

DSGE COURSE

NK Modelling



national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA




**STAY
SAFE**

VACCINATE TO SAVE SOUTH AFRICA

2. Baseline New Keynesian Model

2. New Keynesian (NK) Model with MIU

- We are using the estimations of the MIU (Money-in-the-Utility) model with labour and an explicit output gap defined relative to the flexible-price natural output and natural rate of interest.
 -the goal is to understand monetary transmission through money demand and interest-rate dynamics.
- The measurement equations used in the estimation include observed data for:
 - the output gap 
 - money demand,
 - money supply,
 - the interest rate, and
 - inflation, with inflation measured using the GDP deflator.

Model Set-up

➤ Euler Equation
$$r_t = r_t^n + \eta_c(\tilde{y}_{t+1} - \tilde{y}_t)$$

➤ Production Function
$$y_t = \xi_t^z + \alpha n_t$$

➤ NK Phillips Curve
$$\pi_t = \beta \pi_{t+1} + \tilde{\kappa} \tilde{y}_t$$

➤ Money Supply
$$m_t = h_t + \frac{1}{\text{effrr}}(h_t - fr_t) + \xi_t^{ms}$$

➤ Money Demand
$$m_t - p_t = \frac{\eta_c}{\eta_m} y_t - \frac{1}{\eta_m} i_t + \xi_t^{md}$$

➤ Monetary Policy Rule
$$i_t^T = \rho_i i_{t-1}^T + (1 - \rho_i)(\kappa_\pi \pi_t + \kappa_y \tilde{y}_t) + \varepsilon_t^i$$



Descriptive Statistics



- Output gap:

Mean: 0.04

Std: 2.31

Min: -8.72

Max: 12.57

GDP Deflator:

Mean: 6.37

Std: 1.99

Min: 3.52

Max: 13.31

Nominal Policy rate:

Mean: 7.26

Std: 2.51

Min: 3.50

Max: 13.50

- Money Supply:

Mean: 1.27

Std: 0.80

Min: -1.50

Max: 3.56

Money Reserves:

Mean: 2.49

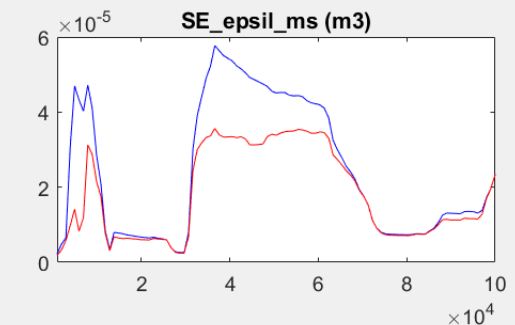
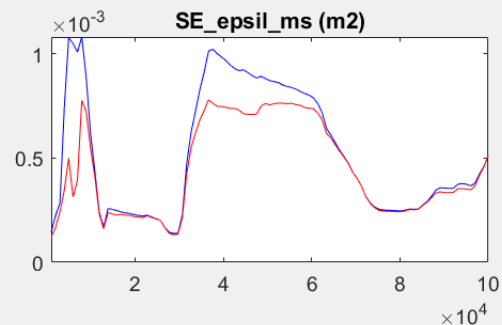
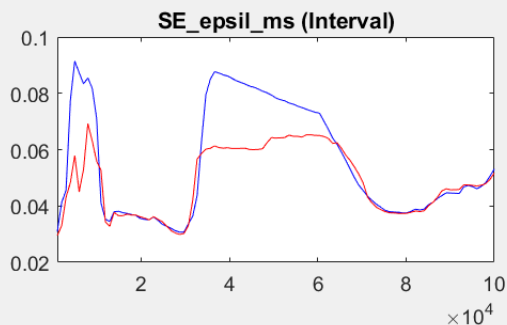
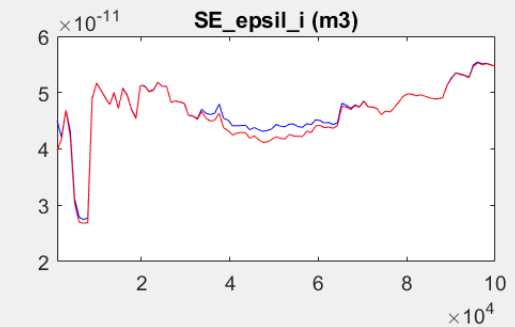
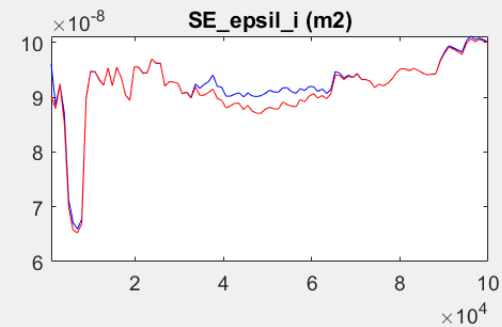
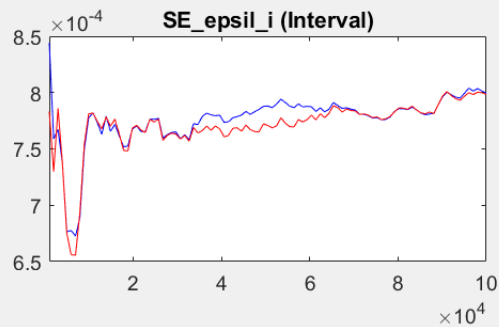
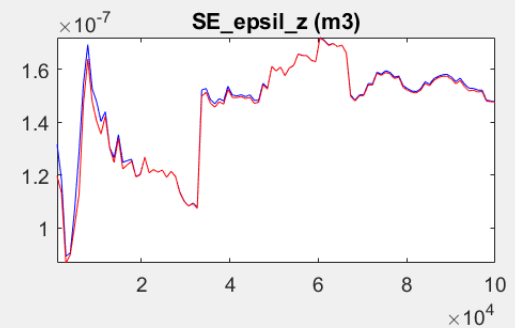
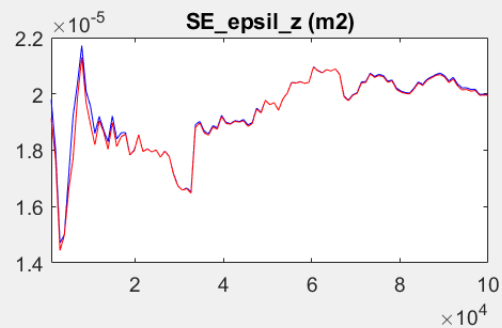
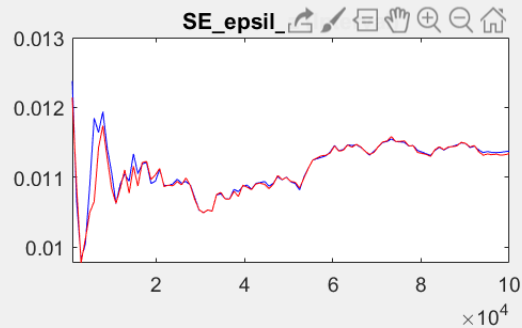
Std: 2.04

Min: -1.68

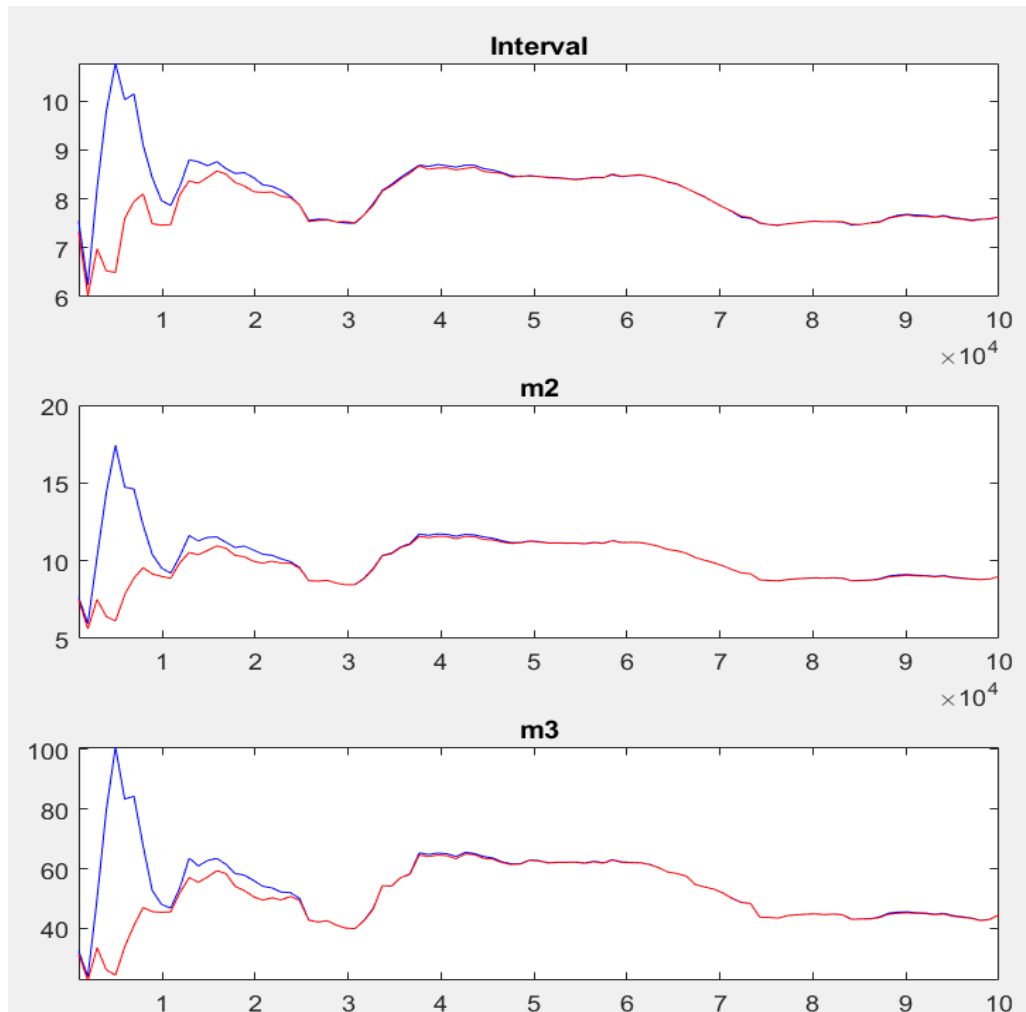
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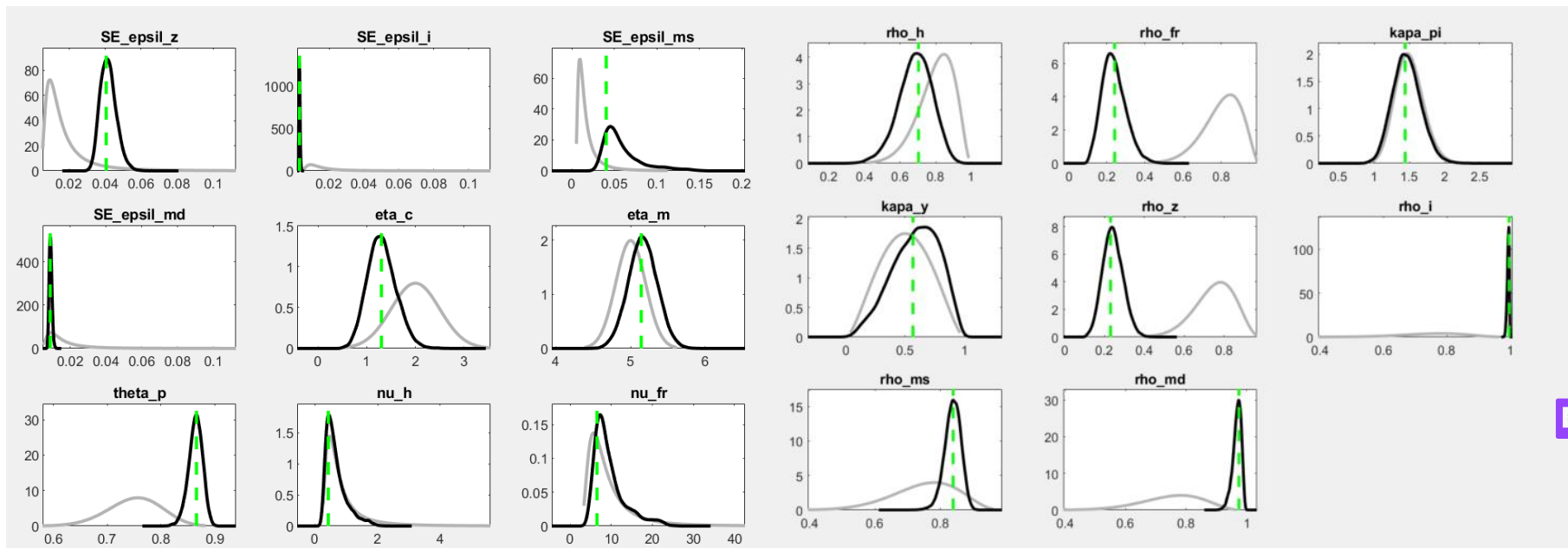
STANDARD ERRORS



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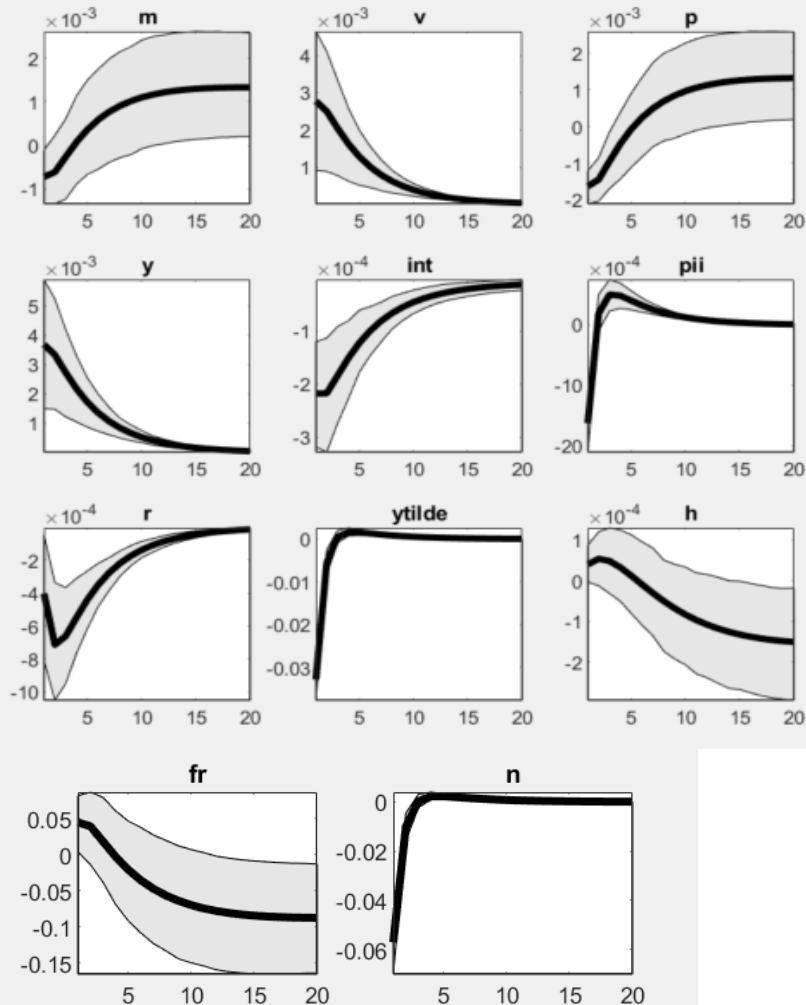
Priors and Posteriors




- The plots show posterior distributions (black) versus priors (gray) for, with green dashed lines marking posterior mode.
- Most posteriors are more concentrated than priors, indicating the data is informative, with shock variances generally small and structural parameters like elasticities and price stickiness well-identified.

IMPULSE RESPONSES

TECHNOLOGY SHOCK



- A positive technology shock in a money-in-the-utility model raises productivity, leading to higher output, investment.
- **Why output gap fall?** 
- Higher productivity lowers production costs, which eases inflationary pressures, leading to low or moderate inflation despite higher demand.
- Lower interest rate gap lead to higher free reserves (**?Why**) **leading to lower money reserves and ultimately, lower money supply.**
- Households demand more real money balances due to higher income, while nominal money may remain fixed, adjusting real balances through prices.

HISTORICAL DECOMPOSITION (for output)

