Impact of Monetary Policy Shocks in the Peruvian Economy Over Time *

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* The views expressed here are those of the authors and not necessarily of the BCRP

Contents

Objective

We investigate the evolution of the impact of monetary policy shocks in Peru using a set of time-varying parameter vector autoregressive models with stochastic volatility (TVP-VAR-SV)

Literature Review

- Cogley & Sargent (2005) TVP-VAR-SV. US
- Nakajima (2011) ZLB-TVP-VAR-SV. Japan
- Castillo et al. (2016) TVP-VAR-SV. Peru
- Portilla & Rodriguez (2022) TVP-VAR-SV. Peru

TVP-VAR-SV

$$\mathbf{B}_{0,t}\mathbf{y}_t = \boldsymbol{\mu} + \sum_{j=1}^{p} \mathbf{B}_{j,t}\mathbf{y}_{t-j} + \boldsymbol{\epsilon}_t, \tag{1}$$

where $\boldsymbol{\epsilon}_t \sim \mathbf{N}(\mathbf{0},\Sigma_t)$ y $\Sigma_t = diag\left(\exp\left(\mathbf{h}_{1t}\right), ..., \exp\left(\mathbf{h}_{nt}\right)\right)$. Furthermore, $\mathbf{h}_t = \mathbf{h}_{t-1} + \boldsymbol{\zeta}_t$y $\boldsymbol{\zeta}_t \sim \mathbf{N}\left(\mathbf{0},\Sigma_h\right)$.
Grouping everything in a state-space form:

$$\begin{aligned} \mathbf{y} &= \mathbf{X}\boldsymbol{\theta} + \boldsymbol{\epsilon}, \\ \mathbf{H}_\theta \boldsymbol{\theta}_t &= \widetilde{\boldsymbol{\alpha}}_\theta + \boldsymbol{\eta}, \end{aligned} \tag{2}$$

TVP-VAR-SV models

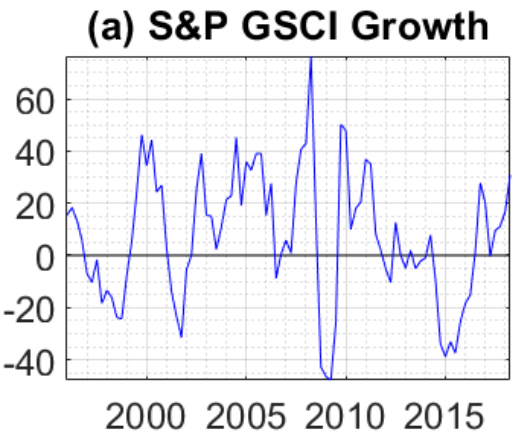
TVP-VAR-SV	TVP-VAR with Stochastic Volatility
TVP-VAR	Same as TVP-VAR-SV but $h_t = h_0$
TVP-VAR-R1-SV	Same as TVP-VAR-SV but $\beta_t = \beta_0$
TVP-VAR-R2-SV	Same as TVP-VAR-SV but $\gamma_t = \gamma_0$
TVP-VAR-R3-SV	Same as TVP-VAR-SV but only intercepts are time varying
CVAR-SV	Same as TVP-VAR-SV but $\beta_t = \beta_0$ and $\gamma_t = \gamma_0$
CVAR	Constant coefficients VAR with $\theta_t = \theta_0$ and $h_t = h_0$

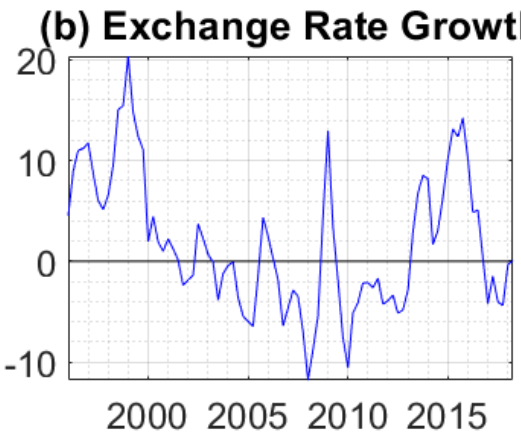
Sample

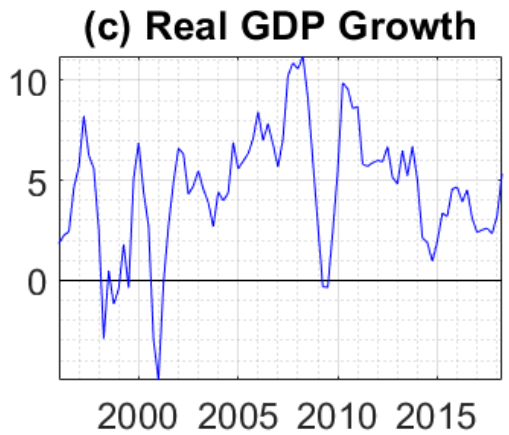
Between 1996Q1 and 2018Q2:

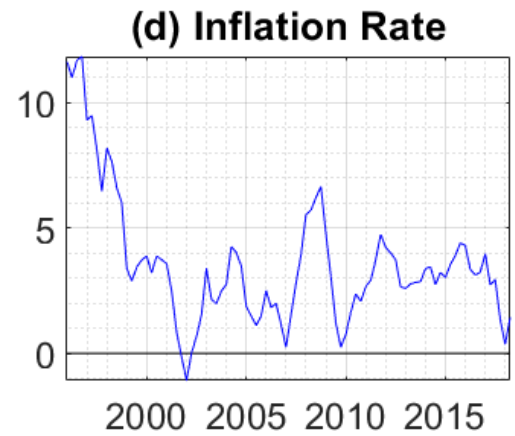
- S&P GSCI Growth
- Nominal Exchange Rate Growth
- Real GDP Growth
- Inflation
- Currency in Circulation Growth
- Interest Rate (2003Q3)

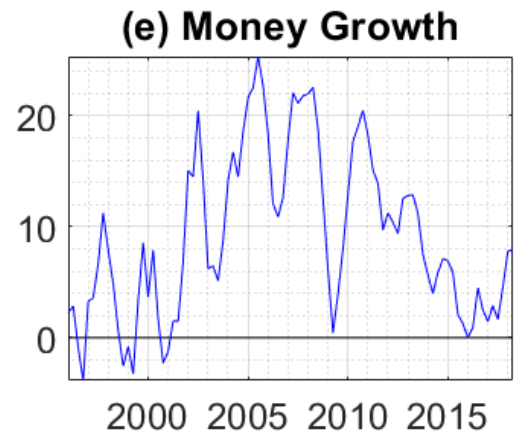
Annual Growth Rates

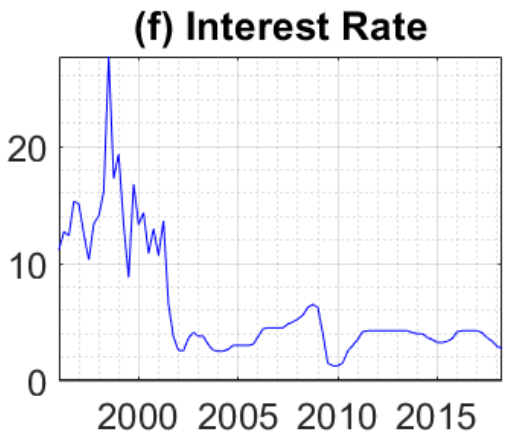










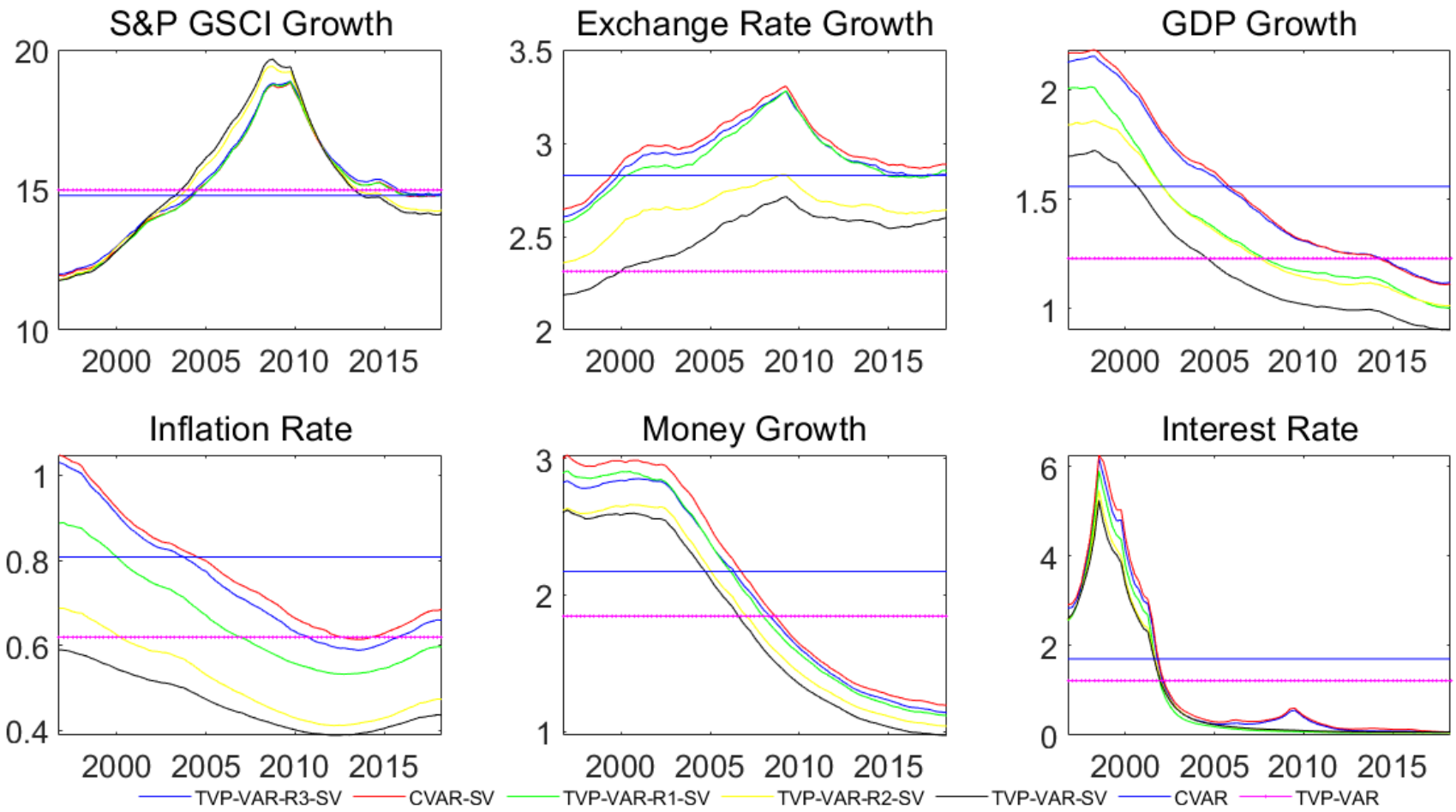


Tests for Time Variation in the Coefficients and Volatilities

1. The trace test shows that the trace of the posterior median of h_t is statistically significant but small. Both the KS-test and the t-test show that all elements of h_t vary over time
2. Under the KS-test and the t-test, all elements of γ_t change over time in both comparison groups.
3. Most elements of β_t vary under KS-test and t-test

In sum, these results suggest that all volatilities and most of the parameters change over time.

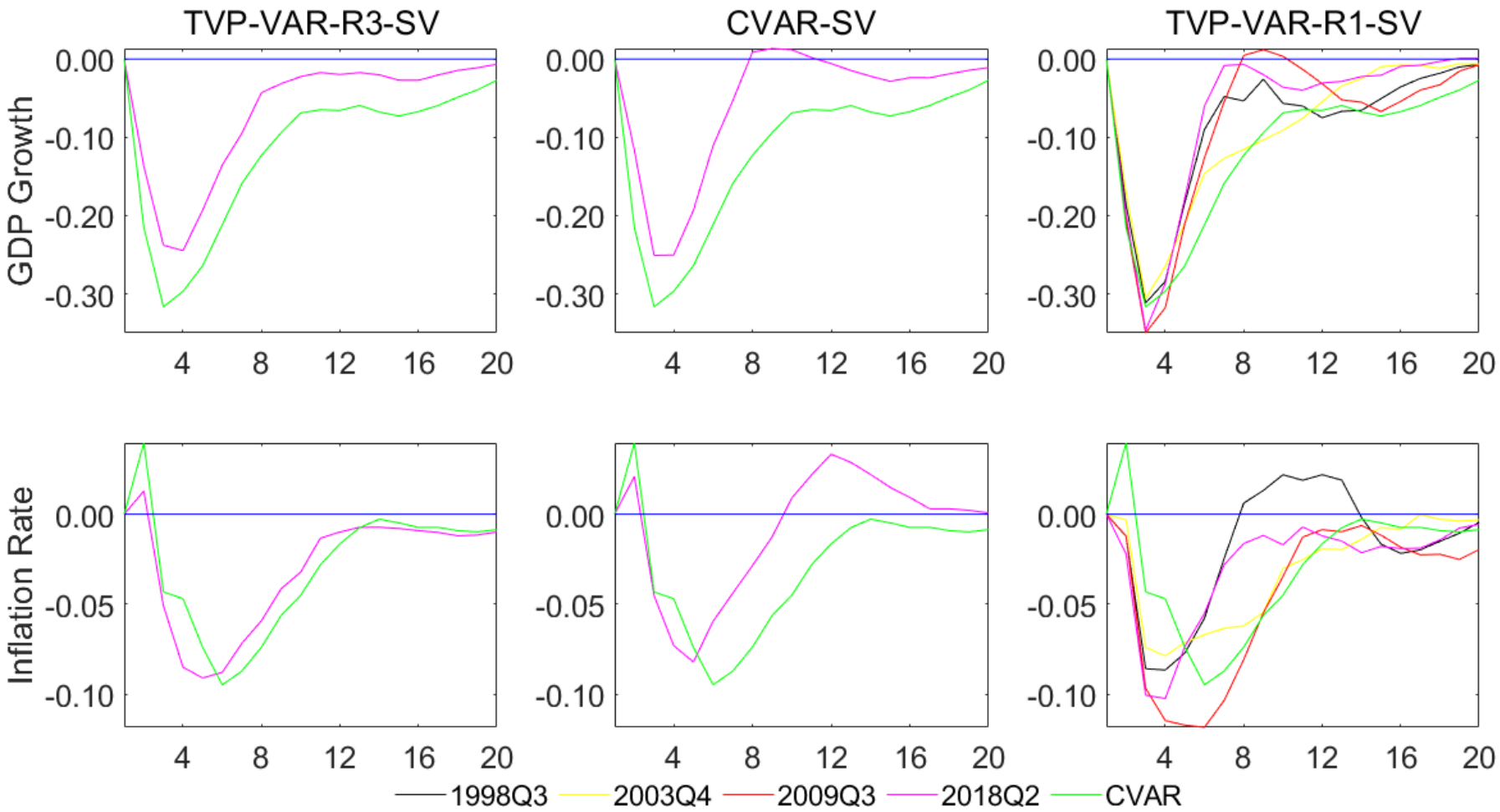
Standard Deviations



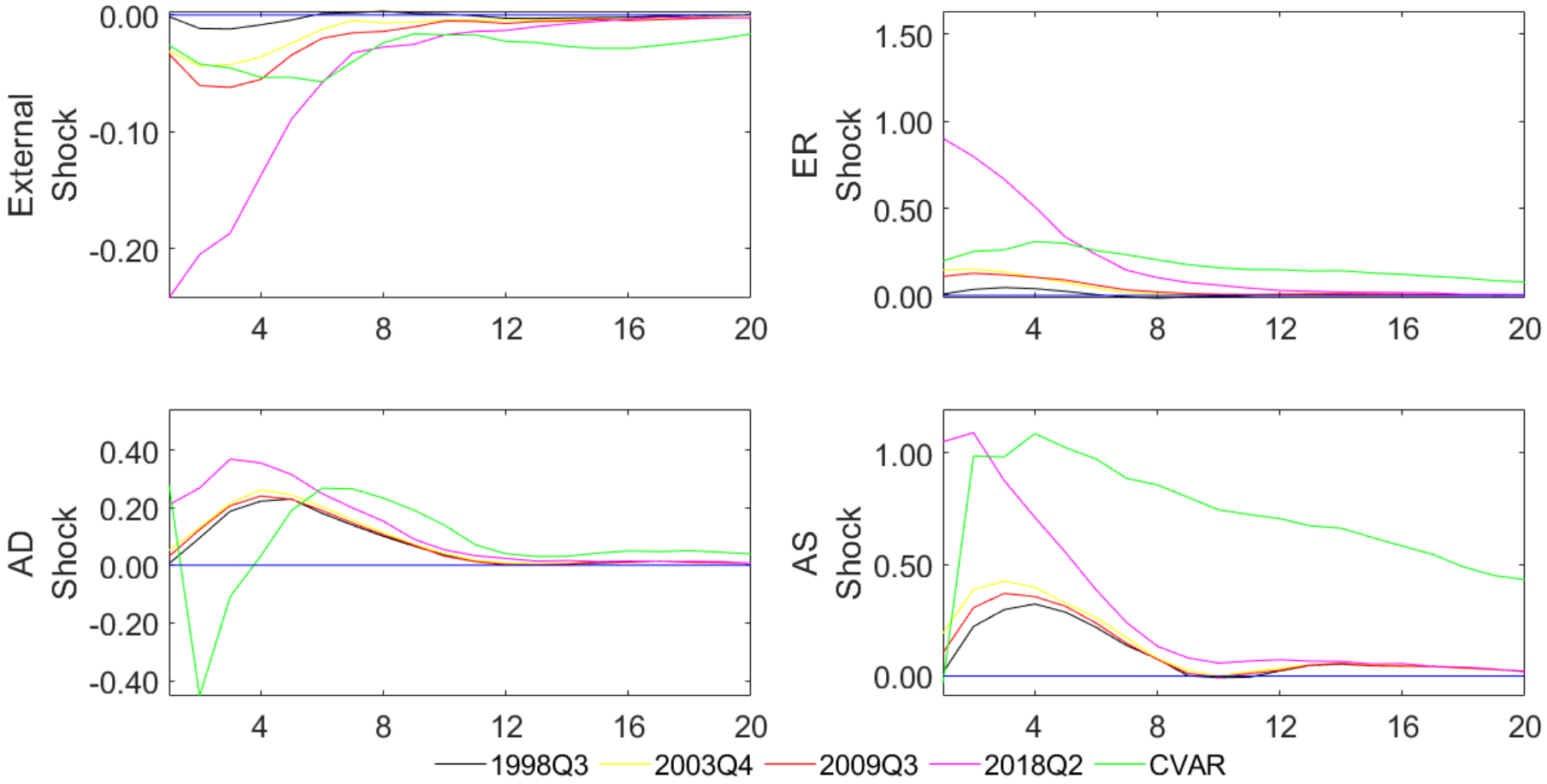
Model Selection

Model	Log-ML$_{CE}$	SD	Rank	DIC	SD	Rank
TVP-VAR-SV	-1506.455	0.288	5	2533.232	1.155	5
TVP-VAR	-1580.195	0.194	6	2633.436	2.949	7
TVP-VAR-R1-SV	-1483.666	0.264	1	2411.979	0.514	3
TVP-VAR-R2-SV	-1502.186	0.397	4	2498.542	1.657	4
TVP-VAR-R3-SV	-1484.715	0.282	2	2390.006	0.531	2
CVAR-SV	-1486.077	0.073	3	2346.120	6.300	1
CVAR	-1584.832	0.023	7	2562.849	0.351	6

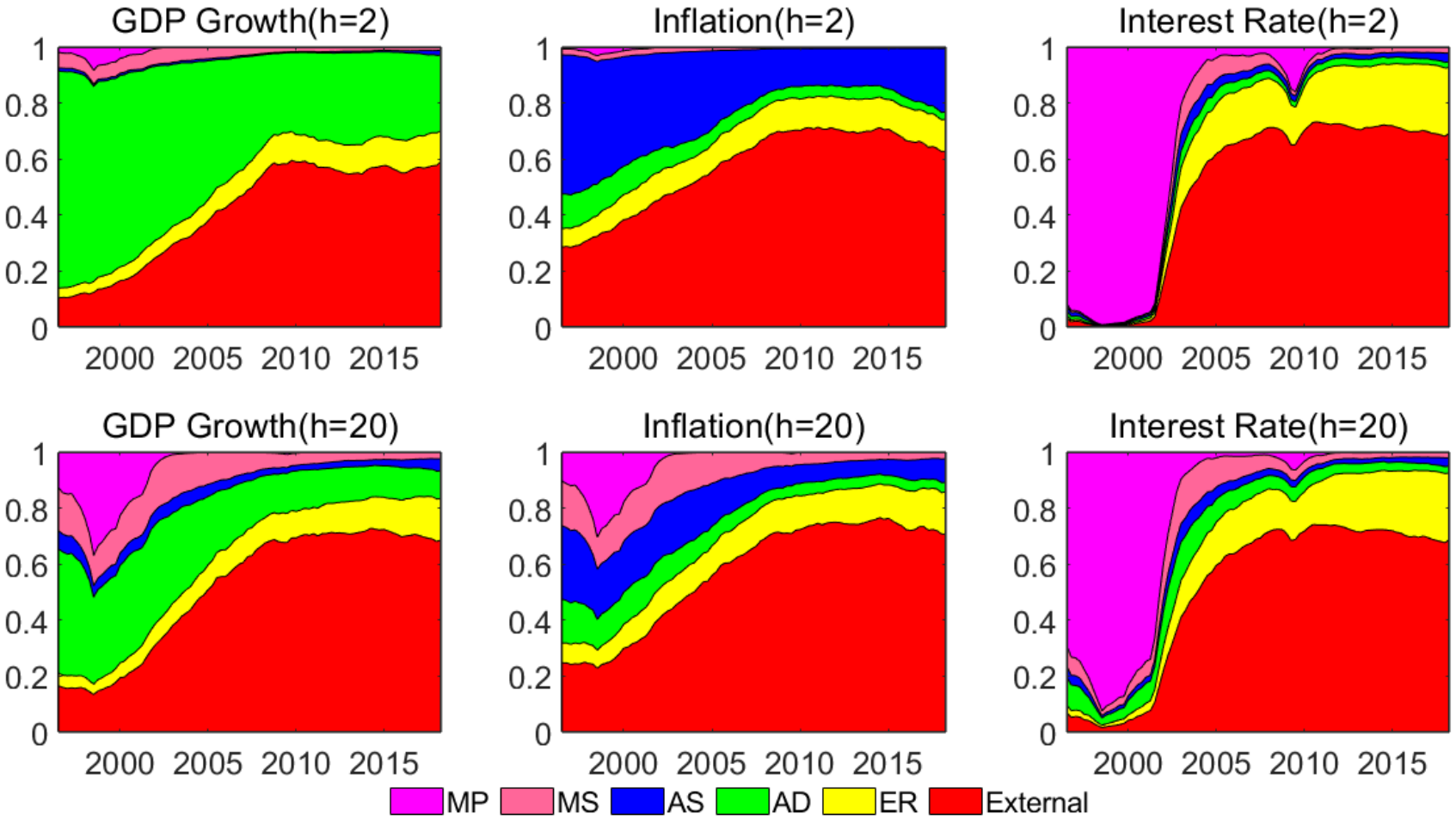
IRF to Monetary Policy Shocks



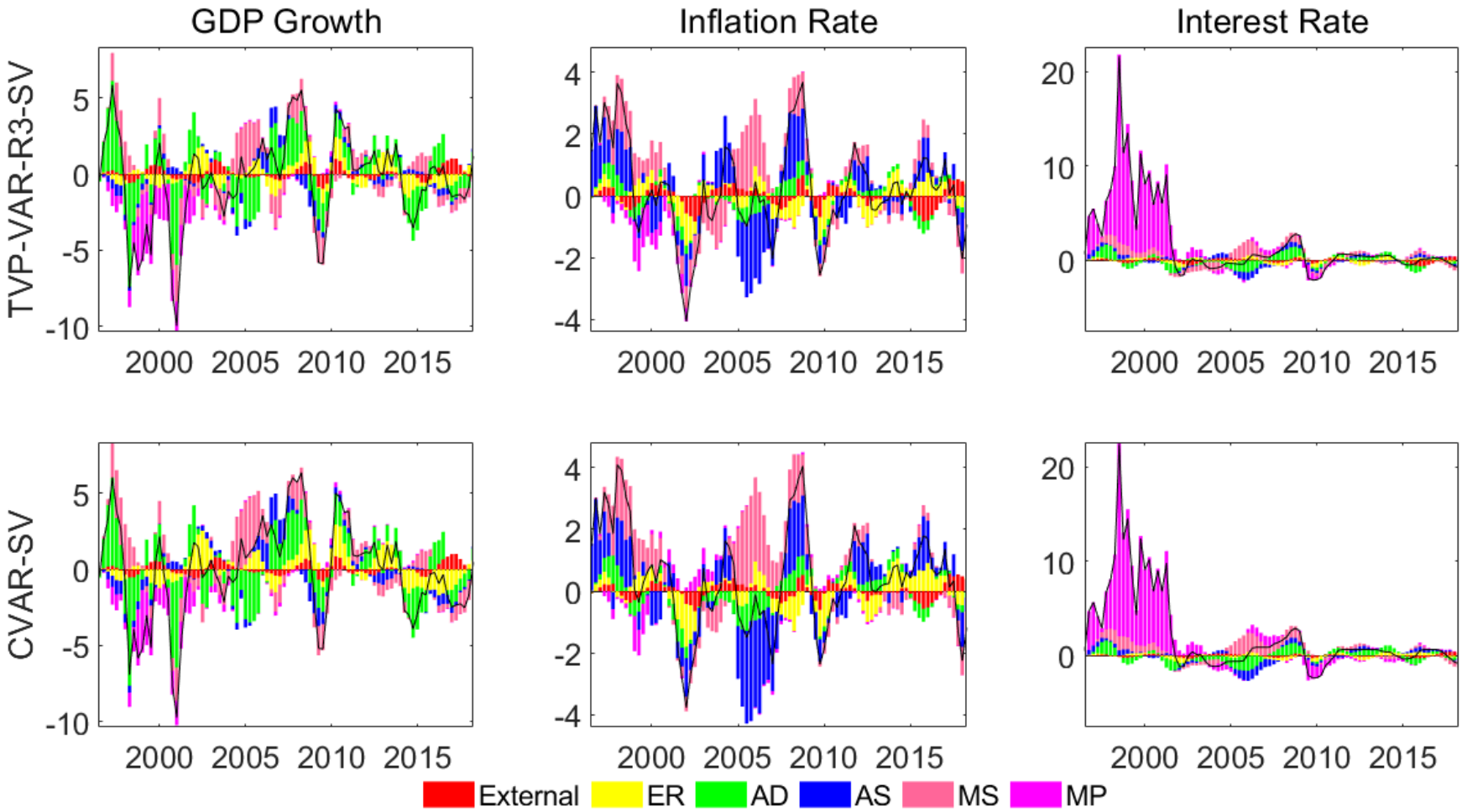
IRF of Interest Rate



FEVD


GDP Growth(h=2)
Inflation(h=2)
Interest Rate(h=2)
GDP Growth(h=20)
Inflation(h=20)
Interest Rate(h=20)
0
0.2
0.4
0.6
0.8
1
2000 2005 2010 2015
MP
MS
AS
AD
ER
External

HD


GDP Growth
Inflation Rate
Interest Rate
TVP-VAR-R3-SV
CVAR-SV
2000 2005 2010 2015
External
ER
AD
AS
MS
MP

Results: Resume

1. The volatilities, intercepts, and contemporaneous coefficients change more gradually than VAR coefficients over time
2. The volatility of MP shocks falls during the Inflation Targeting (IT) regime
3. A contractionary MP shock decreases both GDP growth and inflation
4. The interest rate reacts faster to aggregate supply shocks than to both aggregate demand shocks and exchange rate shocks
5. MP shocks explain less the uncertainty in GDP growth, inflation and the interest rate under the IT regime in comparison to the pre-IT regime