

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

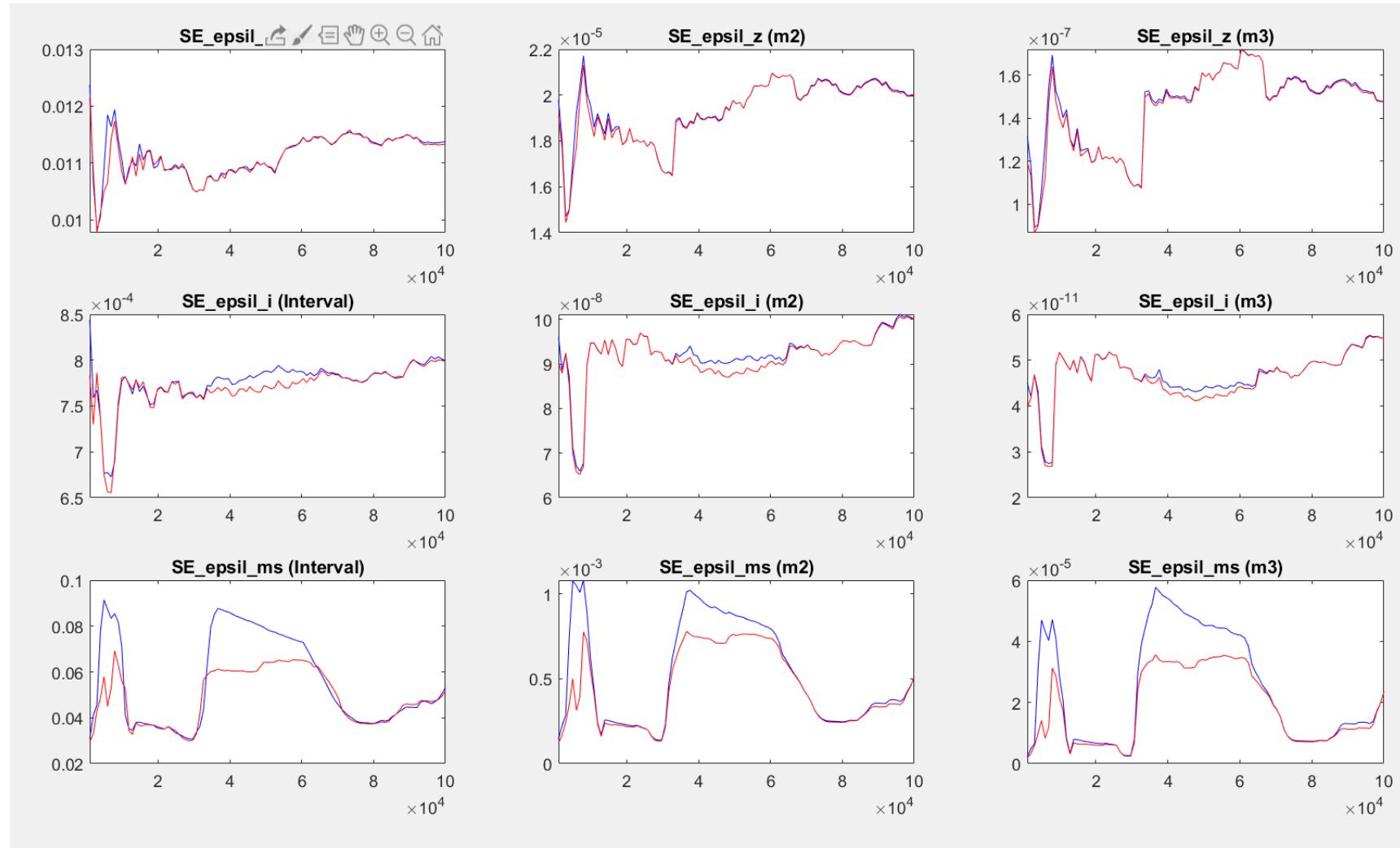
- Money Supply:
Mean: 1.27
Std: 0.80
Min: -1.50
Max: 3.56



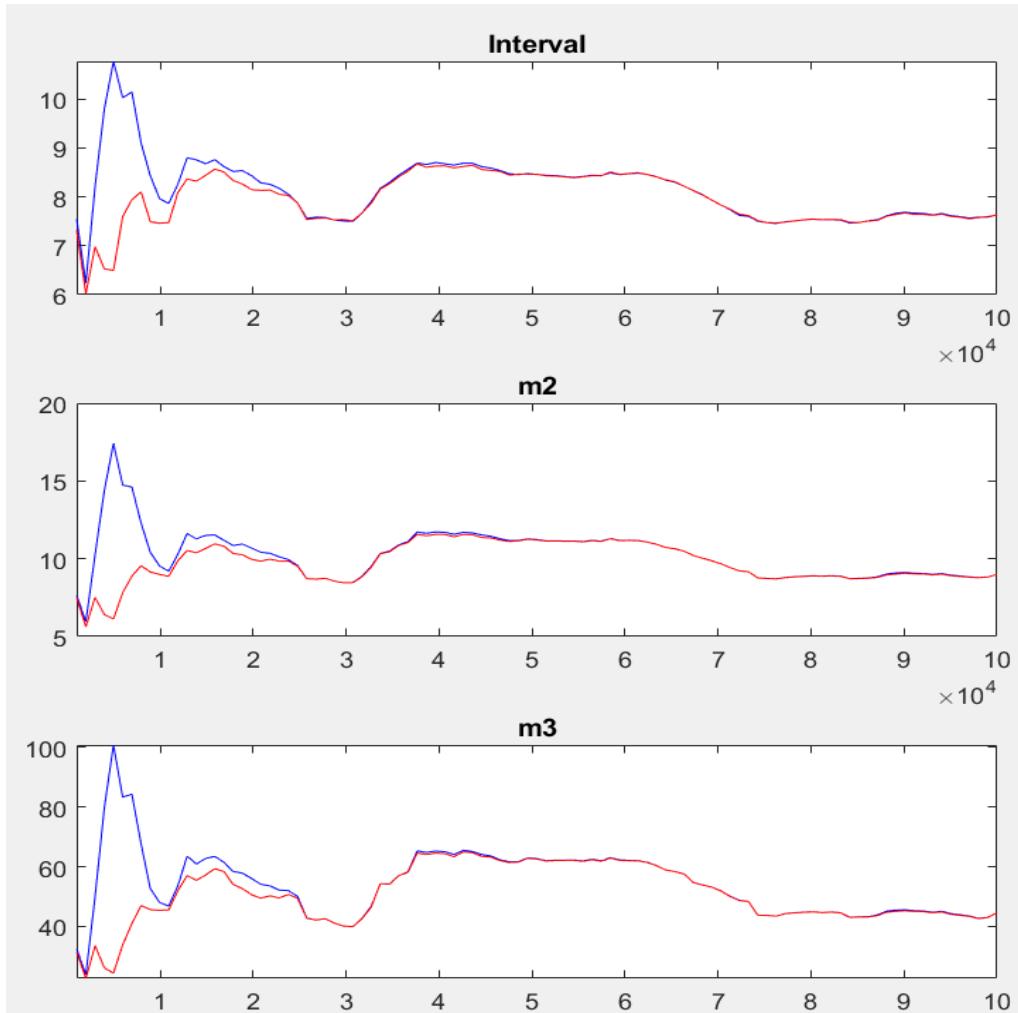
Money Reserves:
Mean: 2.49
Std: 2.04
Min: -1.68
Max: 9.03

Nominal Policy rate:
Mean: 7.26
Std: 2.51
Min: 3.50
Max: 13.50

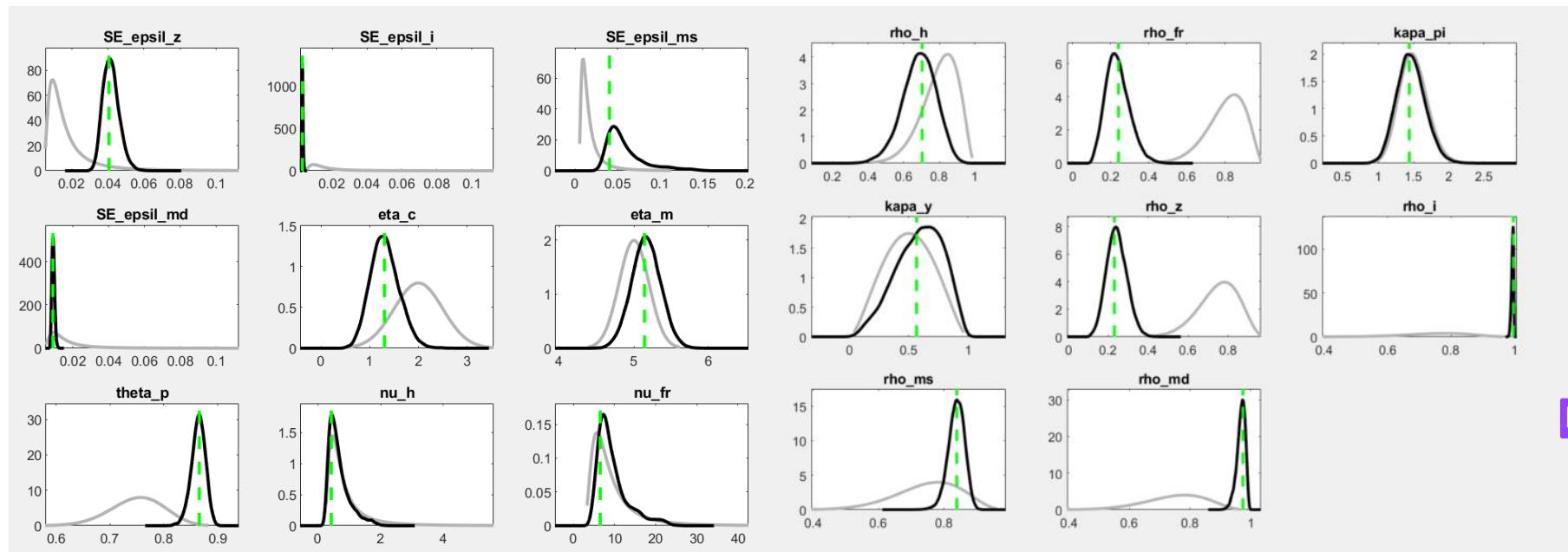
STANDARD ERRORS



STANDARD ERRORS



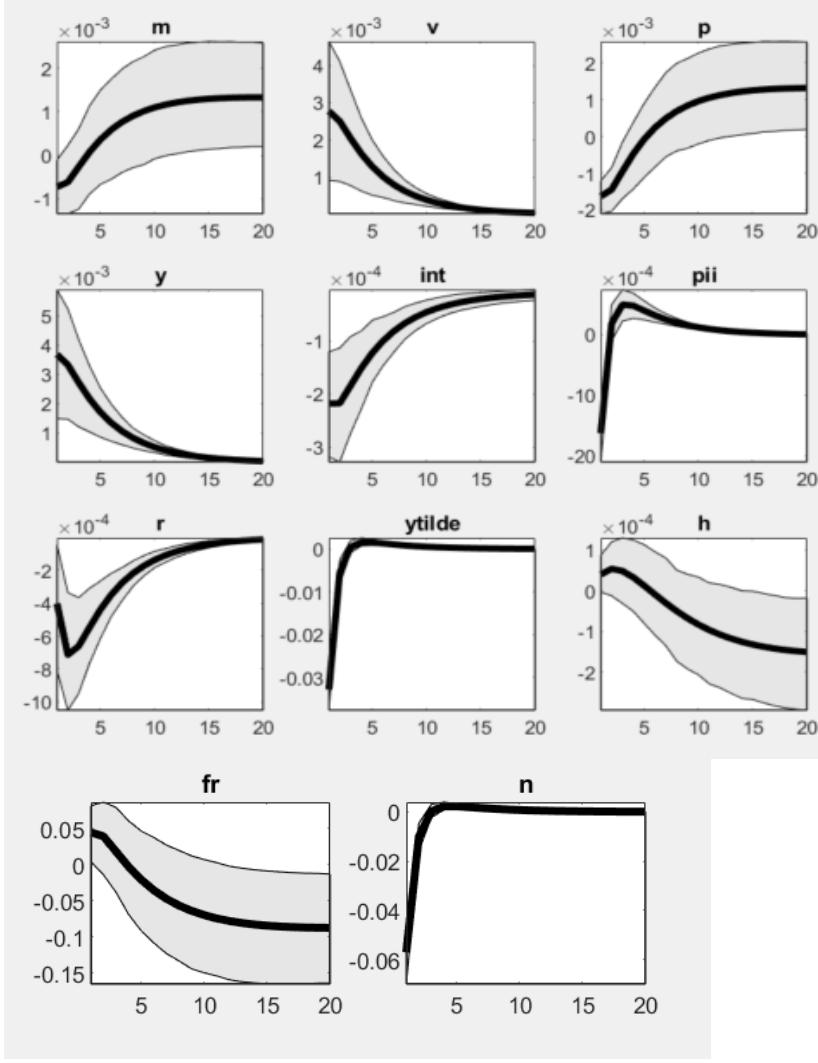
Priors and Posterios



- 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)

