

Macroeconomic effects of lowering South Africa's inflation target: an SVAR analysis

Richard Kima ¹ Keagile Lesame ²

¹UNU-WIDER, ²National Treasury of South Africa

ERSA Conference - Back to Inflation
08 - 09 May 2025, Pretoria

Disclaimer: The views expressed here are those of the authors, and should not be interpreted as the views of UNU-WIDER or the National Treasury.

Overview

Introduction

Literature

Empirical Strategy

Baseline Results

Robustness Analyses

Transmission Channels

Conclusion

Introduction

Motivation

Introduction

- Inflation targeting has become the preferred monetary policy implementation framework for many central banks around the world and its price stabilization benefits relative to alternative frameworks are well documented.
- While an important strand of the literature suggests that the optimal inflation rate should be near zero percent, some central banks in advanced economies target 2% inflation.
- Meanwhile, emerging market economies that adopted the inflation targeting framework initially had high targets, but then gradually shifted towards lower ones.
- However, the macroeconomic effects of lowering the inflation target in emerging markets has received less attention in the literature.
- This paper aims to fill this gap by estimating the dynamic effects of shifting to a lower inflation target in South Africa as the country's central bank has made public calls of its desire to shift its inflation target from a range of 3 – 6% to a point target of 3%.

What We Do

Introduction

- We investigate the macroeconomic effects of shifting to a lower inflation target for South Africa.
- We use the Max Share Identification strategy to identify inflation target shocks in an SVAR and then estimate the impacts of these shocks using Bayesian techniques.
- We estimate the model using quarterly data over the 2000Q3-2024Q3 period, including the highly volatile COVID-19 episode with extreme observations recorded in 2020, which we account for in our estimation strategy.
- We estimate the Bayesian VAR using a Markov Chain Monte Carlo (MCMC) Gibbs sampler.

What We Find

Introduction

- We find that a decrease of 1% (ppts) in the inflation target leads to output expanding over the next few quarters after an initial muted response, with a peak of about 1.20% after about two years and remains positive and statistically significant for nearly three years after the shock.
- We also observe a short- and medium-term co-movement of inflation and the nominal policy rate in response to the inflation target shock, reminiscent of Neo-Fisherian effects.
- However, unlike most of the findings in the literature whereby the effects of inflation target shocks are persistent, we find that they are less persistent for the South African economy, implying that the often-cited gains linked with permanent lower borrowing costs may not apply to South Africa.
- Finally, we investigate the transmission mechanism of the inflation target shock and find a strongly operative sovereign credit risk and asset price channels through which lower inflation target increases output.

Literature

Related Literature

Literature

- **Empirical literature using SVARs:** Mumtaz and Theodoridis (2023), Lukmanova and Rabitsch (2023), De Michelis and Iacoviello (2016), Uribe (2022).
- **Theoretical literature using NK DSGE models:** Ireland (2007), Cogley, Primiceri and Sargent (2010), Feve, Matheron and Sahuc (2010).
- **Emerging markets and/or developing economies, and SA-based literature:** Ndou and Gumata (2024), Pirozhkova and Viegli (2023).

Outline of the Talk

- ▶ Empirical Strategy
- ▶ Baseline Results
- ▶ Robustness Analyses
- ▶ Transmission Channels

Empirical Strategy

Identification (I)

Empirical Strategy

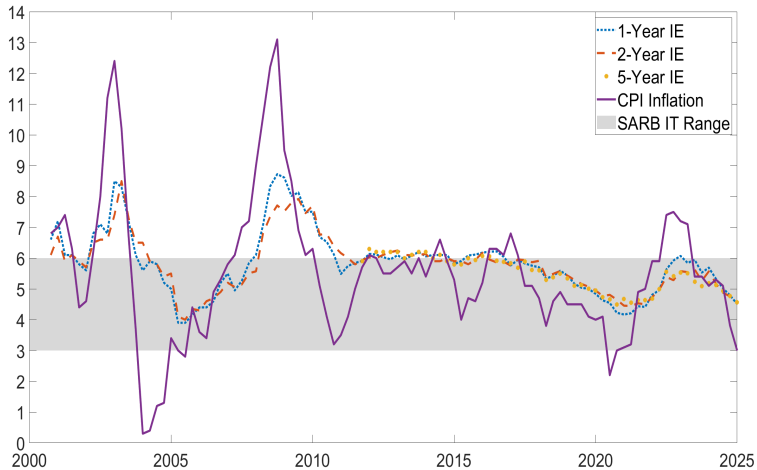
- Theoretically, long-run inflation expectations π^{LH} are driven by shocks to the central bank's inflation target $\varepsilon_t^{\pi^*}$ and a range of additional shocks $\tilde{\varepsilon}_t$ including technology, policy, and non-policy aggregate demand shocks:

$$\pi^{LH} = f(\varepsilon_t^{\pi^*}, \tilde{\varepsilon}_t) \quad (1)$$

- Yet, over the medium- to long-run horizons, the contribution of $\varepsilon_t^{\pi^*}$ is higher in relative terms, compared to the other shocks.
- Specifically, if the central bank reacts systematically to changes in inflation and is, at least, perceived to be credible in the long run, then long-horizon inflation expectations would coincide with the inflation target, i.e., inflation expectations would be well anchored in the long-term.
- As a consequence, any further changes in long-horizon inflation expectations reflect shocks to the inflation target.

Identification (II)

Empirical Strategy



Identification (III)

Empirical Strategy

- We use the following VAR to approximate these economic disturbances:

$$Y_t = \alpha + \sum_{j=1}^P \beta_{t-j} Y_{t-j} + A_0 \varepsilon_t, \quad (2)$$

where Y_t includes a measure of long-horizon inflation expectations $\hat{\pi}^{LH}$ and a set of other endogenous variables with $\hat{\pi}^{LH}$ ordered first (for simplicity); α is a vector of intercepts and P the lag length.

- ε_t denotes the orthogonal shocks and A_0 is the contemporaneous impact matrix such that $A_0 A_0' = \Sigma$, with Σ being the variance-covariance matrix of the reduced-form error $u_t = A_0 \varepsilon_t$.
- A_0 is not unique and the space spanned by these matrices can be written as $\tilde{A}_0 Q$ where Q is an orthonormal rotation matrix such that $Q' Q = I$.

Identification (IV)

Empirical Strategy

- If we re-write equation (2)'s VAR in structural moving average form, we get $Y_t = B(L)A_0\varepsilon_t$.
- The k -period ahead forecast error of the i th variable is given by

$$Y_{it+k} - \hat{Y}_{it+k} = e_1 \left[\sum_{j=0}^{k-1} B_j \tilde{A}_0 Q \varepsilon_{t+k-j} \right], \quad (3)$$

where e_1 is a selection vector that picks out $\hat{\pi}^{LH}$ in the set of variables.

- The shock to the inflation target is then identified by imposing the restriction that this shock makes the largest contribution to the forecast error variance (FEV) of $\hat{\pi}^{LH}$.

Identification (V)

Empirical Strategy

- The proposed identification scheme thus amounts to finding the column of Q that solves the following maximization problem:

$$\arg \max_{Q_1} e_1' \left[\sum_{k=0}^K \sum_{j=0}^{k-1} B_j \tilde{A}_0 Q_1 Q_1' \tilde{A}_0' B_j' \right] e_1 \quad (4)$$

subject to $Q_1' Q_1 = 1$, with Q_1 being the column of Q that corresponds to the shock explaining the largest proportion of the FEV of the first variable in the VAR, i.e., $\hat{\pi}^{LH}$, and K the forecast horizon.

- One can re-write it as an eigenvalue-eigenvector problem and obtain the following first order condition: $S Q_1 = \lambda Q_1$, where S is defined as:

$$S = \left[\sum_{k=0}^K \sum_{j=0}^{k-1} \tilde{A}_0' B_j' (e_1 e_1') B_j \tilde{A}_0 \right].$$

- This is the definition of a eigenvalue decomposition, with the solution Q_1 being the eigenvector of S associated with the largest eigenvalue λ .

Model Specification and Data

Empirical Strategy

- On top of the long-run inflation expectations variable π^{LH} which is ordered first, the other variables included in the baseline VAR are real GDP y_t which enters the model in log-levels, the end-of-period annualized CPI inflation π_t^a , the 10-year bond yield I_t , and the end-of-period repo rate R_t , which is the SARB policy rate.
- We use the BER 2-year ahead expected inflation as our benchmark for long-run inflation expectations π^{LH} , and quarterly data over the 2000Q3-2024Q3 period with the lag length of the VAR set to P to 4.
- Ideally, one would like to use the BER 5-year ahead expected inflation as our preferred baseline variable, but its sample only starts in 2011Q3.
- Yet, the BER 2-year ahead expected inflation is highly correlated (96.3%) with its 5-year counterpart over the sample period where both measures are available.

Estimation Approach

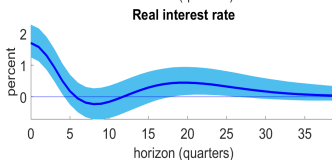
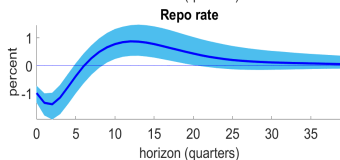
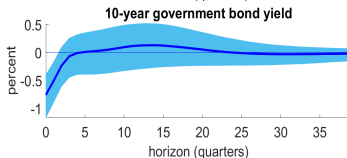
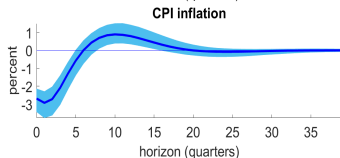
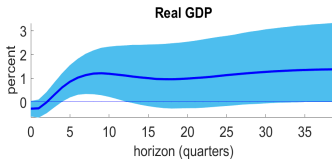
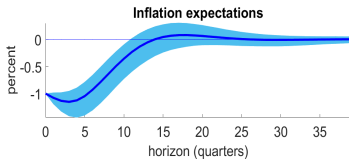
Empirical Strategy

- We estimate the reduced-form VAR in equation (2) using a Bayesian approach and a Markov Chain Monte Carlo (MCMC) Gibbs sampler to approximate the posterior distribution of the parameters.
- In particular, we use the Minnesota prior along with a natural conjugate distribution. This prior specification incorporates the beliefs that the more recent lags should provide more reliable information than the more distant ones, and own lags should explain more of the variation of a given variable than the lags of other variables in the equation.
- Hence, the prior means for each endogenous variable are derived from OLS estimates of an AR(1) - for the first lag - and the sum of the lagged dependent variables, using a training sample. The prior tightness parameters are set close to standard values in the literature.
- To control for the extreme observations witnessed during the COVID-19 pandemic, we follow Cascaldi-Garcia (2024) by extending the prior with time dummies that we adapt to our identification scheme.
- Given the conjugate prior, we then simulate the conditional posterior distributions of the VAR parameters using the Gibbs sampling algorithm.

Baseline Results

IRFs to the Inflation Target Shock

Baseline Results

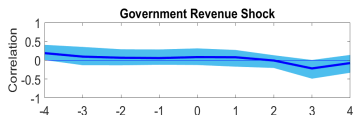
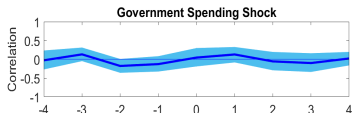
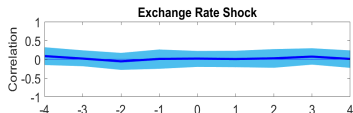
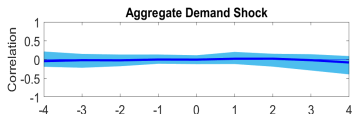
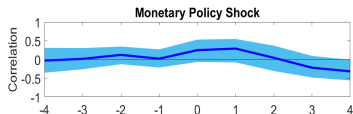
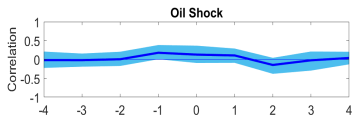
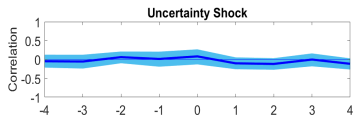


Forecast Error Variances

Robustness Analyses

Shocks Correlations

Robustness Analyses



R2 - Jibar

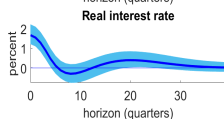
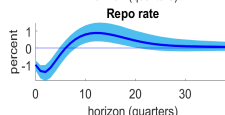
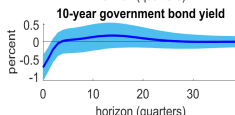
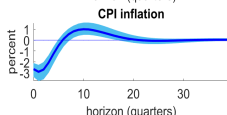
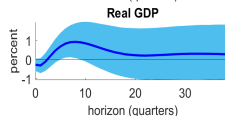
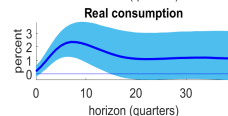
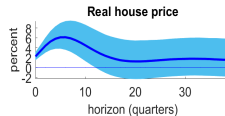
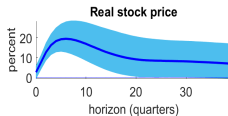
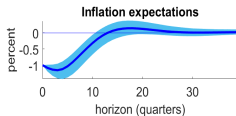
R3 - Oil Price Growth

R4 - Real GDP Growth

Transmission Channels

Interest Rate and Other Asset Prices Channel

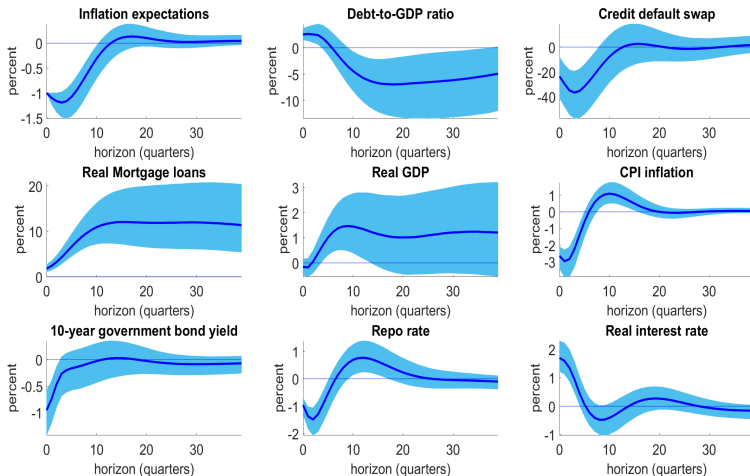
Transmission Channels



Exchange Rate Channel

Sovereign Risk Premium Channel

Transmission Channels



Credit Channel

Conclusion

Summary

Conclusion

- Lowering the South African inflation target leads to output growing over a certain period, driven by aggregate demand, and a co-movement of inflation and the repo rate akin to Neo-Fisherian effects, a feature also evidenced in other similar studies.
- Moreover, the inflation target shock substantially contributes to the fluctuations of both inflation and the policy rate, yet its effects are less persistent.
- An analysis of the transmission mechanism of the target shock to the economy reveals a strongly operative sovereign credit risk and asset price channels.
- However, the exchange rate channel is weakly operative, owing to increased central bank credibility that helped reduce the pass-through of exchange rate movements to inflation, thereby mitigating their effects on trade balance.

Appendix

Details of the Identification Scheme

Additional Materials

- Following Uhlig (2004), one can re-write the maximization problem (4) as the following eigenvalue-eigenvector problem:

$$\begin{aligned}\arg \max_{Q_1} e_1' \left[\sum_{k=0}^K \sum_{j=0}^{k-1} B_j \tilde{A}_0 Q_1 Q_1' \tilde{A}_0' B_j' \right] e_1 &= \sum_{k=0}^K \sum_{j=0}^{k-1} \text{trace} \left[Q_1' \tilde{A}_0' B_j' (e_1 e_1') B_j \tilde{A}_0 Q_1 \right] \\ &= Q_1' \left[\sum_{k=0}^K \sum_{j=0}^{k-1} \tilde{A}_0' B_j' (e_1 e_1') B_j \tilde{A}_0 \right] Q_1 = Q_1' S Q_1 \quad (5)\end{aligned}$$

where $S = \left[\sum_{k=0}^K \sum_{j=0}^{k-1} \tilde{A}_0' B_j' (e_1 e_1') B_j \tilde{A}_0 \right]$.

- The Lagrangian for this maximization problem is

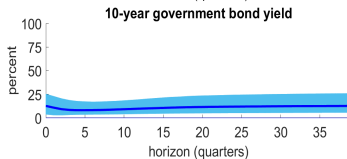
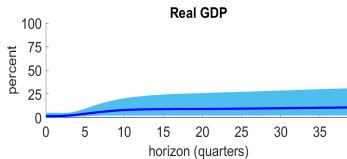
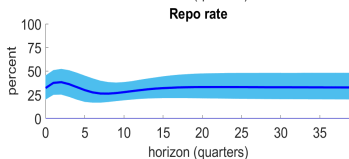
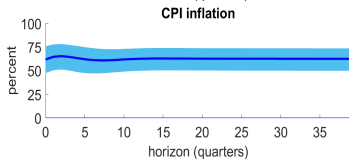
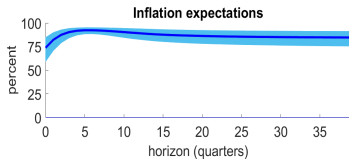
$$L = Q_1' S Q_1 + \lambda(1 - Q_1' Q_1)$$

and the resulting first order condition is $S Q_1 = \lambda Q_1$.

Back

Forecast Error Variance Decompositions

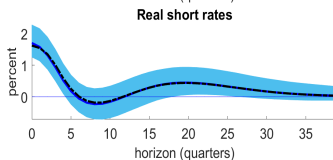
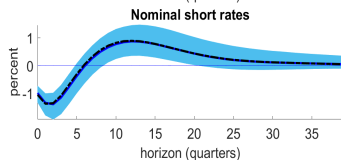
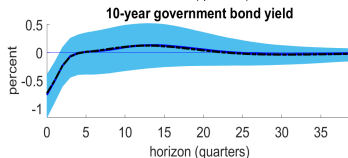
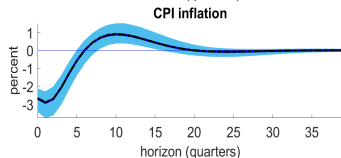
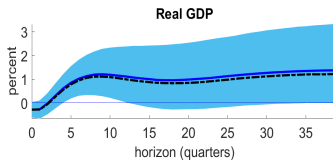
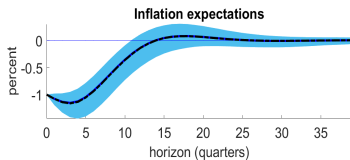
Additional Materials



Back

JIBAR as Proxy for the Repo Rate

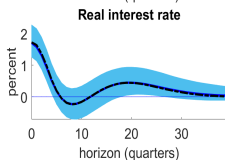
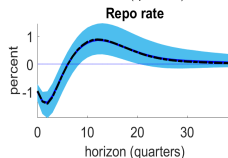
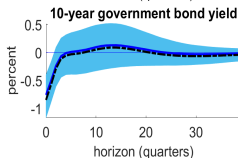
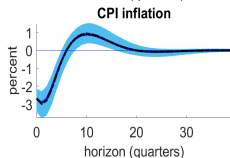
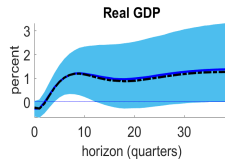
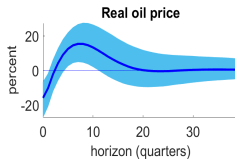
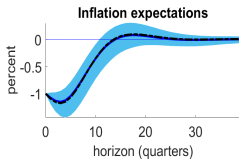
Additional Materials



[Back](#)

Oil Price Growth as Additional variable to Baseline Model

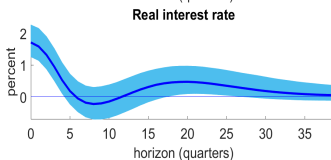
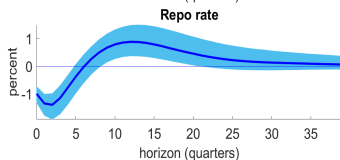
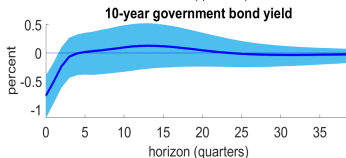
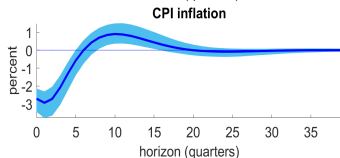
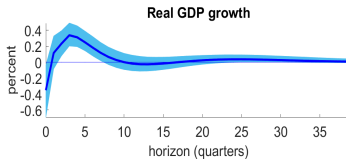
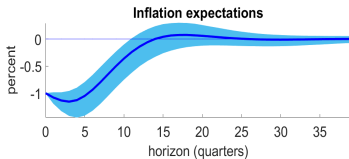
Additional Materials



[Back](#)

Real GDP Growth instead of its Level in Baseline Model

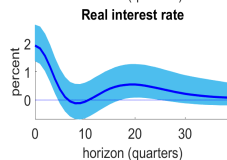
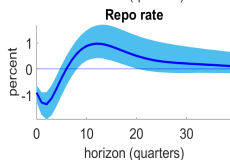
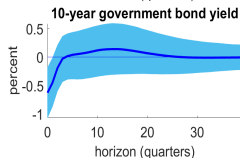
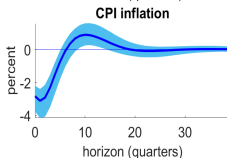
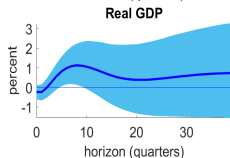
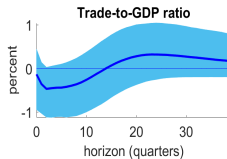
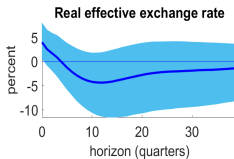
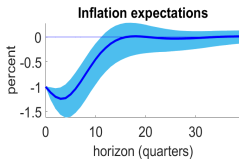
Additional Materials



[Back](#)

Exchange Rate Channel

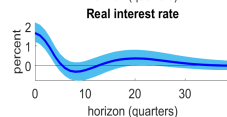
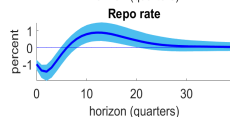
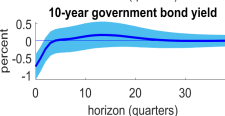
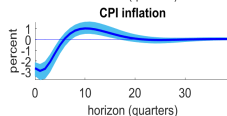
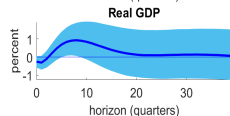
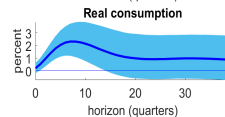
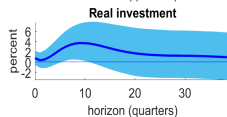
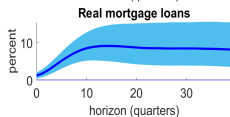
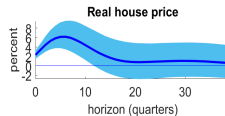
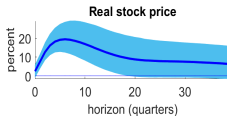
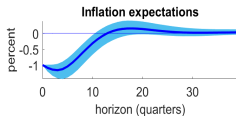
Additional Materials



[Back](#)

Credit Channels: The Balance Sheet Channel

Additional Materials



[Back](#)