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
1 Motivation
   • Objective
   • Literature Review

2 Methodology
   • Models
   • Data

3 Results

4 Results: Resume
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
\[ \mathbf{B}_{0,t}y_t = \mu + \sum_{j=1}^{p} \mathbf{B}_{j,t}y_{t-j} + \epsilon_t, \]  

(1)

where \( \epsilon_t \sim \mathcal{N}(0,\Sigma_t) \) \( \Sigma_t = \text{diag}(\exp(h_{1t}), \ldots, \exp(h_{nt})) \). Furthermore, \( h_t = h_{t-1} + \zeta_t \) \( \zeta_t \sim \mathcal{N}(0,\Sigma_h) \).

Grouping everything in a state-space form:

\[ y = X\theta + \epsilon, \]

(2)

\[ H_\theta \theta_t = \tilde{\alpha}_\theta + \eta, \]
### TVP-VAR-SV models

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVP-VAR-SV</td>
<td>TVP-VAR with Stochastic Volatility</td>
</tr>
<tr>
<td>TVP-VAR</td>
<td>Same as TVP-VAR-SV but $h_t = h_0$</td>
</tr>
<tr>
<td>TVP-VAR-R1-SV</td>
<td>Same as TVP-VAR-SV but $\beta_t = \beta_0$</td>
</tr>
<tr>
<td>TVP-VAR-R2-SV</td>
<td>Same as TVP-VAR-SV but $\gamma_t = \gamma_0$</td>
</tr>
<tr>
<td>TVP-VAR-R3-SV</td>
<td>Same as TVP-VAR-SV but only intercepts are time varying</td>
</tr>
<tr>
<td>CVAR-SV</td>
<td>Same as TVP-VAR-SV but $\beta_t = \beta_0$ and $\gamma_t = \gamma_0$</td>
</tr>
<tr>
<td>CVAR</td>
<td>Constant coefficients VAR with $\theta_t = \theta_0$ and $h_t = h_0$</td>
</tr>
</tbody>
</table>
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

(a) S&P GSCI Growth

(b) Exchange Rate Growth

(c) Real GDP Growth

(d) Inflation Rate

(e) Money Growth

(f) Interest Rate

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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.

Under the KS-test and the t-test, all elements of $\gamma_t$ change over time in both comparison groups.

Most elements of $\beta_t$ vary under KS-test and t-test.

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Log-ML&lt;sub&gt;CE&lt;/sub&gt;</th>
<th>SD</th>
<th>Rank</th>
<th>DIC</th>
<th>SD</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVP-VAR-SV</td>
<td>-1506.455</td>
<td>0.288</td>
<td>5</td>
<td>2533.232</td>
<td>1.155</td>
<td>5</td>
</tr>
<tr>
<td>TVP-VAR</td>
<td>-1580.195</td>
<td>0.194</td>
<td>6</td>
<td>2633.436</td>
<td>2.949</td>
<td>7</td>
</tr>
<tr>
<td>TVP-VAR-R1-SV</td>
<td>-1483.666</td>
<td>0.264</td>
<td>1</td>
<td>2411.979</td>
<td>0.514</td>
<td>3</td>
</tr>
<tr>
<td>TVP-VAR-R2-SV</td>
<td>-1502.186</td>
<td>0.397</td>
<td>4</td>
<td>2498.542</td>
<td>1.657</td>
<td>4</td>
</tr>
<tr>
<td>TVP-VAR-R3-SV</td>
<td>-1484.715</td>
<td>0.282</td>
<td>2</td>
<td>2390.006</td>
<td>0.531</td>
<td>2</td>
</tr>
<tr>
<td>CVAR-SV</td>
<td>-1486.077</td>
<td>0.073</td>
<td>3</td>
<td>2346.120</td>
<td>6.300</td>
<td>1</td>
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<tr>
<td>CVAR</td>
<td>-1584.832</td>
<td>0.023</td>
<td>7</td>
<td>2562.849</td>
<td>0.351</td>
<td>6</td>
</tr>
</tbody>
</table>
IRF to Monetary Policy Shocks

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- TVP-VAR-R3-SV
- CVAR-SV
- TVP-VAR-R1-SV

GDP Growth

Inflation Rate

1998Q3, 2003Q4, 2009Q3, 2018Q2, CVAR
IRF of Interest Rate

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- External Shock
- ER Shock
- AD Shock
- AS Shock

1998Q3, 2003Q4, 2009Q3, 2018Q2, CVAR

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GDP Growth

Inflation Rate

Interest Rate

TVP-VAR-R3-SV

CVAR-SV

External  
ER  
AD  
AS  
MS  
MP


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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.