Disinflation Policy in a Fiscal DSGE Model with Trend Inflation and Price Dispersion

Hylton Hollander Clinton Joel

University of Cape Town

May 9, 2025

Table of Contents

- Motivation
- Aims
- Brief review of the literature
- Main findings
- The Generalised New Keynesian Model
- Results
  - Inflation and price dispersion
  - Disinflation policy: long run output and welfare
  - Disinflation policy: Monetary policy shock
  - Disinflation policy: Inflation target shock
  - Macroeconomic policy coordination
- Policy Implications
- References
- Appendix

Trend inflation distorts relative prices

"A signal wrapped in an incentive" – *Alex Tabarrok*.

A high price that signals scarcity also creates powerful incentives to fix the problem:

- Consumers: Maybe wait or find a substitute
- Producers: Increase production–there is profit to be made
- Entrepreneurs: Develop alternatives or more efficient production methods

Information paired with motivation makes prices uniquely powerful for coordinating economic activity—which trend inflation distorts!

Aims

1. **Trend inflation:** How does price dispersion under trend inflation affect macroeconomic dynamics and household welfare?
2. **Disinflation policy trade-offs:** What are the long-run *gains* and transitional *costs* of the SARB's move to a lower inflation target?
3. **Policy coordination:**

   How does government debt shape the disinflation strategy and policy coordination?

   How can the short-run costs of disinflation policy be mitigated?

Placement within the literature

- **Trend inflation** matters for policy analysis:
  (Ascari and Sbordone, 2014)
  - to identify sources of persistence, and the extent of cyclical trade-offs (more volatile and unstable economy);
  - higher trend inflation requires more hawkish policy (misidentification of monetary policy)
  - higher trend inflation tends to destablise inflation expectations
- **Divine coincidence** also breaks under heterogeneous HHs and nominal wage rigidity (Bhatnagar, 2023; Blanchard and Galí, 2007; Erceg et al., 2000; Garín et al., 2016)
- **Credibility** of the inflation target requires the public's belief on whether the government will respect that commitment (Krause and Moyen, 2016)

Placement within the literature

- **Information frictions** generally refer to limitations in the availability, accuracy, or interpretation of information that agents use to make economic decisions
  - Relaxing perfect information assumptions yields a more realistic policy analysis framework (Eusepi and Preston (2018)).
  - Price dispersion reduces efficiency, widening the gap between actual and potential output (Sims (2017)).
- **Interest rates and fiscal concerns**

  (Krause and Moyen, 2016; Havemann and Hollander, 2024)
  - Lowering the inflation target may reduce long-term interest rates such that $r - g < 0$.
  - However, deteriorating government finances (higher real debt burden) could counteract this reduction by pushing rates higher, complicating the target-setting process.

Placement within the literature

- **Optimal inflation in theory vs. practice**
  - Most 'sticky price' models recommend a zero inflation rate as optimal for minimising welfare losses (Ascari and Sbordone, 2014; Brunnermeier and Sannikov, 2016; Diercks, 2019)
  - In practice, CBs set higher inflation targets to address, e.g., measurement imprecision, zero lower bound, and deflationary risks.
- **Lack of consensus**
  - Challenging to determine an 'optimal' inflation target – especially one tailored to South Africa. (Horn et al., 2025, Undermind.ai)

Main findings - Disinflation policy

- **Long run output gains** from lower inflation target significant; For household **welfare**, lower is better−−but not necessarily zero%!
- **Short run costs** mitigated by lower price and wage dispersion
- **Transfers** to poor households mitigates short run costs, but government debt dynamics complicate the trade-offs . . .
- **Credible communication** of the target crucial (partial information)

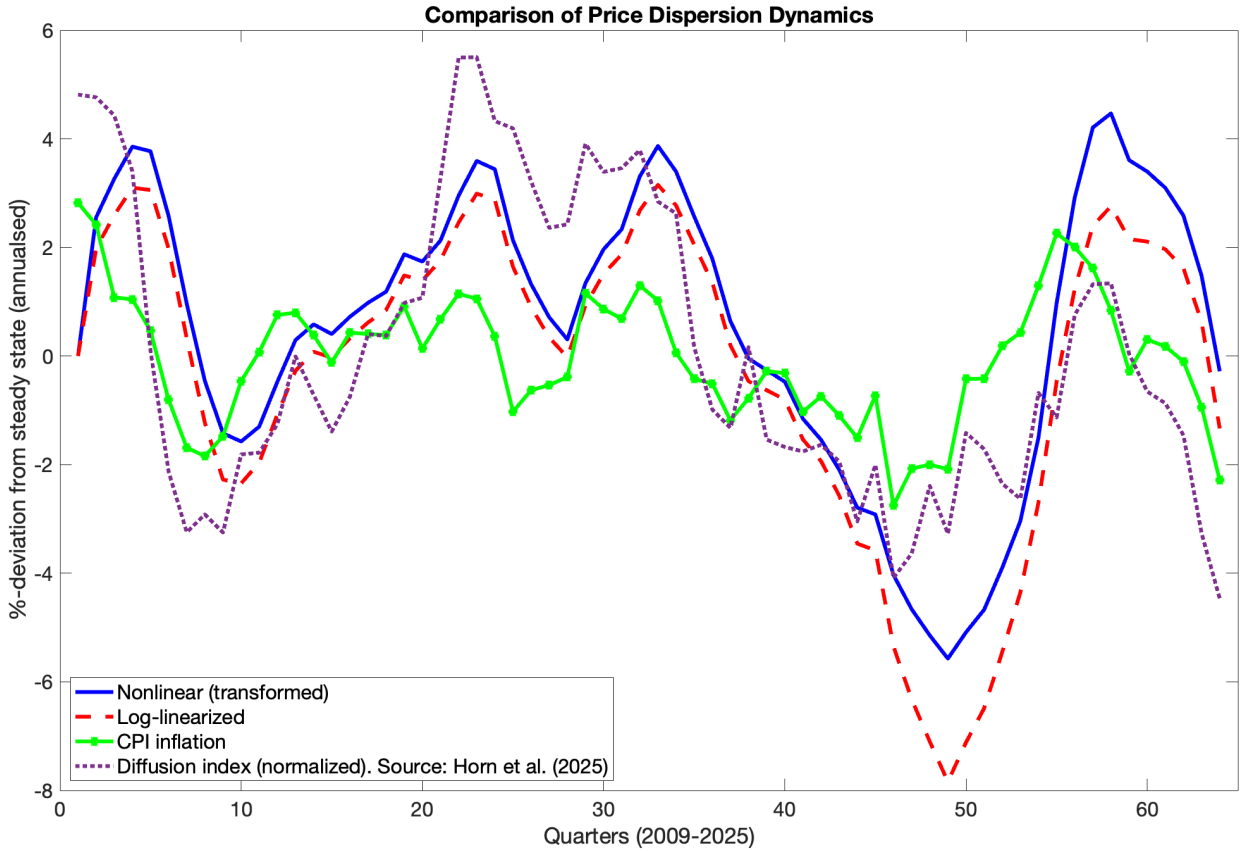
Core model features

- The Two-Agent New Keynesian (**TANK**) model (Garín et al., 2016; Bhatnagar, 2023)
  - **Ricardian:** Households with access to financial markets, able to smooth consumption.
  - **Non-Ricardian** Households excluded from financial markets, only consume income from wages and transfers.
  - **Nominal rigidities**: Calvo price and wage setting with indexation
- **Generalised** New-Keynesian Phillips Curve (AS, 2014)
  - introduces trend inflation: a role for price (and wage) dispersion

Policy authorities

- **Monetary policy** stabilises inflation and output (Taylor rule)
  – time-varying and positive inflation target
  - *Monetary policy trade-off* : divine coincidence is not possible when output distribution between households is unequal.
- **Fiscal policy** raises revenue, spends and redistributes
  - four fiscal instruments (fiscal reaction functions: tax bouyancy and automatic stabilisers)
  - risk premium on long-term bonds
  - public debt maturity structure (Krause and Moyen, 2016).

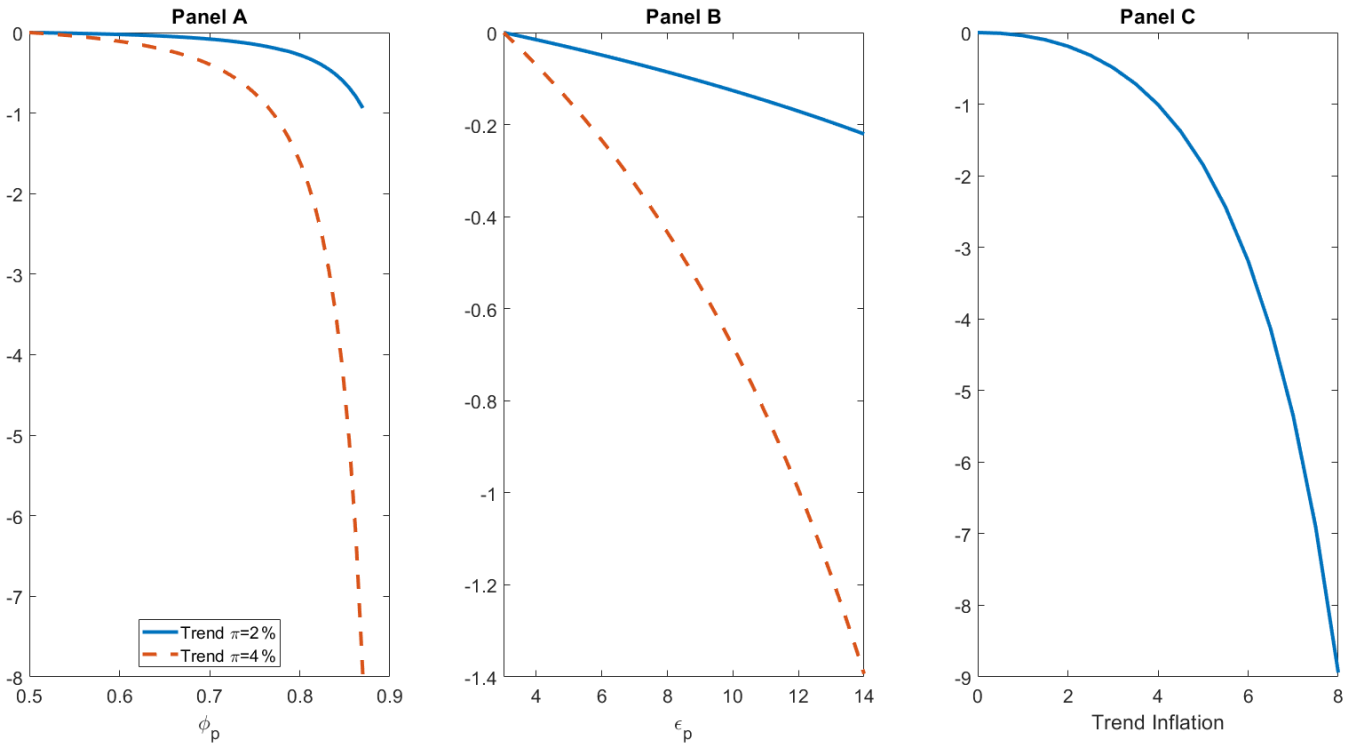
Inflation and price dispersion



Price dispersion (log-linearised): $\hat{v}_{p,t} = A\hat{\pi}_t + B\hat{v}_{p,t-1}$

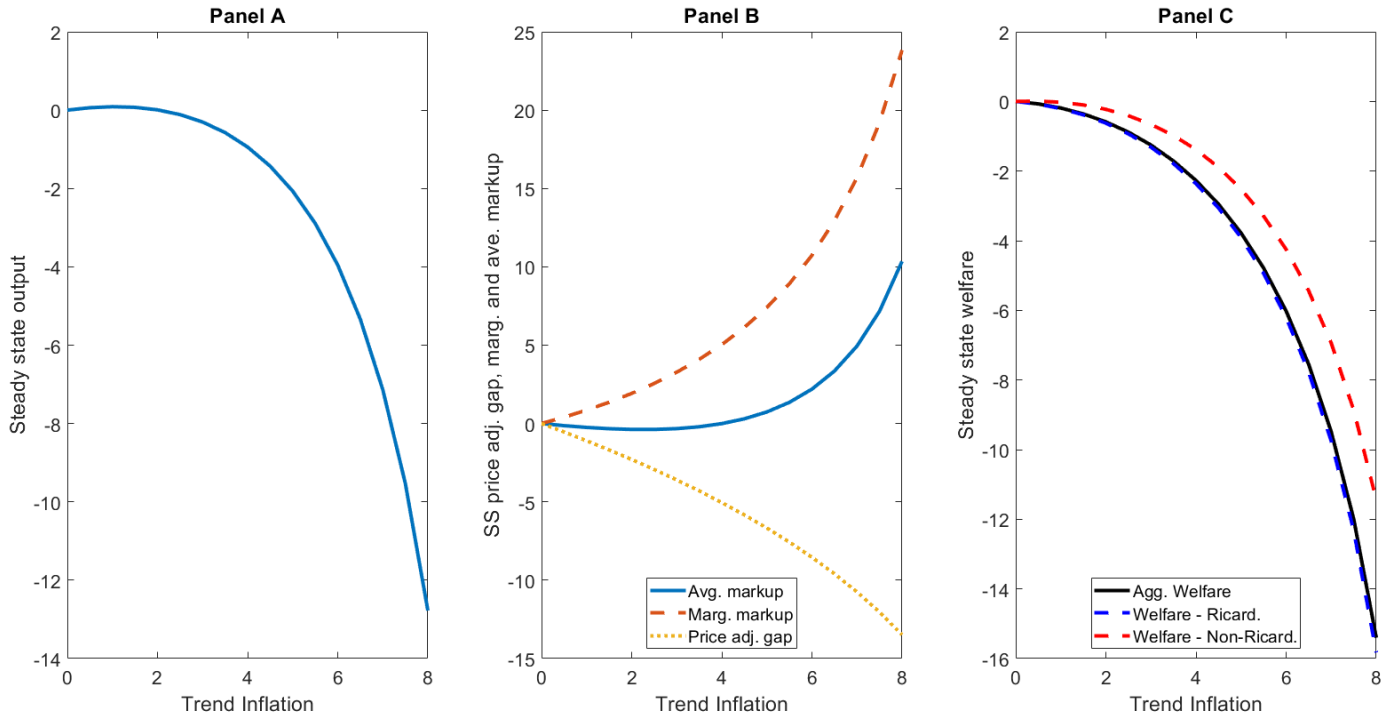
Dispersion as a result of inflation and persistence are both rising in trend inflation, stickiness, and elasticity of substitution: $A = \Omega'(\bar{\pi}, \phi_p, \varepsilon_p) > 0$ and $B = \Omega'(\bar{\pi}, \phi_p, \varepsilon_p) > 0$. Correlations with inflation $\approx 0.54 - 0.68$

The cost of price dispersion



$$p_i^{\#} = \left(\frac{1 - \phi_p \left(1 + \bar{\pi}\right)^{(\epsilon_p - 1)(1 - \zeta_p)}}{(1 - \phi_p)} \right)^{\frac{1}{1 - \epsilon_p}}$$

Trend inflation, long run output and welfare



Labour: $N^d = \frac{N}{v_w}$, given: $Y = \frac{AN^d}{v_p} \quad \Rightarrow \quad Y = \frac{AN^d}{v_p v_w} \quad \Rightarrow \quad \tilde{A} = \frac{A}{\underbrace{v_p v_w}_{\text{Comp. dispersion}}}$

Trend inflation and transition costs

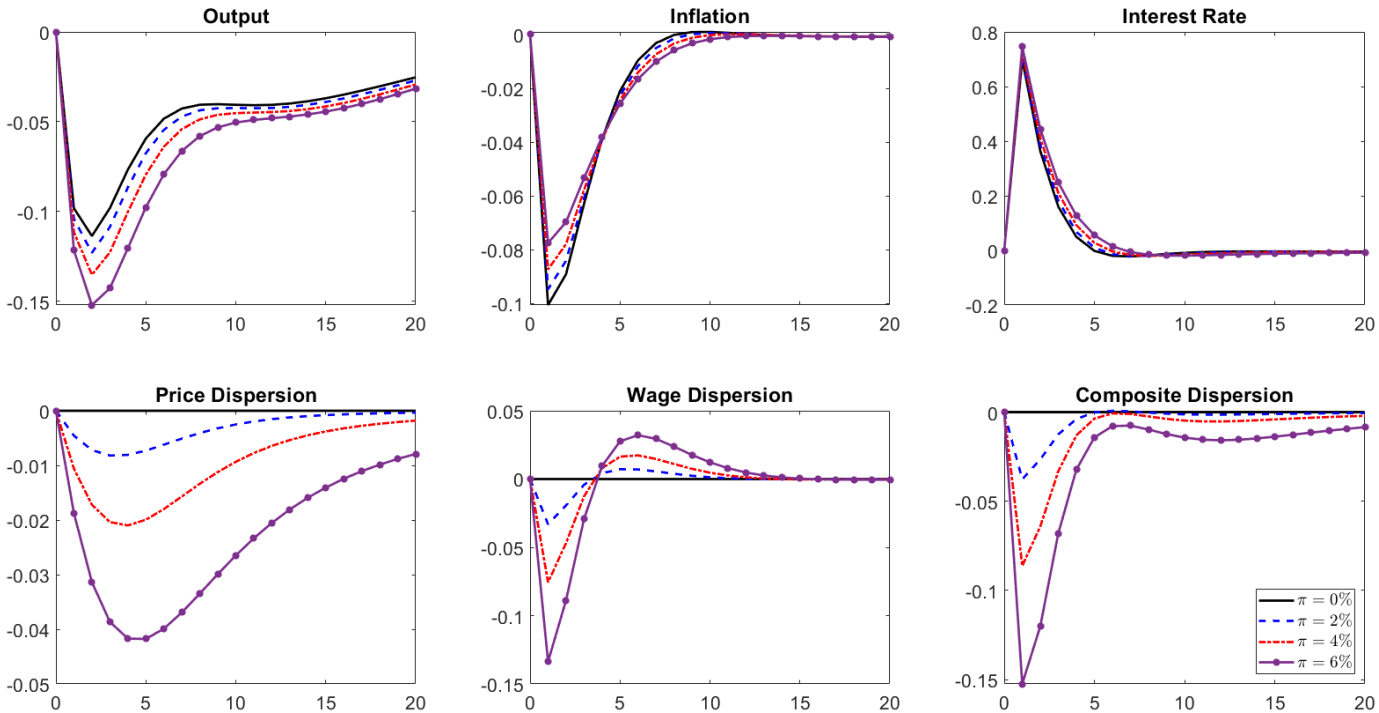


Figure: IRFs to a 1%-point positive MP shock

Trend inflation and nominal rigidities

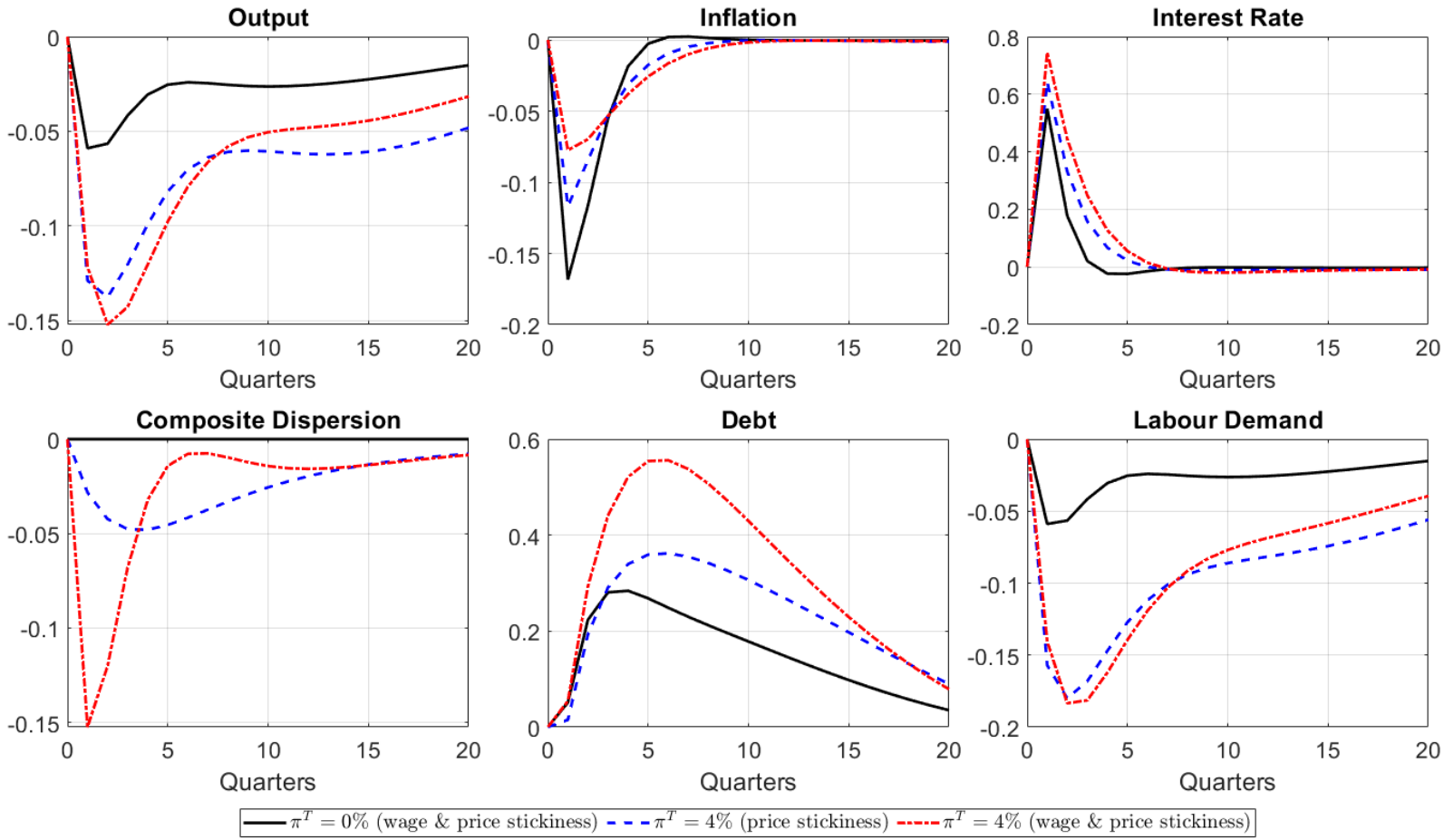


Figure: IRFs to a 1%-point positive MP shock

Communication matters

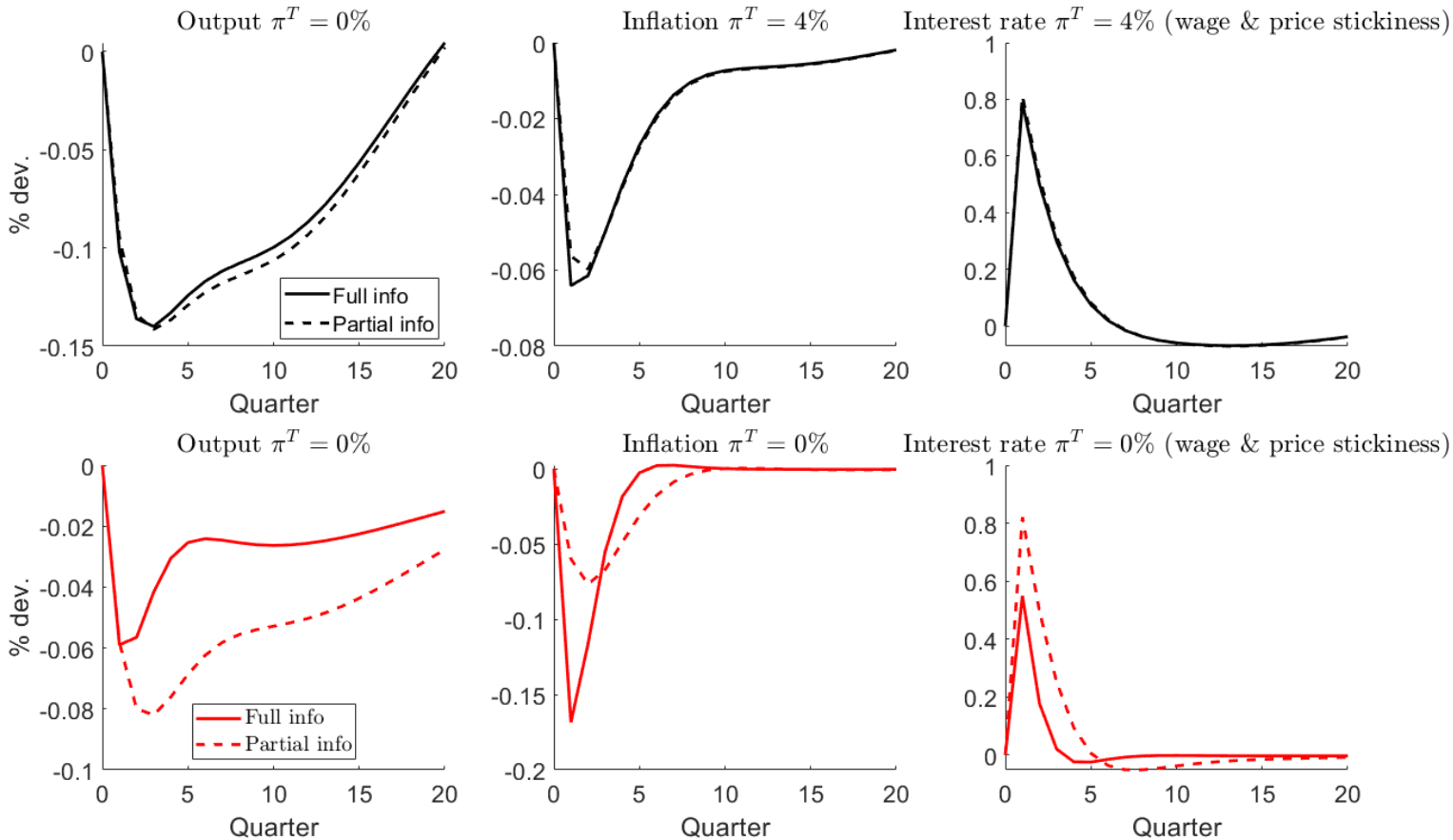


Figure: IRFs to a 1%-point monetary policy shock under partial information

Trend inflation and transition costs

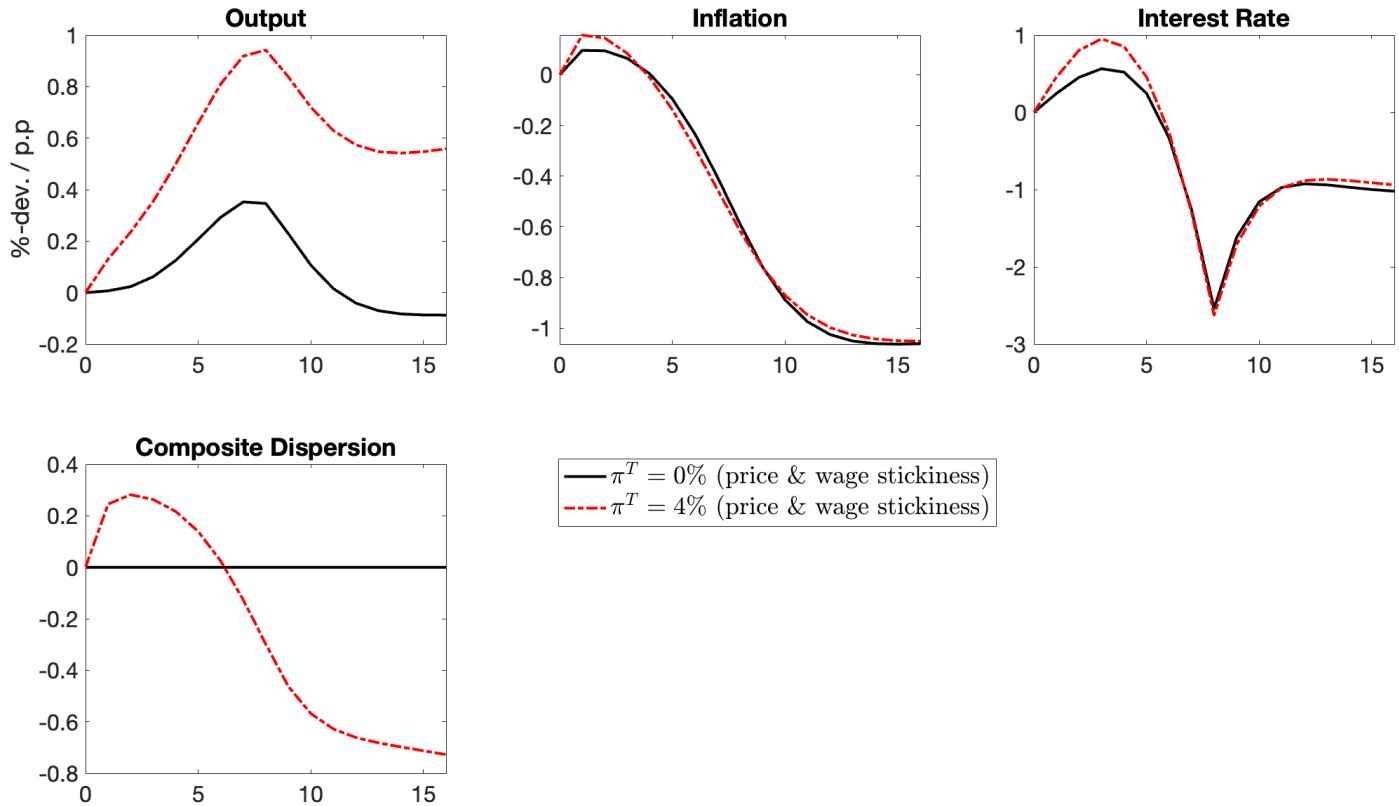


Figure: IRFs to a negative 1%-point inflation target shock – anticipated 8-quarters ahead

Trend inflation and nominal rigidities

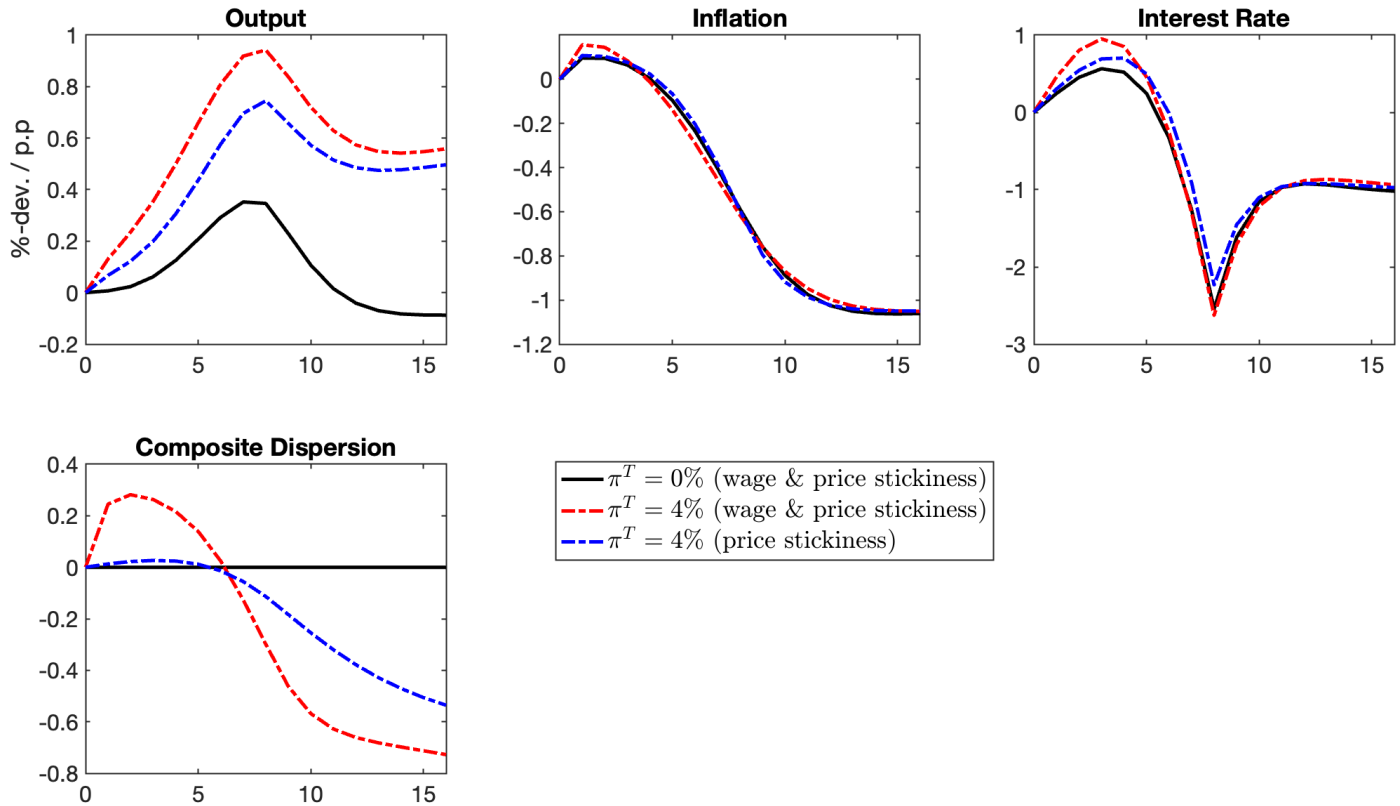


Figure: IRFs to a negative 1%-point inflation target shock – anticipated 8-quarters ahead

Communication matters

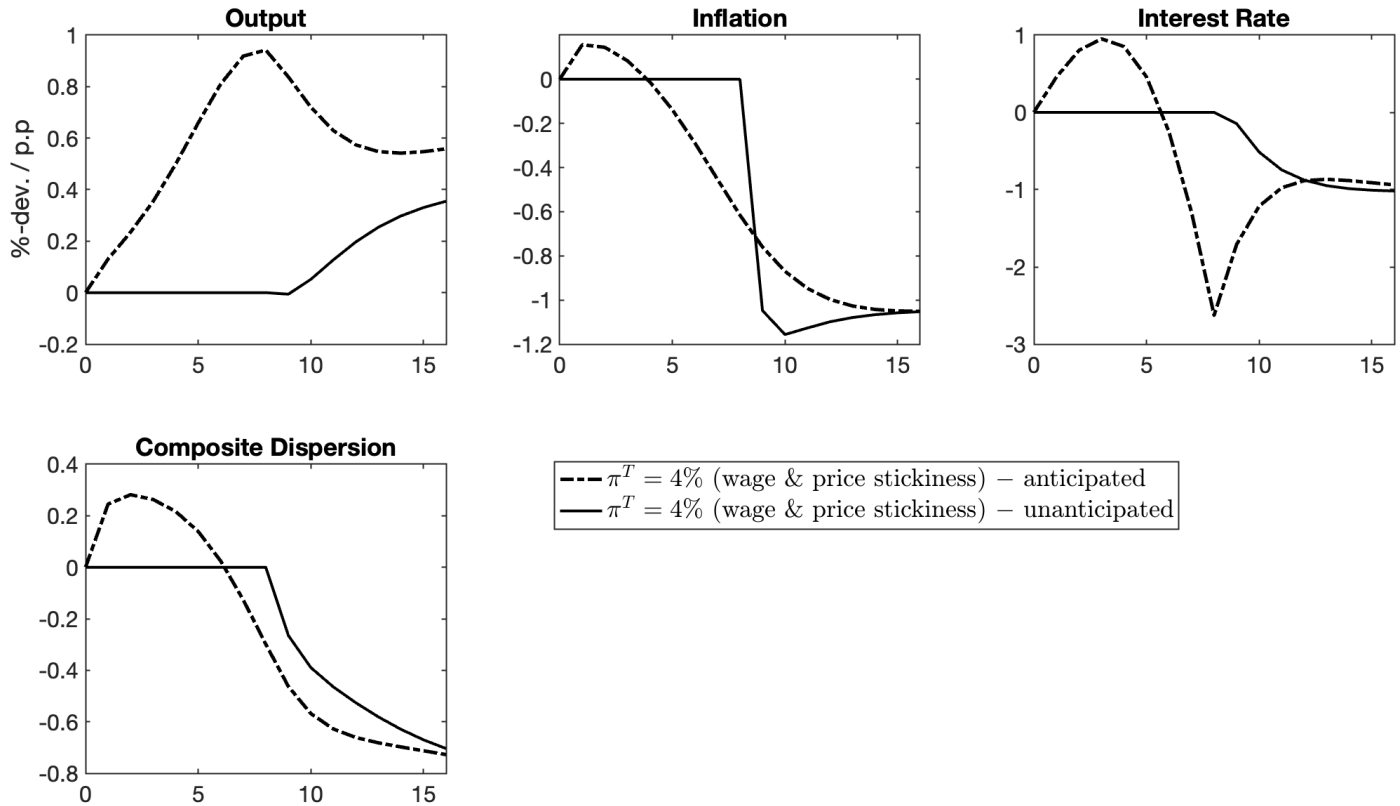


Figure: IRFs to a negative 1%-point inflation target shock – (un)anticipated 8-quarters ahead

The sensitivity of debt to changing the inflation target

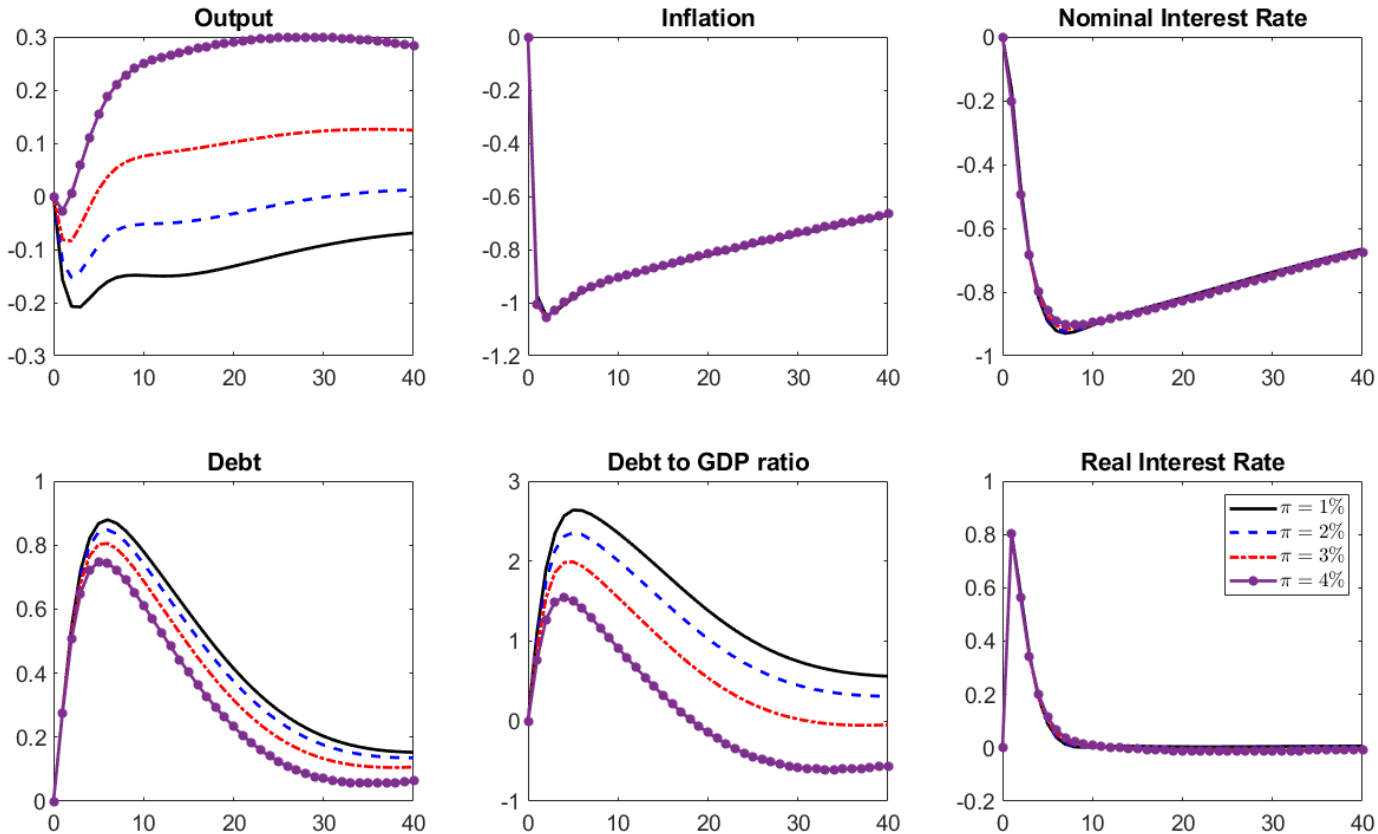
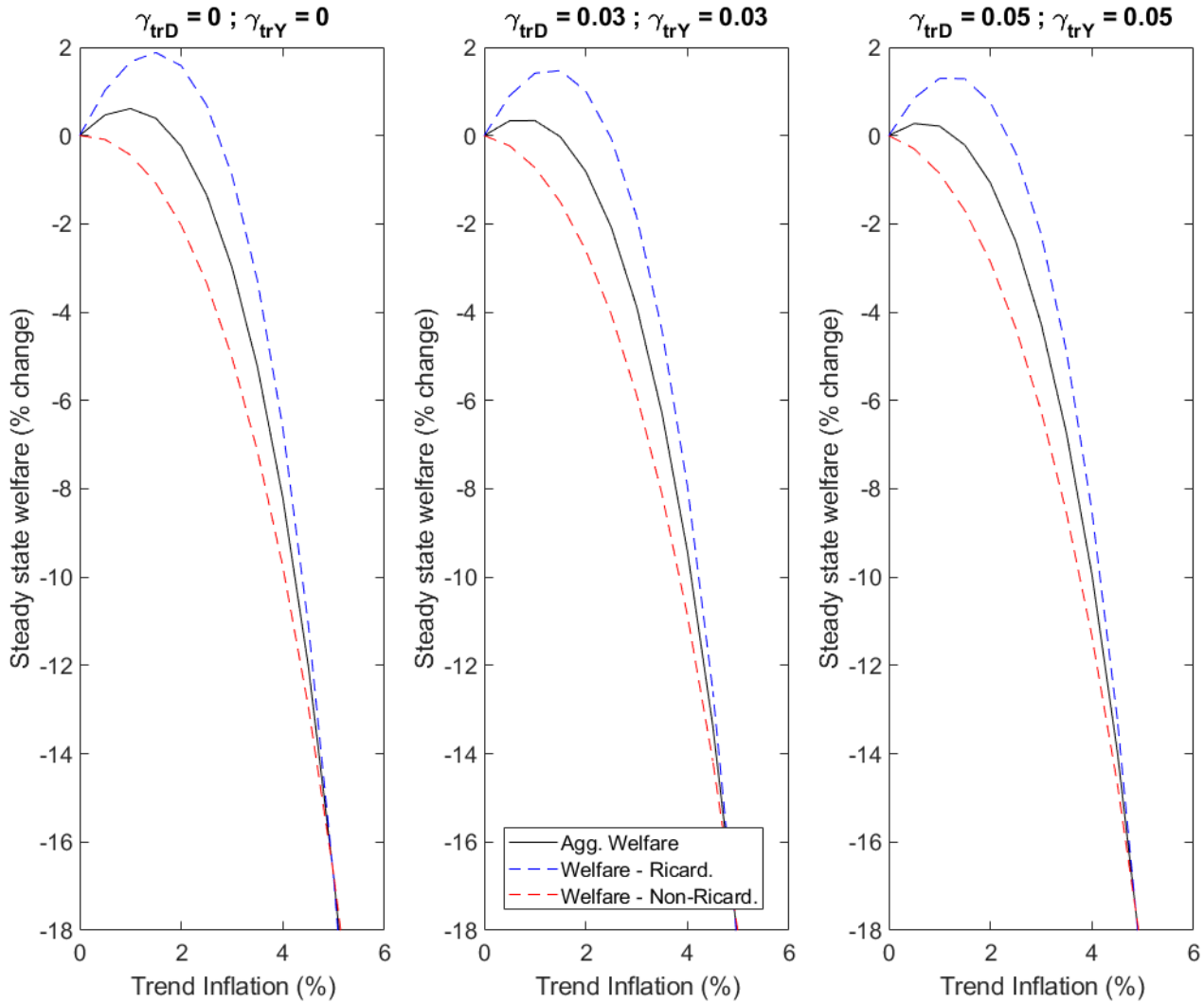


Figure: IRFs to a 1%-point **dis**-inflation target shock

Fiscal sensitivity analysis to debt (γ_{trD}) and output (γ_{trY})



Conclusion

- Propose a *Generalised* NK-DSGE framework for policy analysis in South Africa where positive trend inflation creates meaningful distortions (information frictions)
- Analyse monetary and fiscal policy under these complexities
- Policy implications: *prices are signals, don't shoot the messenger!*
  - lower is better $\rightarrow$ significant output and welfare gains
  - short-term costs likely minimal given that current CPI inflation is hovering around 3% $\rightarrow$ transition costs to financially constrained ('poor') mitigated through transfers, but government debt dynamics complicate the story ...
  - credible communication is crucial (partial information)
  - as well as government commitment to fiscal sustainability

Going forward

- We aim to explore different aspects of information frictions in policy coordination using DSGE models calibrated/estimated to the South African economy.
  1. Time-varying inflation targeting under imperfect information (signal extraction problem).
  2. Robust policy rules under forecast / output gap uncertainty (noisy information).
  3. Optimal policy coordination under bounded rationality (agent myopia).

References I

Ascari, G. and Sbordone, A. M. (2014). The macroeconomics of trend inflation. *Journal of Economic Literature*, 52(3):679–739.

Bhatnagar, A. (2023). Monetary policy with non-ricardian households. *The Quarterly Review of Economics and Finance*, 89:12–26.

Blanchard, O. and Galí, J. (2007). Real wage rigidities and the new keynesian model. *Journal of money, credit and banking*, 39:35–65.

Brunnermeier, M. K. and Sannikov, Y. (2016). On the optimal inflation rate. *American Economic Review*, 106(5):484–89.

Diercks, A. M. (2019). The Reader's Guide to Optimal Monetary Policy. Technical report, SSRN.

Erceg, C. J., Henderson, D. W., and Levin, A. T. (2000). Optimal monetary policy with staggered wage and price contracts. *Journal of monetary Economics*, 46(2):281–313.

References II

Eusepi, S. and Preston, B. (2018). The science of monetary policy: An imperfect knowledge perspective. *Journal of Economic Literature*, 56(1):3–59.

Garín, J., Lester, R., and Sims, E. (2016). On the desirability of nominal gdp targeting. *Journal of Economic Dynamics and Control*, 69:21–44.

Havemann, R. and Hollander, H. (2024). Fiscal policy in times of fiscal stress (or what to do when r>g). *Journal of Policy Modeling*, 46(5):1020–1054.

Hollander, H. and van Lill, D. (2020). On the estimation and application of structural decompositions of the south african business cycle. *Business Cycles and Structural Change in South Africa: An Integrated View*, pages 167–234.

Horn, A. J., Martin, L., Pretorius, J. H., and Steenkamp, D. (2025). Gaps in the South African Inflation Targeting Debate. MPRA Paper 124010, University Library of Munich, Germany.

References III

Kemp, J. H. and Hollander, H. (2020). A medium-sized, open-economy, fiscal DSGE model of South Africa. WIDER Working Paper Series wp-2020-92, World Institute for Development Economic Research (UNU-WIDER).

Krause, M. U. and Moyen, S. (2016). Public debt and changing inflation targets. *American Economic Journal: Macroeconomics*, 8(4):142–176.

Sims, E. (2017). A new keynesian model with both price and wage stickiness. Lecture notes for Graduate Macro Theory II. Accessed: 22/07/2024.

Estimation/Calibration

- Calibrated/Estimated to South African economy using SARB and StatsSA data and literature (Kemp and Hollander (2020), Hollander and van Lill (2020), Havemann and Hollander (2024)).

Estimated Taylor rule - South Africa

Taylor rule (log-linearised):

$$i_t = \rho_i * i_{t-1} + (1 - \rho_i) * (\phi_\pi * \pi_t + \phi_y * y_t) + \varepsilon_t^i$$

No trend ($\bar{\pi} = 0$):

$$i_t = \underset{[0.92,0.96]}{0.94}\, i_{t-1} + (1-0.94)(\underset{[1.57,2.3]}{1.93}\, \pi_t + \underset{[0.14,0.29]}{0.22}\, y_t) + \underset{[0.13,0.19]}{0.16}$$

Estimated trend ($\bar{\pi} = 4.42$):

$$i_t = \underset{[0.68,0.83]}{0.75}\, i_{t-1} + (1-0.75)(\underset{[1.90,2.66]}{2.30}\, \pi_t + \underset{[0.16,0.32]}{0.24}\, y_t) + \underset{[0.15,0.24]}{0.20}$$

Simulated MP shock - AS2014 baseline

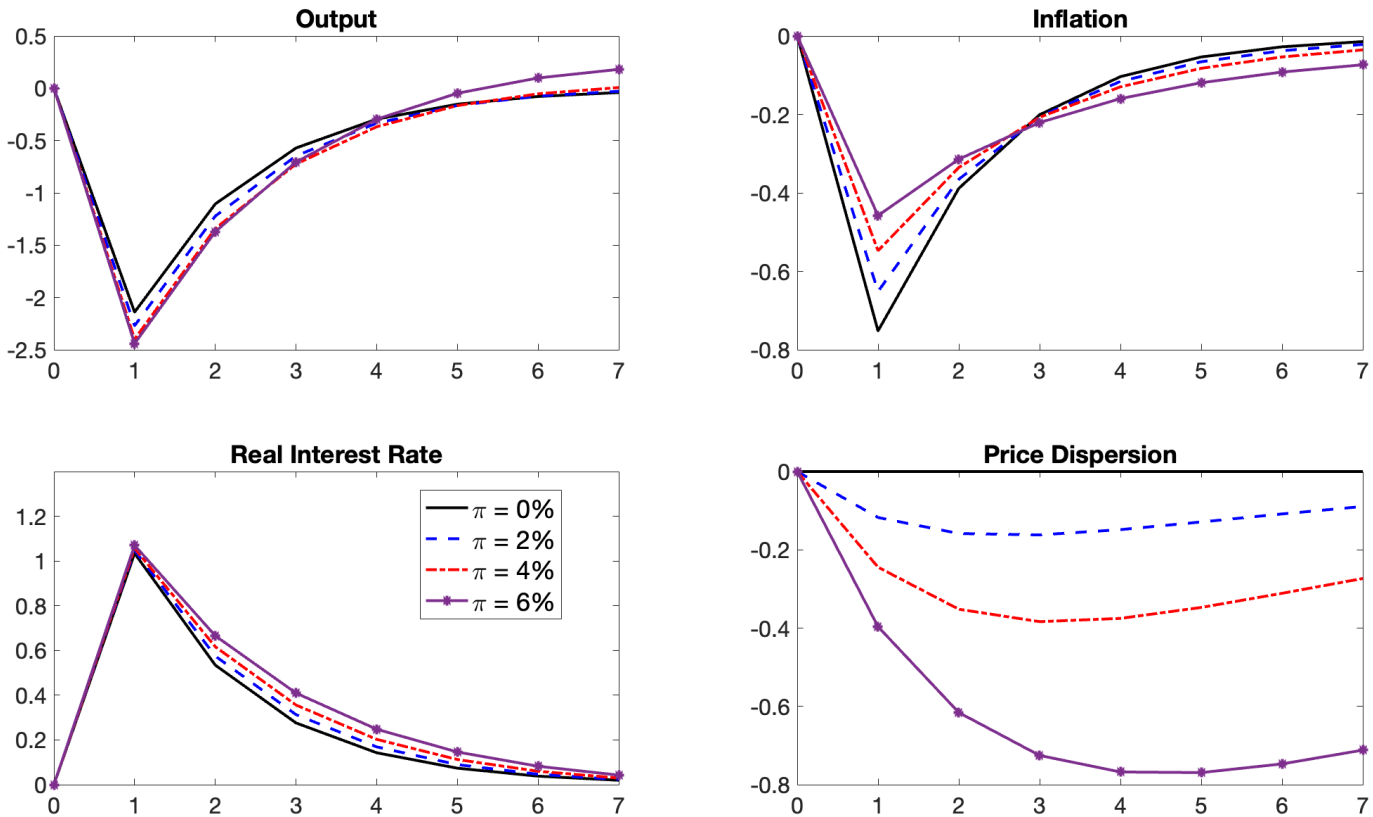


Figure: Ascari and Sbordone (2014): IRFs to MP shock for different trend levels

Estimated MP shock - South Africa

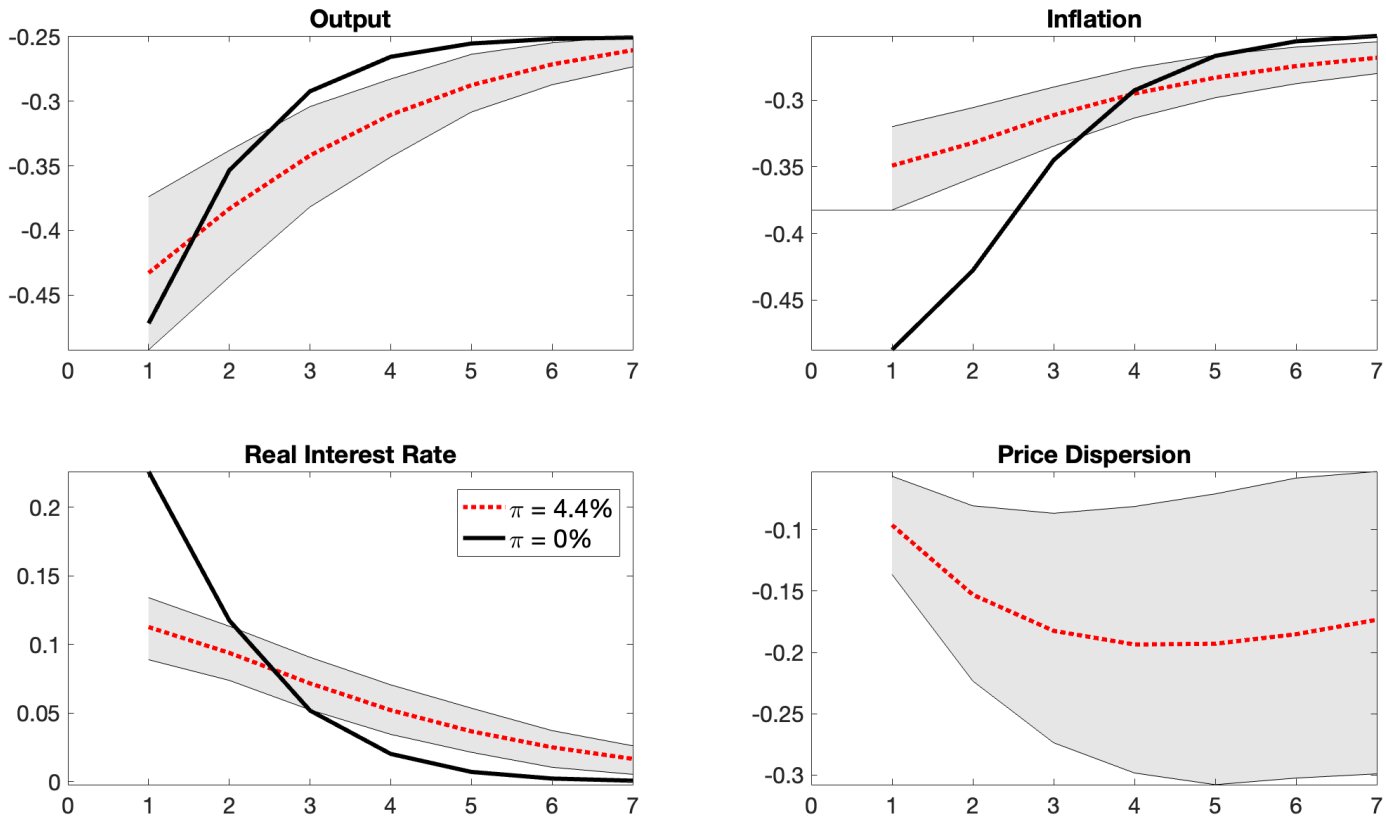


Figure: Estimated over 2009−2019: IRFs to MP shock for different trend levels

Sensitivity to Inflation Target Persistence and Debt Maturity

Krause and Moyen (2016):

- To reduce real government debt need permanent change (increase) in inflation target (temporary changes have limited impact)
- High average debt maturity alone cannot make moderate inflation changes substantially reduce debt.
- Short-term debt amplifies the effect of higher inflation on debt due to mispricing from imperfect information.

The sensitivity of debt to changing the inflation target

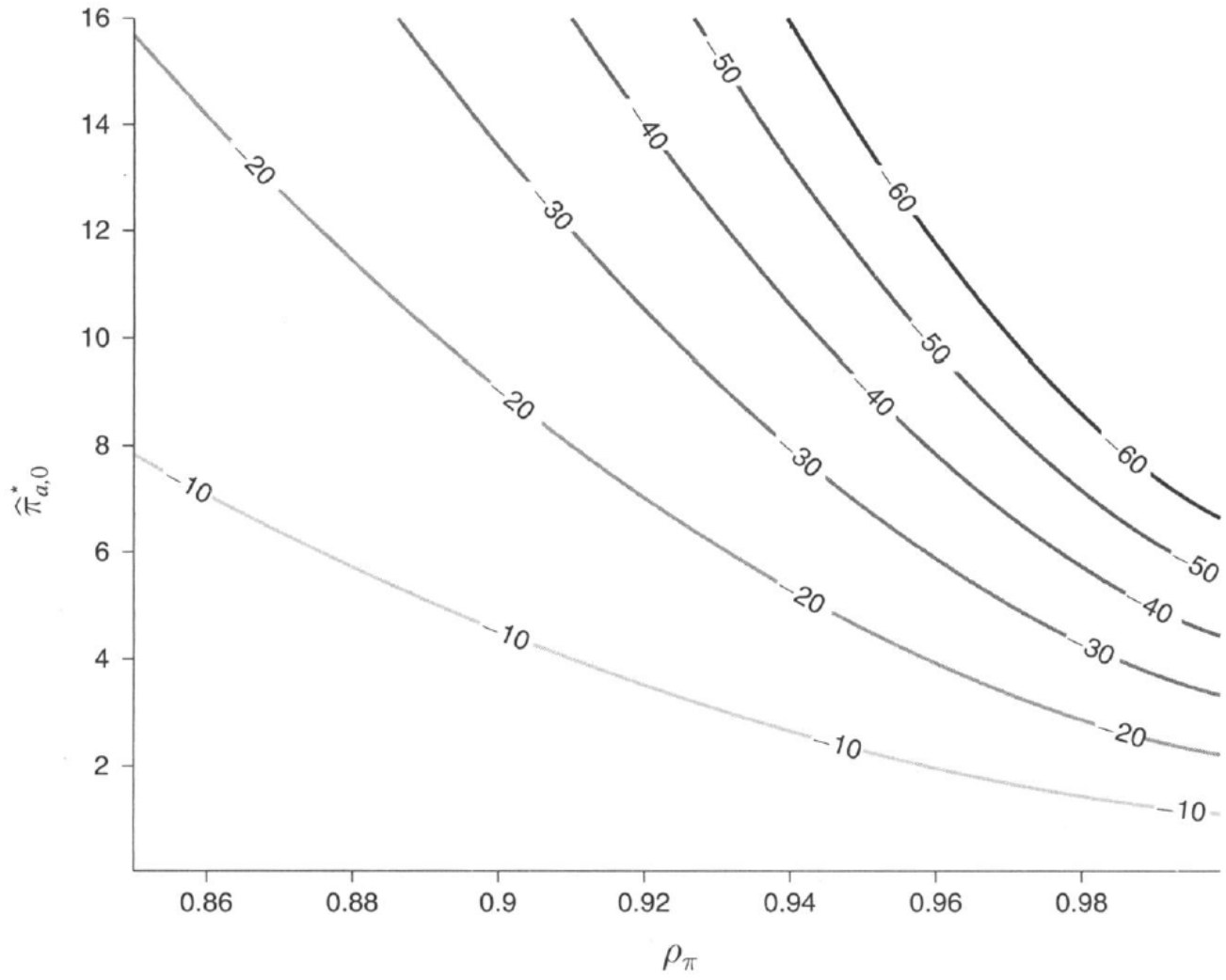


Figure: Inflation target process and shock size (KM 2016)

Partial information: endogenous persistence

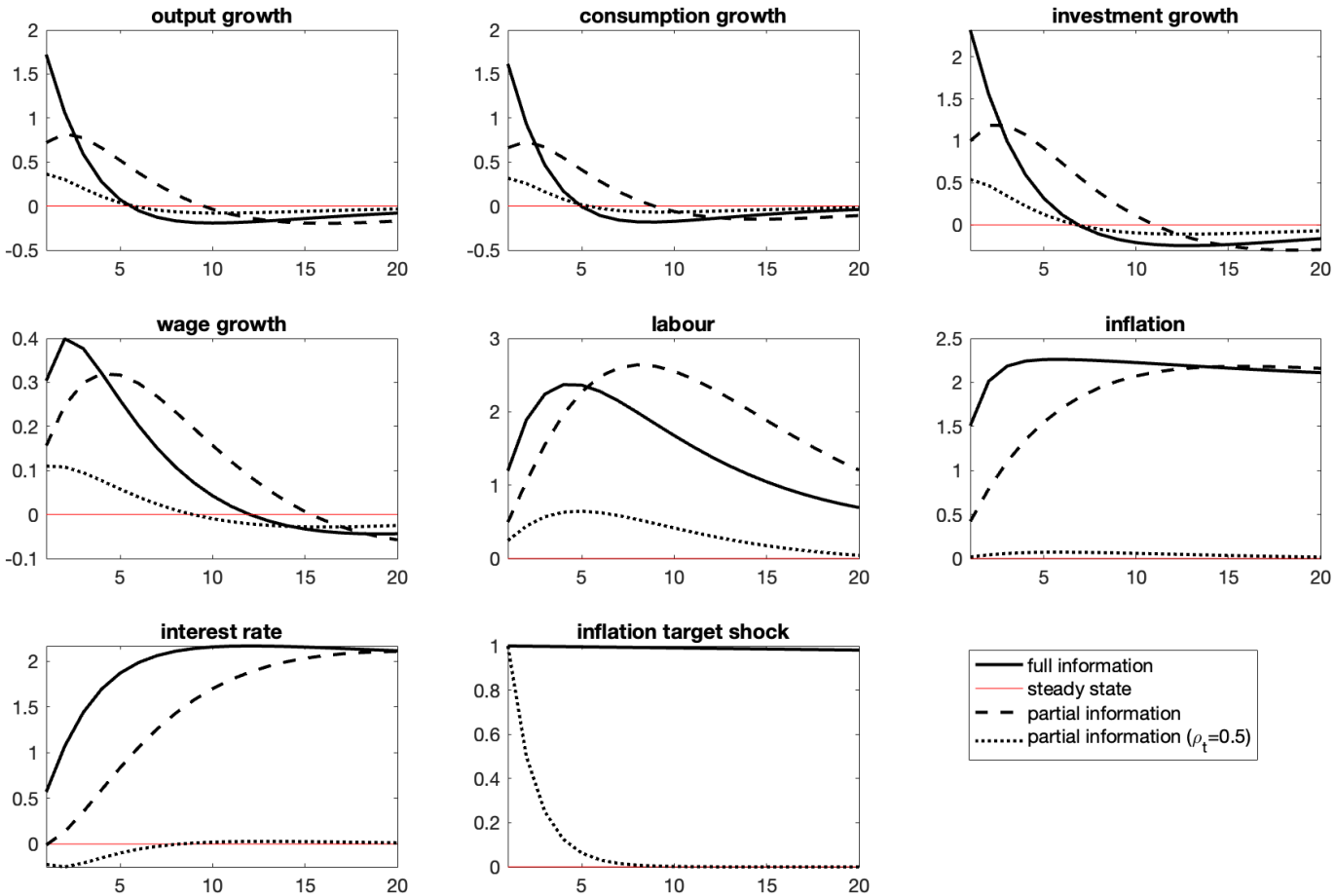


Figure: Inflation target shock (1%-point) under partial information (SW 2007)