Motivation

Recently, the Covid-19 pandemic has led to unprecedented macroeconomic policy responses in many countries. Its deepness compares with the global financial crisis (GFC) of 2008-09. Regarding monetary policy:

- Short-term interest rate thresholds have reached their effective lower bounds (ELB).
- Complementarily, unconventional monetary policies provided additional stimulus to economic activity. As result:
  - traditional monetary aggregates increased.
  - size of central banks' balance sheets enlarged.

How to correctly measure the total monetary stimulus in this context?

The Model

The DFM is standard. Let \( y_t = y_1, \ldots, y_n \) denote a sequence of vectors with \( \alpha \) stationary and standardized observed variables, which may have missing data. It is assumed that \( y_t \) admits a dynamic representation in terms of \( \alpha \) unobserved factors. Let \( f_t = \{ f_{1t}, \ldots, f_{\alpha t} \} \) be a sequence of factor vectors. Measurement eqs.:

\[
y_t = \Lambda_f f_t + e_t, \quad e_t \sim N(0, \Omega), \tag{1}
\]

where \( \Lambda \) is a matrix of \( n \times \alpha \) factor loadings and the idiosyncratic innovations \( e_t = [e_{1t}, \ldots, e_{\alpha t}]' \) correspond to i.i.d errors with zero mean and diagonal variance-covariance matrix \( \Omega \).

The joint dynamics of the latent factors follow a VAR of order \( \alpha \):

\[
f_t = \sum_{\tau=1}^{\alpha} \Lambda f_{t-\tau} + \nu_t, \quad \nu_t \sim N(0, \Omega), \tag{2}
\]

where \( \Lambda \) denotes a matrix of autoregressive coefficients and \( \Omega \) is the variance-covariance matrix of the shocks to \( f_t \), possibly correlated. The idiosyncratic shocks are uncorrelated and \( \nu_t \sim N(0, \Omega) \), \( t \). We extend (2) and assume block exogeneity restrictions on \( \Lambda \) and \( \Omega \) (SOE):

\[
\Lambda = \left[ \begin{array}{c|c} \Lambda_1 & \mathbf{0} \\ \hline \mathbf{0} & \Lambda_2 \end{array} \right] \quad \Omega = \left[ \begin{array}{c|c} \Omega_1 & \mathbf{0} \\ \hline \mathbf{0} & \Omega_2 \end{array} \right], \tag{3}
\]

where \( \Lambda_1 (\Lambda_2) \) is a matrix of dimension \( n_1 \times \alpha_1 \) \( (n_2 \times \alpha_2) \), \( n_1 + n_2 = n \), and \( \alpha_1 + \alpha_2 = \alpha \).

The vectors of observed variables and unobserved factors are partitioned into external and domestic blocks denoted by super-indices ‘e’ and ‘d’ respectively:

\[
y_t = \left[ \begin{array}{c} y_{te} \\ y_{td} \end{array} \right], \quad f_t = \left[ \begin{array}{c} f_{te} \\ f_{td} \end{array} \right]. \tag{4}
\]

Eqs. (1) to (4) specify the DFM that we will use to estimate the SMPR for Chile.

As in [2], we consider missing observations for (foreign and domestic) interest rates when they reach their ELB.

Data and Model’s specification

We use monthly data for Chile and the U.S. spanning from Sept. 2002 to Oct. 2020, following the structure by [2]:

1. Block 1: Interest rates
2. Block 2: Monetary aggregates
3. Block 3: Federal Reserve balance sheet (assets)
4. Block 4: Federal Reserve balance sheet (liabilities)

To set the number of factors, we apply the ABC criterion developed in (1). We choose 4 for the external block and 5 for the domestic one. These factors explain 87 and 94% of the variance in each block, respectively.

The VAR(1) is based on standard information criteria (AIC, SIC, HQC).

Main Results

1. The evolution of the estimated SMPR is coherent with the timing and scope of the monetary policy actions taken by the CBC.
2. Driving factors behind SMPR variability:
   a. In the short run, shocks to domestic factors explain the largest share.
   b. As time horizon increases, contributions of shocks to domestic factors declines monotonically. In the long run, shocks to foreign factors play a dominate role.
   c. Robust results to changes in model specification and in the set of observed variables.

Estimated SMPR for Chile

Chile: Effective MPPr and estimated SMPR

Notes: The black line depicts the estimated SMPR, and dotted ones are the corresponding 95% confidence intervals. The red line shows the observed MPPr.

References
