Impact of monetary policy shocks in the Peruvian economy over time[1]

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- The analysis of these economies is complex, as external shocks are the main source of uncertainty;
- Peru is a special case among EMEs, as it has undergone numerous reforms throughout its history;
- In the early 1990s, the Fujimori administration introduced a stabilization program, deregulated markets, and reduced government involvement in the economy;

- Price controls were abandoned, capital markets were liberalized and the foreign exchange market was unified;
- Through the 1993 Constitution and the Organic Law of the Central Reserve Bank of Peru-BCRP (Decree Law 26123), the BCRP was constitutionally granted operational independence, thus putting an end to inflationary fiscal financing;
- The design and implementation of the MP have undergone many changes. Initially, to deal with hyperinflation, price stability was considered the only objective of the BCRP, with the monetary base being the operational instrument;

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- The correlation between the monetary base and inflation also decreased, weakening the aggregate monetary regime, which complicated the communication of the MP;
- As a result, in the January 2002 Monetary Program, the BCRP announced and adopted an Inflation Targeting (IT) regime, with a target band of 1.5%–3.5% to anchor inflation expectations and current accounts of the BCRP as an operational instrument;
- After the interbank market became more stable, and with the aim of improving MP signaling, the BCRP introduced the overnight interbank interest rate as a reference rate for the MP in September 2003;

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- Since then, several alternative tools have been implemented, such as currency swaps and reverse repos;
- In February 2007, the BCRP adjusted the target band to 1%–3%, with the objective of increasing flexibility to address adverse shocks and align domestic inflation with that of the main developed economies;
- These modifications in the MP framework lead to potential changes in the transmission of MP shocks, which can be better captured or better identified using Time-Varying Parameter Vector Autoregression (TVP-VAR) models;
- Importance of the SV component;

Literature

- Sims (1980), Gordon and Leeper (1994), Bernanke and Mihov (1998), Christiano et al. (1999)
- Cogley and Sargent (2001), Cogley and Sargent (2005)
- Benati (2008)
- Sims and Zha (2006)
- Primiceri (2005), Canova et al. (2007), Koop et al. (2009)
- Nakajima (2011), Chan and Eisenstat (2018)

Literature

- References:
  - Portilla, Rodriguez and Castillo B. (2022)→→ PRC (2022), *CESifo Economic Studies*
  - Pérez Rojo and Rodriguez (2024)→→ PR (2024), *Structural Change and Economic Dynamics*
  - Alvarado, Cáceres and Rodríguez (2024)→→ ACR (2024), *WP 537*, Departamento de Economía, PUCP

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Based on Chand and Eisenstat (2018):

$$\mathbf{B}_{0,t}\mathbf{y}_t = \boldsymbol{\mu}_t + \mathbf{B}_{1,t}\mathbf{y}_{t-1} + ... + \mathbf{B}_{p,t}\mathbf{y}_{t-p} + \boldsymbol{\epsilon}_t \qquad \boldsymbol{\epsilon}_t \sim \mathcal{N}(\mathbf{0}, \boldsymbol{\Sigma}_t)$$

where

$$\mathbf{y}_t = \widetilde{\mathbf{X}}_t\beta_t + \mathbf{W}_t\boldsymbol{\gamma}_t + \boldsymbol{\epsilon}_t \qquad \widetilde{\mathbf{X}}_t = I_n \otimes (1, \mathbf{y}'_{t-1}, ..., \mathbf{y}'_{t-p})$$

$$\mathbf{y}_t = \mathbf{X}_t\boldsymbol{\theta}_t + \boldsymbol{\epsilon}_t \qquad \mathbf{X}_t = (\widetilde{\mathbf{X}}_t, \mathbf{W}_t)$$

$$\beta_t = vec((\boldsymbol{\mu}_t, \mathbf{B}_{1,t}, ..., \mathbf{B}_{p,t})')$$

$$\boldsymbol{\theta}_t = (\beta'_t, \boldsymbol{\gamma}'_t)'$$

$$\boldsymbol{\theta}_t = \boldsymbol{\theta}_{t-1} + \boldsymbol{\eta}_t \qquad \boldsymbol{\eta}_t \sim \mathcal{N}(\mathbf{0}, \boldsymbol{\Sigma}_\theta)$$

$$\boldsymbol{\Sigma}_t = \text{diag}(\exp(h_{1,t}), ..., \exp(h_{n,t}))$$

$$\mathbf{h}_t = \mathbf{h}_{t-1} + \boldsymbol{\zeta}_t \qquad \boldsymbol{\zeta}_t \sim \mathcal{N}(\mathbf{0}, \boldsymbol{\Sigma}_h)$$

Results

- Six recursively identified variables: S&P GSCI growth, exchange rate growth, GDP growth, inflation, money growth, and the interest rate;
- All volatilities, all contemporary coefficients, and approximately 75% of the parameters for lagged variables and intercepts should change over time, as indicated by the trace test, KS test, and t-test;
- SV improves model fit, according to the Log-ML and the DIC;
- Volatilities of AD, AS, MS, and MP shocks decrease under the IT regime;

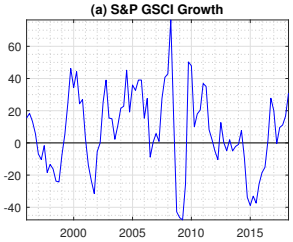
Results

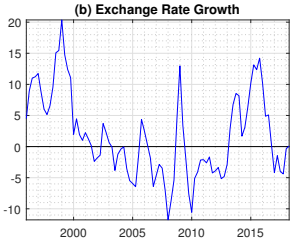
- the volatilities of external and ER shocks rise after the GFC, suggesting that IT adoption reduced the volatility of domestic structural shocks
- the volatility of MP shocks increased more during the Asian-Russian crisis than during the GFC, due to the different policies implemented by the BCRP
- a countercyclical MP shock decreases both GDP growth and inflation, but GDP growth responds quicker and more intensively than inflation, which could be attributed to the existence of sticky prices
- the reactions of the interest rate to AS shocks are stronger than the responses to AD shocks, aligning with the BCRP's anti-inflationary bias

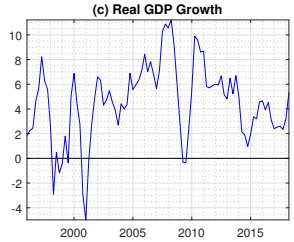
Results)

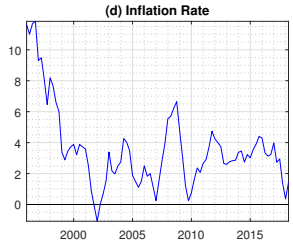
- All models also estimate an increasing reaction of the interest rate to external and ER shocks;
- MP shocks are only significant during the pre-IT regime, suggesting an improvement in monetary policy since IT adoption;
- Results indicate that IT adoption contributed to stabilizing macroeconomic uncertainty in Peru
- Alternative specifications, including changes in priors, recursive order, identification scheme or certain variables, reinforce the main findings;
- Effects of MP shocks on GDP growth and inflation remain qualitatively similar, and the interest rate's reaction to various shocks is generally robust across different exercises;

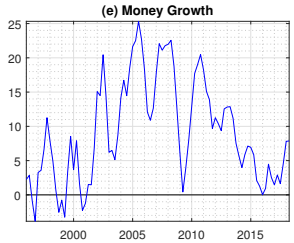
Results: Series

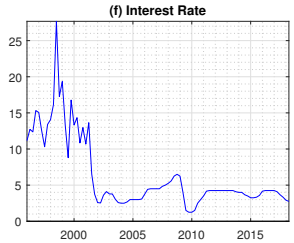








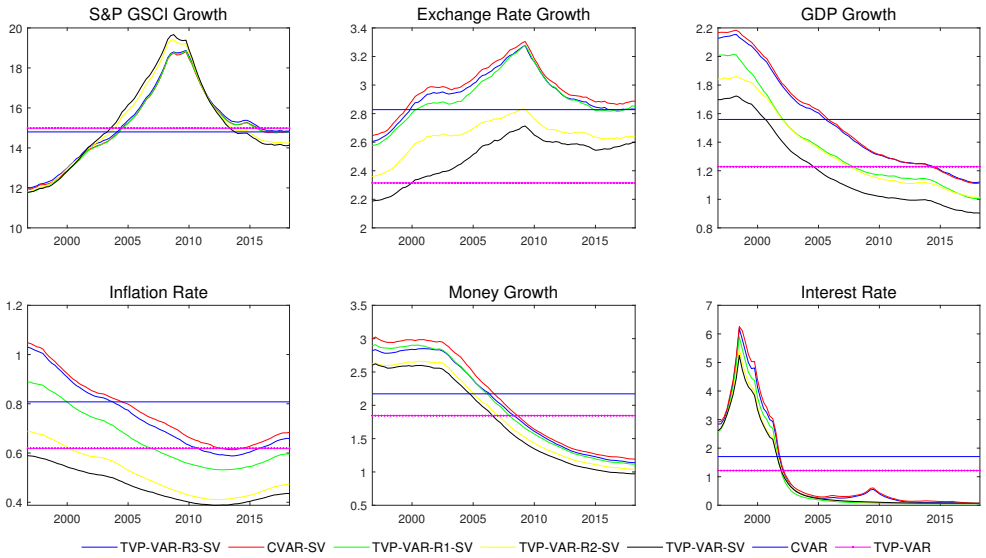




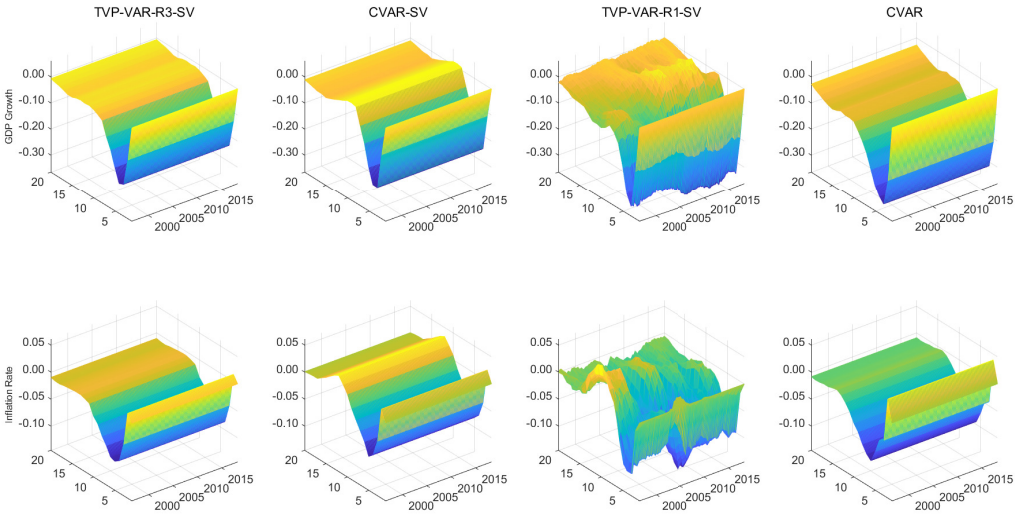
Results: Selection of Models

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

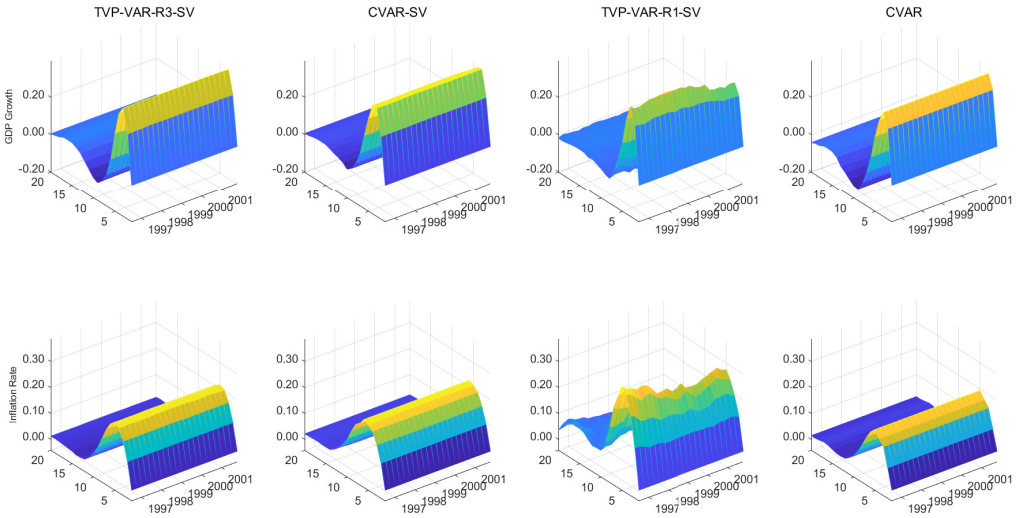
Results: Volatilities



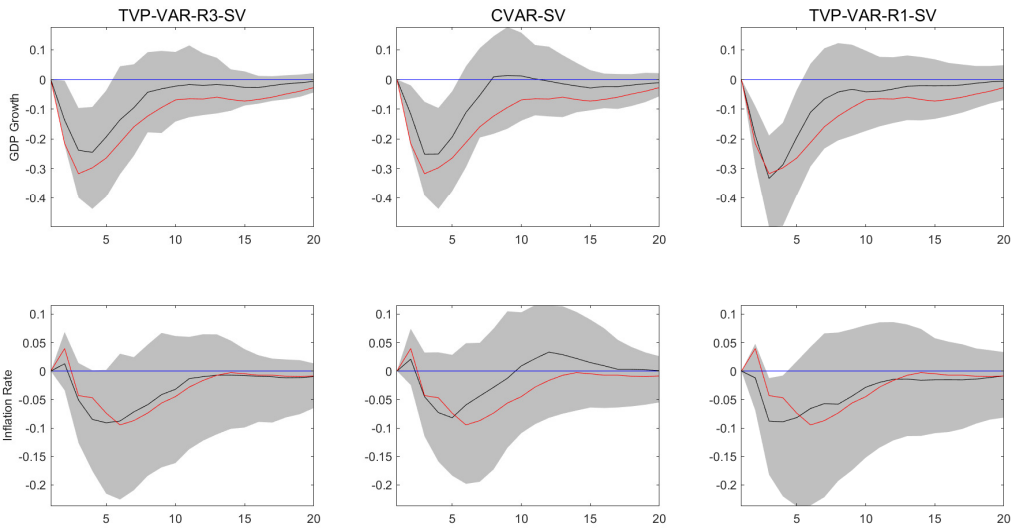
Results: 3D IRFs to MP Shock



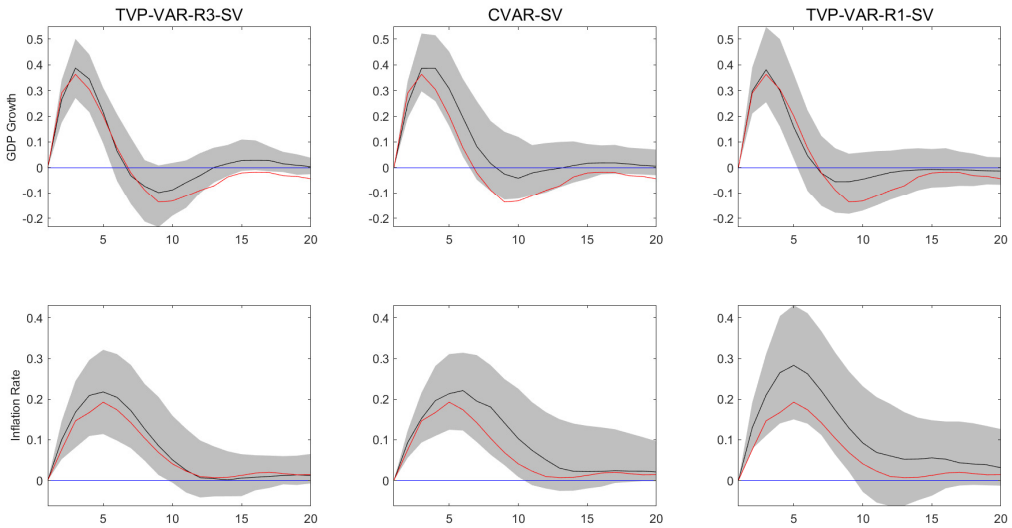
Results: 3D IRFs to MS Shock



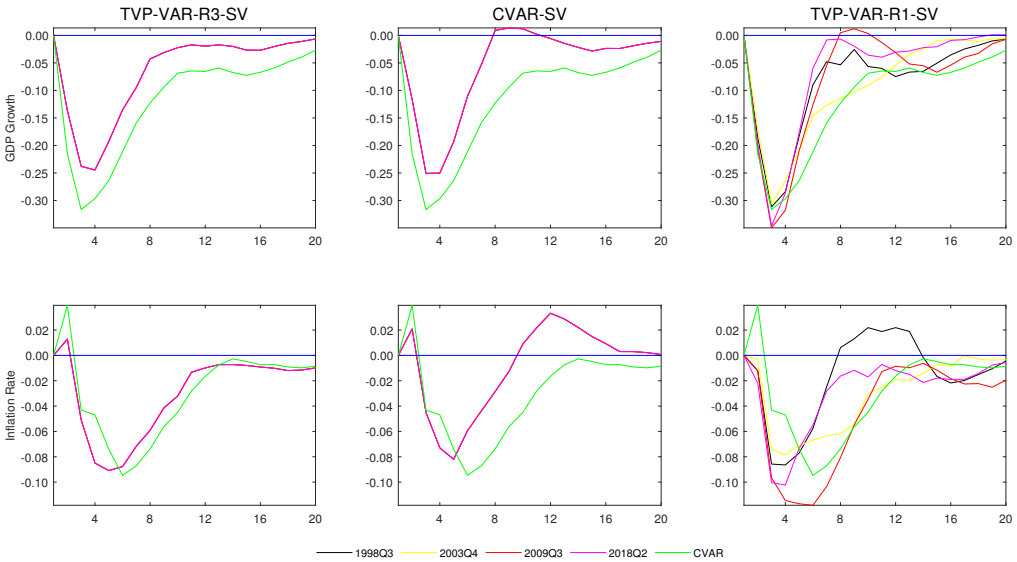
Results: Median IRFs to MP Shock



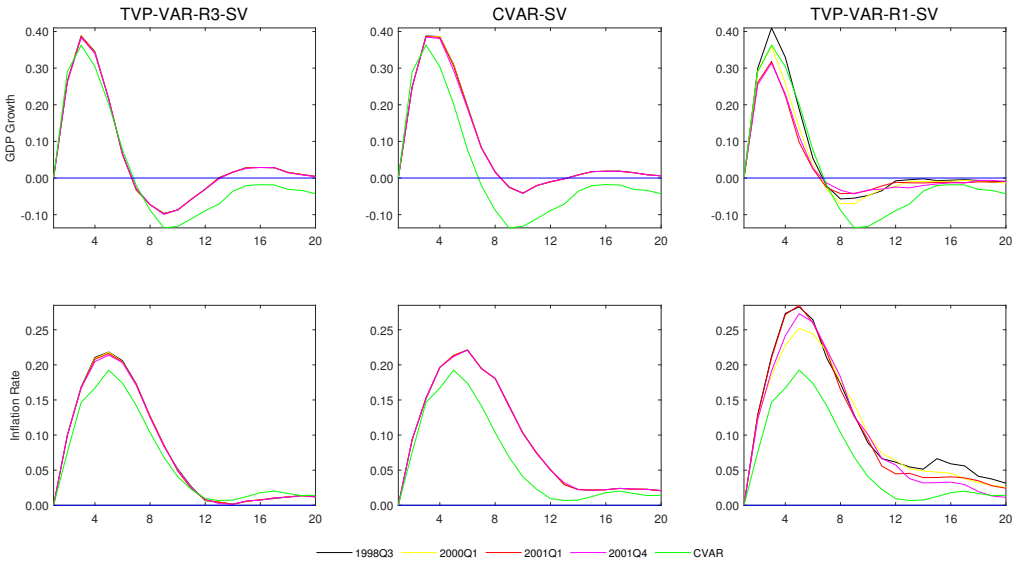
Results: Median IRFs to MS Shock



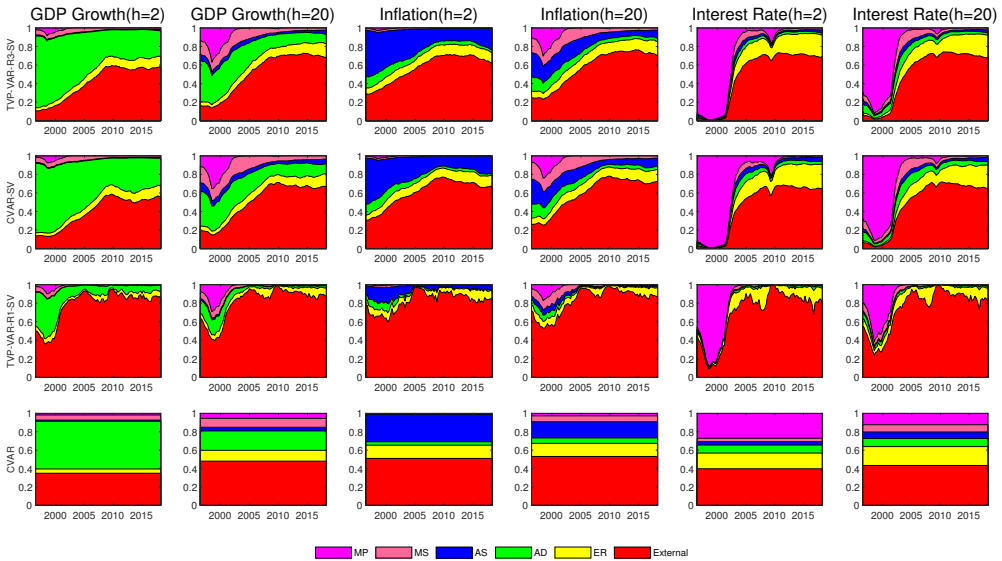
Results: Median IRFs to MP Shock



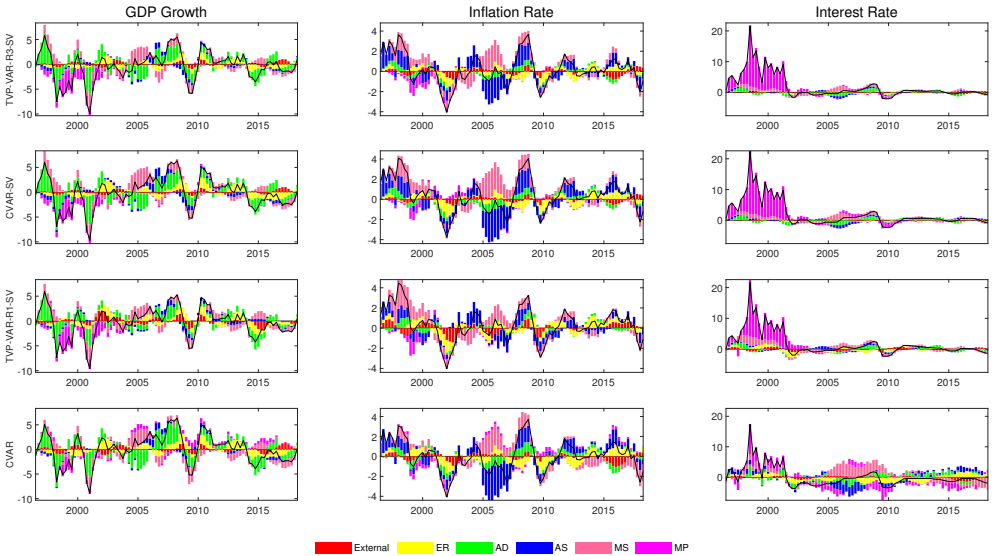
Results: Median IRFs to MS Shock



Results: FEVD



Results: HD


GDP Growth
Inflation Rate
Interest Rate
TVP-VAR-R3-SV
CVAR-SV
TVP-VAR-R1-SV
CVAR
2000
2005
2010
2015
External
ER
AD
AS
MS
MP

Conclusions

- Volatility of MP shocks is on average higher under the pre-IT regime compared with the IT regime;
- Since IT adoption, MP shocks have ceased to be an important source of macroeconomic volatility;
- The response of the interest rate to terms of trade (ES) and AS shocks have become stronger in recent years;
- MP in Peru has become more effective in implementing a counter-cyclical policy and in anchoring inflation expectations;

Conclusions

- MP shocks explain a considerable percentage of the FEVD of domestic variables under the pre-IT regime, especially the interest rate's FEVD;
- Under the IT regime, the contribution of MP shocks to the FEVD of the domestic variables decreases over time;
- The participation of MP shocks in the HD of domestic variables decreased under the IT regime;
- Since IT adoption, MP shocks are no longer an important source of macroeconomic volatility, which is a good indicator of the BCRP's good performance;
- Policymakers should focus on mitigating the influence of other shocks, especially ES shocks;

Conclusions

- SV improves model fit, according to the Log-ML and the DIC;
- Volatilities of AD, AS, MS, and MP shocks decrease under the IT regime;
- results suggest that IT adoption reduced the volatility of domestic structural shocks.
- the volatility of MP shocks increased more during the Asian-Russian crisis than during the GFC, due to the different policies implemented by the BCRP
- a countercyclical MP shock decreases both GDP growth and inflation, but GDP growth responds quicker and more intensively than inflation, which could be attributed to the existence of sticky prices