests it should be worrying less about inflation and more about growth” (Business Day).
- **Sep-11** – *MP Decision 0 bps; anticipated; F_4 31.37 (MP4 28.67) bps.* As anticipated, the MPC doesn’t change the policy rate. However, the deepening of the European debt crisis makes the bank sharply reduce the growth projection and highlights several risk factors in the statement. The market hears the risks but does not see action. “The Bank revised its growth forecasts sharply down, and warned that they were still at risk from the global downturn. It was concerned about the potential impact of global turmoil” (Business Day).
- **Sep-13** – *MP Decision 0 bps; anticipated; F_4 -27.03 (MP4 -27.66) bps.* Markets reel while the Fed pauses its tapering. The SARB responds by reaffirming its focus on macro stability and does not change rates. “Markets might have been a little euphoric yesterday after the US Federal Reserve pulled back from the ‘tapering’ [...]. But the Reserve Bank’s monetary policy committee was definitely not about to be carried away. Its tone yesterday [...] was anything but euphoric” (Business Day).

5.3 Information disturbances

We close this section by discussing three MPC decisions – excluding the COVID episode – that, conditional on our analysis, appear to have carried significant information content. These events correspond to large spikes in our information indicator, in Figure 4e, and are consistent with the way the announcements were reported in the press. Notably, the information contained in the MPC decisions highlights how supply shocks are shifting the expected inflation path.

- **Jan-15** – *MP Decision 0 bps; anticipated; F_1 1.95 (MP1 19.56), F_2 1.05 (MP2 5.63) bps; Info -2.21 std.⁴⁶* The MPC includes the expected GDP cost of current electricity disruptions in its forecasts. The statement reads “given the supply side nature of this constraint, the

⁴⁶The reported values of the information component are expressed in standard deviations relative to the mean.

impact of further monetary policy accommodation on growth is likely to be limited, in the absence of progress being made in the alleviation of electricity constraints.” The Business Day commentary reads “Just because the Reserve Bank’s monetary policy committee (MPC) did what the market had universally expected it to do yesterday [...] didn’t make it boring. Indeed, the committee’s statement yesterday was one of the more interesting we have had lately, with a sharp downward revision in the inflation forecast, a notable change in rhetoric, and a pretty clear indication of its intended path.”

- **Jul-21** – *MP Decision 0 bps; anticipated; F1 -0.81 (MP1 -15.81), F2 -12.25 (MP2 -10.21) bps; Info 1.54 std.* From the 8th to the 18th of July, civil unrest affected part of the country. Soon thereafter the MPC revise their GDP forecast “[...] recent unrest and economic damage could have lasting effects on investor confidence and job creation. We estimate the unrest to have fully negated the better growth results from the first quarter, resulting in an unchanged estimate of 4.2% for growth in 2021.” The Business Day commentary reads “The committee made the call to keep rates on hold even as it slightly upgraded the 2021 inflation forecast, saying consumer price increases were contained while the economy faced potential downside risks in the wake of the unrest.”
- **Jul-22** – *MP Decision 75 bps; unanticipated; F1 56.58 (MP1 24.73), F2 -10.40 (MP2 -5.32) bps; Info 4.84 std.* The MPC statement reads: “Russia’s war in Ukraine is likely to persist for the rest of this year and may have significant further effects on global prices. Oil prices increased strongly from the start of the war and may rise further as stresses in energy markets intensify. Electricity and other administered prices continue to present short- and medium-term risks.” The Business Day comment reads “When the Reserve Bank’s monetary policy committee goes into extensive detail on the inflation outlook in its postmeeting statement, you know it is preparing to say something dramatic. So it was on Thursday, when the committee hiked interest rates by 75 basis points. That was more than most in the market were expecting. [...] Which is how you know the Bank is really worried about what is happening to inflation, and more particularly to inflation expectations.”

6 The empirical model

In the next two sections, we identify different exogenous policy disturbances using the instrumental variables constructed above as external IVs in a medium-sized VAR model

$$y_t = \sum_{p=1}^{12} A_p y_{t-p} + \varepsilon_t, \quad \varepsilon_t \sim \text{i.i.d. } \mathcal{N}(0, \Sigma_\varepsilon), \quad (23)$$

Table 4: F-statistics of the first stage regression of the monetary IVs.

	Factor 1	Factor 2	Factor 3	Factor 4
Raw factors	364	20	31	19
Informationally-robust factors	180	13	1	20

Note. The table reports the F-statistics of the regressions of reduced-form innovations of the VAR models on the different IVs, used to study the effects of conventional monetary policy shock, forward guidance shocks, term premia shocks and country risk shocks. We instrument the 3M Jibar with F1, the 12M Jibar with F2, and the 10Y bond with F3 and F4. Sample 2002M2-2025M4.

estimated on a monthly dataset of macroeconomic and financial indicators over the period 2002M2–2025M4 for the baseline results. The vector of endogenous variables includes a co-incident indicator of industrial production, a consumer price index, the value of goods exports and imports in U.S. dollars, the 3- and 12-month Jibar interbank rates, the 5- and 10-year sovereign bond yields, the JSE stock market index, the volume of bank loans outstanding, the nominal exchange rates of the South African rand against the U.S. dollar and the euro, non-residents’ net purchases of South African financial assets as a ratio to GDP, and the 5-year CDS spread (see Table I in the Online Appendix for details on the dataset).⁴⁷ The VAR is estimated with Bayesian techniques and standard macroeconomic Normal–Inverse Wishart priors, with their informativeness calibrated following [Giannone et al. \(2015\)](#).

The policy shocks are identified by regressing the VAR residuals on the IVs, in an external IV approach, and their propagation is then estimated using the VAR coefficients. This methodology delivers correctly identified shocks under three assumptions: (i) invertibility of the shocks of interest, meaning that the shock can be recovered as a linear combination of the VAR residuals; (ii) relevance of the IVs, that is, the IVs and the VAR residuals are correlated through the shock of interest; and (iii) contemporaneous and dynamic exogeneity, implying that the VAR residuals at time t and the IV are correlated only through the shock of interest and not through any other current or lagged shocks (see [Mertens and Ravn, 2013](#), [Stock and Watson, 2018](#), [Miranda-Agrippino and Ricco, 2023](#), and [Forni et al., 2023](#) for a formal discussion of these conditions).

6.1 The relevance of the IVs

Before putting our IVs to work, it is important to assess their relevance. We consider the F-statistics from regressions of the VAR reduced-form innovations on the different IVs – the 3M

⁴⁷The 12-month Jibar rate serves as the policy indicator in the specification used to identify forward guidance shocks, and enters only that specification, replacing the 5-year sovereign bond yield.

Jibar for F1, the 12M Jibar for F2, and the 10Y bond yield for F3 and F4 (see Table 4).⁴⁸ All four raw instruments are above the conventional threshold for weak instruments. The IV for conventional monetary policy is particularly strong, owing to the low forecastability of policy rate changes, which we discuss in the next section. By contrast, the informationally robust version of F3 is very weak, with an F-statistic equal to 1, indicating that this component is largely endogenous rather than an additional dimension of monetary policy in South Africa. This is consistent with the absence of QE-type policies at the SARB, as well as with the narrative proposed above, according to which only the redefinition of the inflation target could be interpreted as an exogenous policy action at the long end of the curve. In line with these results, in the main text we only discuss the transmission of the shocks identified using the informationally-robust counterparts of F1, F2, and F4, and report the IRFs for F3 in the Online Appendix.

7 The transmission of monetary policy

We start this section by exploring the transmission of conventional monetary policy. We then discuss the macroeconomic effect of policy shocks to medium and long-term rates – (implicit) forward guidance, term premium related to policy uncertainty, and country risk shocks. We conclude with the SARB information effects.

7.1 Conventional monetary policy actions

7.1.1 (Almost) every change is a surprise

As is apparent in Figure 4a, there is a high degree of correlation between the short-term factor, which captures surprise movements in the policy rate, and changes in the SARB repurchase rate (correlation coefficient 0.72, see Table IX in the Online Appendix). This points to the fact that policy decisions are largely unanticipated and generally come to market participants as a surprise. Indeed, the median forecast errors of the Bloomberg market surveys are also correlated with policy changes (correlation coefficient 0.42) and with the short-term factor (correlation coefficient 0.86). This is not the case for the Fed’s and the ECB’s policy rate announcements (and, for the latter, especially after it established its credibility), whose short-term surprises have a lower correlation with policy changes.⁴⁹

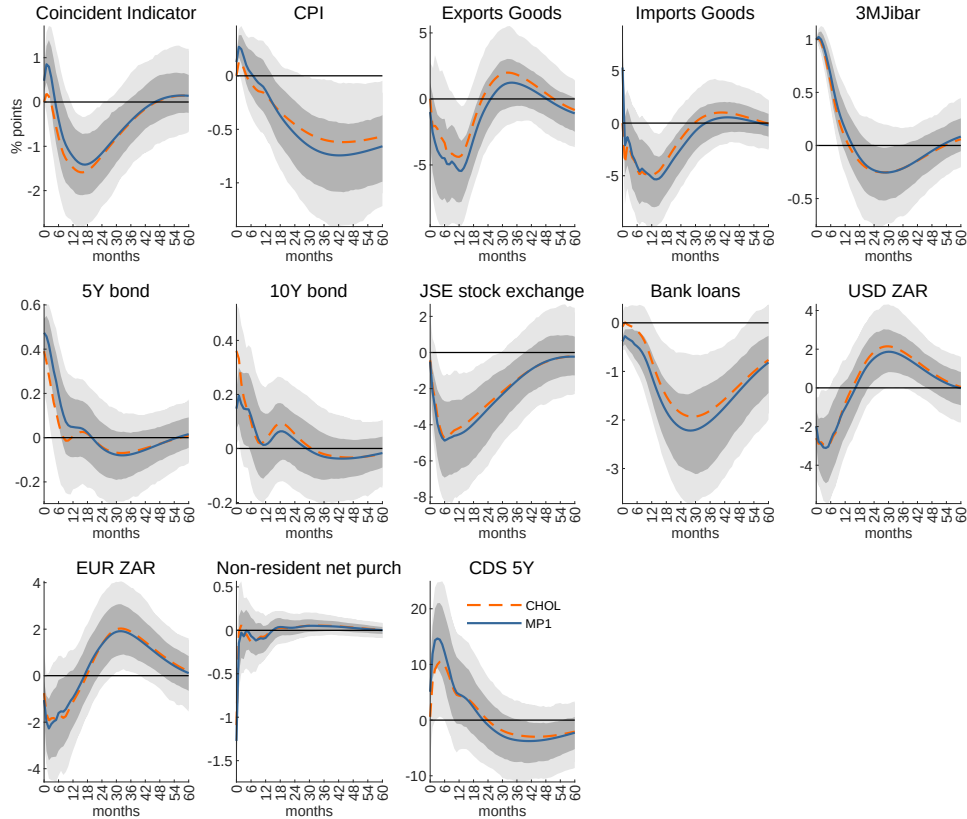
⁴⁸The measures of instrument reliability of Mertens and Ravn (2013) for the first-stage regressions of the monetary policy IVs are reported in Table X of the Online Appendix.

⁴⁹In the Online Appendix, correlation coefficients for the SARB, the Fed and the ECB are presented in Table IV, while Figure XLV plots the policy changes, along with the short-term factor and the Bloomberg market surveys’ median forecast errors for the policy rate.

Why are markets so often surprised in South Africa? We conjecture that in an emerging market and small open economy, monetary policy must react to both internal and external shocks while balancing sharp trade-offs. This inherent instability makes policy decisions less predictable, even when taken within a well-defined policy framework, as in South Africa. This is a key fact with important implications for the study of monetary policy in emerging markets.⁵⁰

7.1.2 Conventional instruments, standard effects

Figure 5: Conventional monetary policy shock



Note. Responses to a conventional monetary policy shock. The shock is identified either with recursive restrictions (orange dashed) or with the informationally robust instrument for conventional monetary policy shocks ‘MP1’ (dark blue). The shock is normalised to induce a 100 basis point increase in the 3M Jibar rate. Sample is 2002M2-2025M4. Light and dark grey shaded areas are respectively 90% and 68% posterior coverage bands for the shock identified with informationally robust instrument (MP1).

We can now study the transmission of conventional monetary policy shocks in the South African economy, employing our VAR model. The VAR impulse response functions to a monetary policy shock are reported in Figure 5, where the impact of the shock is normalised to induce a 100 basis points increase in the 3M Jibar interbank rate. The blue lines are responses to a

⁵⁰This interpretation is supported by the variance decomposition results presented later: conventional monetary policy shocks explain a small share of key variables’ variance, about a third of the values that Forni et al. (2023) report for the U.S., using the same methodology. This points to the larger volatility caused by other shocks in the South African economy, rather than to a lower quality of policymaking.

monetary policy shock identified using the informationally robust IV – i.e. MP1, which is derived from the short-term policy surprises –, with a Proxy-SVAR/SVAR-IV approach (see [Stock and Watson, 2012](#) and [Mertens and Ravn, 2013](#)). The orange (dashed) lines report the responses to a monetary policy shock identified using a traditional recursive identification of monetary policy shocks (see, for example, [Christiano et al., 1999](#)). Specifically, production as measured by the coincident indicator, the consumer price index, and the trade balance variables are assumed to be ‘slow variables’, featuring sluggish responses to the policy shocks, and hence not responding to the monetary policy shock within a month.

Let us first analyse how conventional monetary policy shocks transmit. The exogenous increase in the short-term rate affects the yield curve lifting the short-end more than the longer maturities. Bank credit issuance falls by around 2 pp and is depressed persistently following the shock, indicating that the credit channel of monetary policy is operative. Stock prices fall, possibly putting downward pressure both on the value of collaterals of the borrowers and on the balance sheets of lenders. The shock is persistently contractionary with falling aggregate activity (coincident indicator) and prices (CPI).⁵¹ The ZAR USD and ZAR EUR nominal exchange rates respond negatively on impact to slowly recover, while the CDS spread increases. The FX market response is possibly due to macroeconomic channels dominating the direct effect of the higher rates. Overall, these effects are in line with what has been reported for advanced economies, and consistent with responses to a conventional monetary policy shock as predicted by standard macroeconomic theory. We believe that this is an important result both for the implication for the modelling of a small open economy and for its policy implications since no ‘perverse effect’ of monetary policy is apparent (see, for example, [Gourinchas, 2018](#)) in the case of South Africa.⁵²

Let us now discuss the question of identification. South Africa is one of the few emerging markets where it is possible to build modern IVs for the identification of monetary policy shocks due to the presence of a well-defined policy framework, deep financial markets, and a well-developed economic infrastructure that includes professional economic forecasters. In advanced economies, recursive identification and high-frequency identification provide results that are both qualitatively and quantitatively different (see, for example, [Gertler and Karadi, 2015](#) and [Miranda-Agrippino and Ricco, 2021](#)). Our results show that, in the case of South Africa, instead, the results coincide and one could dispense with more complex techniques and use robust old-

⁵¹The response of the coincident indicator and the CPI is subject to a small price puzzle upon impact, which may be due to the imperfect way we control for information and external shocks.

⁵²As a robustness exercise, we show that these results, as well as results for the other identified shocks, are not sensitive to extending the set of central bank forecast variables used to control for information effects in Eq. (22) to include the USD ZAR exchange rate forecast (Figure XI in the Online Appendix). We also show that the results are robust when the analysis is performed on the pre-COVID sample (Figure XV in the Online Appendix).

Table 5: Variance decomposition

	Conventional MP	Forward Guidance	Term premia	Country risk
Coincident indicator	5 (2.2–9.2)	2.9 (1.0–6.5)	5.1 (2.0–10.7)	15.3 (7.5–25.4)
CPI	5.5 (2.8–10.1)	5.4 (2.2–11.1)	4.8 (1.8–10.6)	7.4 (3.0–15.4)
JSE stock exchange	4.4 (1.6–9.0)	4.3 (1.4–9.5)	2.9 (1.0–7.0)	24 (14.3–35.2)
Non-resident net purchases	2.8 (1.0–6.4)	7.6 (3.0–14.3)	9.9 (4.3–18.1)	26.1 (16.6–37.0)
CDS 5Y	4.1 (1.6–8.3)	4.3 (1.4–9.6)	3.5 (1.1–8.4)	26.8 (17.0–37.8)

Note: The table reports the fraction of the total variance of variables in the left column explained by the conventional monetary policy shock, forward guidance shock, term premia shock and country risk shock for waves of periodicity 2–5 years (business cycle). 68% coverage bands in the brackets. The details of methodology used to compute the variance decomposition, the results for all the variables in the VAR and all the lengths of waves periodicity are shown in Section G of the Online Appendix.

style approaches. This is a result with clear practical relevance, and one that we conjecture to apply to many other emerging economies for which high-frequency identification is not feasible, while a traditional recursive identification can be readily employed.⁵³

We conclude this section by gauging the importance of monetary shocks. We do so by computing the share of the observed variance of the variables in the VAR that is explained by conventional policy shocks (Table 5).⁵⁴ In particular, we follow Forni et al. (2023) and compute the contribution of the identified shocks to the observed variance of the indicators in the VAR, at different frequency bands. Results indicate that, at business cycle frequencies, conventional monetary policy shocks explain 5% of the variance of economic activity as measured by the coincident indicator, 5.5% of the variance of the CPI inflation, 4.4% of the stock market, and 4.1% of the CDS spread. Overall, conventional monetary policy accounts for a small share of the observed variance of the South African economy, at the low end of what is found for advanced economies and about a third of what Forni et al. (2023) report for the U.S., using the same methodology. This indicates the prevalence of other shocks in the economy compared to conventional monetary policy.

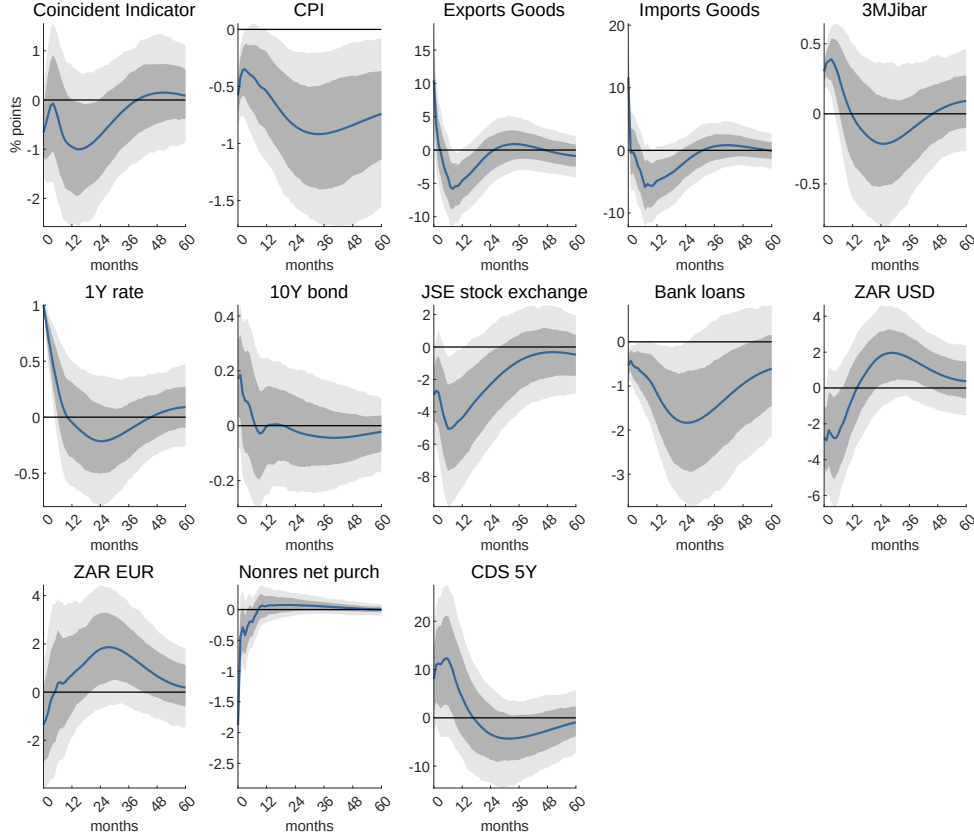
7.2 Forward guidance shocks

Forward guidance shocks, unrelated to the economic conditions, lift the medium part of the yield curve with prices persistently negatively affected (see Figure 6). The CPI falls on impact to stay

⁵³It is important to add a cautionary note: the presence of small impact puzzles may indicate an imperfect correction for information effects, which could mask small contemporaneous responses of the ‘slow’ variables. Nevertheless, the overall evidence suggests that, for South Africa, the differences between high-frequency and recursive identification schemes are likely to be modest.

⁵⁴The details of the methodology used for computation and results of variance decomposition for all the variables in the VAR are shown in Section G of the Online Appendix.

Figure 6: Forward guidance shock.



Note. Responses to a monetary policy shock identified with ‘MP2’ – the medium-term/F2 factor series corrected for the central bank’s economic projections (see Section 4 for details). The shock is normalised to induce a 100 basis point increase in the 12M Jibar rate. Sample is 2002M2-2025M4. Light and dark grey shaded areas are respectively 90% and 68% posterior coverage bands.

below equilibrium over several years. The reduced growth prospects seem to dominate in the response of financial assets. The domestic currency depreciates against the U.S. dollar and the euro. There is portfolio reallocation, a reduction of non-residents’ net purchases of South African shares and bonds, and a repricing of the sovereign risk premium. The variance decomposition indicates that, at business cycle frequencies, the forward guidance shock explains 2.9% of the observed variance of the coincident indicator, 5.4% of the CPI, and 7.6% of the variation in capital flows due to non-residents’ net purchases of South African financial assets (see Table 5).

7.3 Term premia shocks

The post-information regression IV for term premia shocks is too weak to allow us to correctly identify a structural shock. While F3 has a significant role in the policy surprises, it appears to be a fully endogenous factor – i.e. largely communication about endogenous uncertainty in the economy –, and the F-stat of which drops much below the conventional threshold after the information correction. Indeed, the SARB does not employ quantitative easing or other

unconventional policy tools affecting the long end of the yield curve.⁵⁵

7.4 Country risk shocks

Country risk shocks have large contractionary effects on the South African economy (Figure 7). The shock induces a hike of the country default risk premium and a repricing of the CDS spread. The portfolio reallocation by global investors is evident in the movement of capital flow, with non-residents reducing their net purchases of South African shares and bonds upon the shock impact. The stock market value is negatively affected, while interest rates increase, especially for medium and long-maturity instruments. Demand for domestic currency falls, and the South African rand depreciates strongly against the U.S. dollar and the euro. The pattern of responses is compatible with domestic assets becoming less attractive, and international investors demanding higher compensation for risk for holding South African bonds and equities.

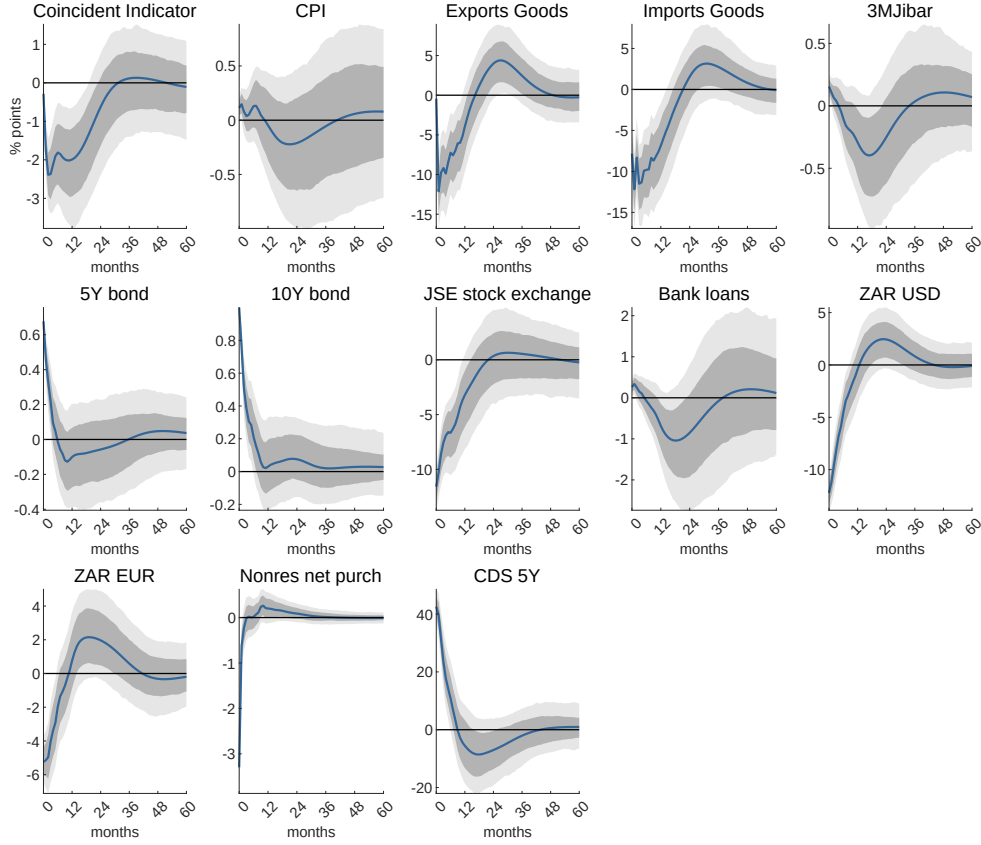
Low financial assets' values and reduced external positions underlie the weakening of creditors' and borrowers' balance sheets, while increased interest rates make borrowing more expensive. These factors contribute to depressed credit issuance by domestic banks. The weakened aggregate demand appears to put downward pressure on output.

The variance decomposition shows that the country risk shock plays a prominent role in macroeconomic fluctuations in South Africa: at business cycle frequencies, it explains 15.3% of the variance of production – the largest contribution among the identified policy shocks, roughly three times that of conventional monetary policy – and 7.4% of the variance of the CPI. Country risk is also a dominant driver of financial markets, accounting for 24% of the variation of the stock market index, 26.1% of the total variance of capital flows, and 26.8% of the CDS spread – in each case, the largest share among the four policy shocks (see Table 5). It is important to stress, however, that while our results indicate that the central bank plays an important role in the pricing of country risk, it is neither the sole nor, most likely, the main source of these shocks: as the narrative analysis shows, external events and domestic fiscal and political developments are their principal originators, with the SARB's communication shaping how markets assess and price the risks they generate.

Our analysis highlights the importance of the propagation of country risk shocks. The narrative evidence we provide suggests that the SARB actively communicates risks to markets, particularly during periods of elevated stress. The factors indicate that market participants

⁵⁵The IRFs obtained from this weak instrument are reported in Figure V in the Online Appendix, while the variance decomposition is in Table 5. Taken at face value, these results point to subdued macroeconomic effects. While they induce a steepening of the yield curve and a contraction of bank lending, the response of macroeconomic variables is largely statistically insignificant.

Figure 7: Country risk shock.



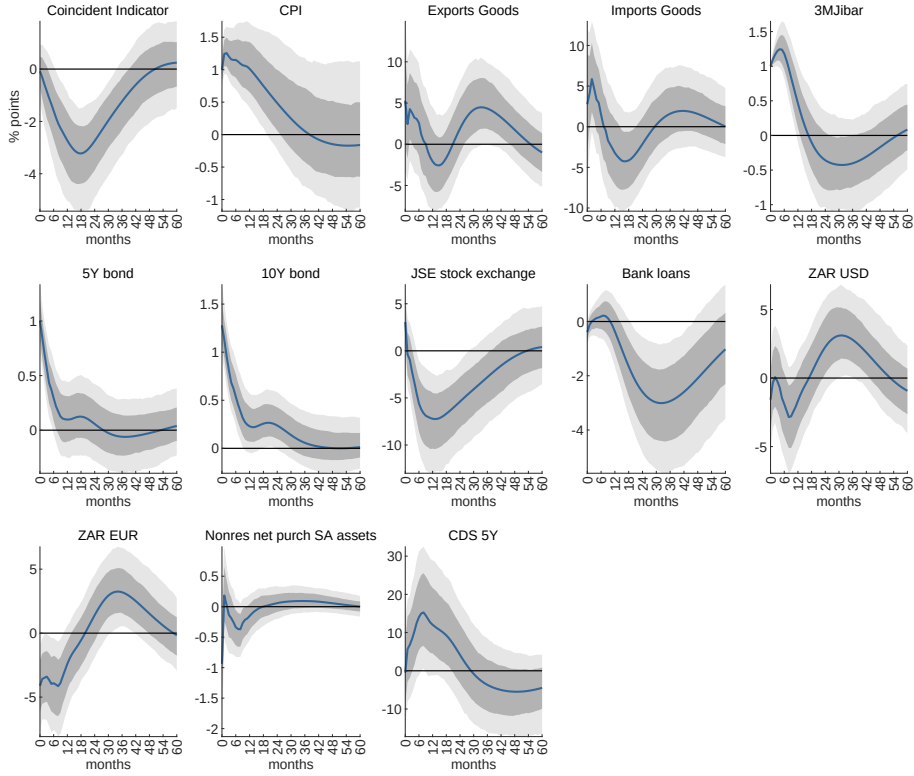
Note. Responses to a monetary policy shock identified with ‘MP4’ – the country risk/F4 factor series corrected for the central bank’s economic projections (see Section 4 for details). The shock is normalised to induce a 100 basis point increase in the 10Y rate. Sample is 2002M2-2025M4. Light and dark grey shaded areas are respectively 90% and 68% posterior coverage bands.

indeed extract signals about country risk from the Bank’s communication and update default probabilities accordingly. Yet, while our analysis points to the importance of this channel, we cannot conclude whether the SARB can fully control its communication on risks as an additional policy tool. We leave this important question to future research.

7.5 Information effects

To study the SARB’s information effects, we use the information IV (constructed in Section 4.2) as an external instrument in the same VAR framework employed for the other shocks, over the full sample 2002M2–2025M4, setting the COVID episode to zero as it represents a very large outlier (Figure 8). The macroeconomic effects of the information shock are consistent with the propagation of a supply shock at business-cycle frequencies. In particular, the information shock is followed by a significant decline in output growth and a contemporaneous increase in CPI inflation. The associated steepening of the yield curve reflects the response of interest rates to higher inflation. Equity prices and credit volumes fall, the sovereign risk premium

Figure 8: SARB information shock.



Note. Responses to a SARB information shock identified with the information IV series. Sample is 2002M2-2025M4. IV values are set to zero for the three months of extreme volatility during the COVID-19 pandemic (2020M3-2020M5). The shock is normalised to induce a 100 basis point increase in the 3M Jibar rate. Light and dark grey shaded areas are 90% and 68% posterior coverage bands.

increases, and the exchange rate depreciates, all in line with textbook predictions for an adverse supply shock. Similar supply-type dynamics are also evident in the IRFs for the pre-COVID sample, 2002M2-2019M12, which are reported in the Appendix (Figure XIX). By contrast, when the COVID spike is included in the information IV, the identified effects resemble those of a demand shock (see Figure XX in the Online Appendix). In this case, the information shock leads to increases in both output growth and CPI inflation. Equity prices respond positively on impact, the exchange rate appreciates, and the sovereign risk premium declines, consistent with a demand-driven expansion.

Taken together, these results suggest that, under normal circumstances, and with the notable exception of the COVID episode, information effects in South Africa are primarily driven by the endogenous response of the central bank to supply shocks. The COVID shock itself, however, was akin to a very large demand shock to the South African economy, of a magnitude not observed elsewhere in our sample. It is worth emphasising that the predominance of supply shocks is a key feature of emerging market economies, in contrast to advanced economies, where central banks

typically respond to and communicate about demand-driven fluctuations (see the evidence on information effects in [Jarociński and Karadi, 2020](#) and [Miranda-Agrippino and Ricco, 2021](#)).

8 Conclusion

Many emerging economies have adopted the modern framework of inflation targeting, flexible exchange rates, and central bank independence, yet we know little about how monetary policy actually operates in their volatile and institutionally contested environments. Studying South Africa with high-frequency methods, this paper shows that conventional monetary policy works in conventional ways – although policy rates are less predictable than in advanced economies, and the central bank responds to shocks that resemble supply rather than demand disturbances. Above all, communication matters: the SARB shapes market expectations with lasting macroeconomic effects, and its main channel of influence is the modulation of perceived macroeconomic risk – absorbing the risks posed by large external shocks, and offering a guarantee of sound policy against internal challenges to its independence and mandate. An independent, credible central bank thus serves as a keystone of macroeconomic stability – a finding worth stressing, at a time when central bank independence is under pressure, for emerging and advanced economies alike.

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