Monetary and macroprudential policies: Interaction and complementarity

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Reassessment of the macroeconomic policy framework:

- Price stability no longer thought of as a sufficient condition for financial stability.
- Microprudential supervision ill-equipped to cope with systemic-wide risks associated to the financial sector.

Policy makers required to take immediate actions to mitigate the sources of systemic risks:

- Introduction of macroprudential policy as a “new policy domain”.

However, despite some early antecedents, in general:

- The toolkit for policy analysis (i.e. standard models) did not provide adequate setups to answer arising questions.
- Lack of formal scrutiny of the granularity of these new policies before they were implemented.
Analytical frameworks supporting the introduction of macroprudential policies surged ever since. Yet, general consensus still far from being reached.

Some challenges:

- What is the correct macroeconomic framework to study financial stability issues?
- Macroprudential policies may be country specific. Generalizations are difficult.
- Relatively short history to find robust empirical results of their efficiency.

Some strands of research:

- Effectiveness of macroprudential tools to mitigate systemic risk (Lim et al., 2011; Korinek, 2010; Bianchi, 2010).
- Coordination between the central bank and the macroprudential authority (Angelini et al., 2012).
- Great literature reviews: Hanson et al., 2011; Smets, 2013 & Galati and Moessner, 2013.
In this paper

- We study the relationship between macroprudential and monetary policy tools focusing on their interaction and complementarity.

- In particular, we analyze the conditions under which the introduction of a macroprudential authority allows for gains for the monetary authority.
In this paper (contd.)

To do so:

- Policy objectives:
  - Monetary policy: price stability $\Rightarrow$ loss function penalizing inflation and output volatility.
  - Macropurudential policy: financial stability $\Rightarrow$ loss function penalizing financial variables’ volatility.

- We use a standard reduced-form macroeconomic model with financial linkages.

- Choose a macroprudential policy tool: dynamic provisioning.

- We analyze three cases of interaction:
  2. Coordinated case: monetary policy & macroprudential policy set simultaneously, certain participation constraints must be considered.
Our results

- A policy arrangement through which the monetary and macroprudential authorities coordinate provides room for welfare gains:
  - Nontrivial result since monetary authority faces trade-offs while interacting with macroprudential authority.
  - A significantly high weight needs to be placed on the traditional objectives of the monetary authority (as opposed to the ones of the macroprudential authority), so that the latter has Pareto-improvements.
  - Source of welfare gains: macroprudential policy provides a “protective shield” that mitigates shocks arising in the financial sector into the real sector (Sámano, 2011).
Our results (contd.)

- Within our model, results are robust to:
  
  i) sources of shocks hitting the economy, and
  
  ii) central bank’s preferences for inflation relative to output stabilization.

- No canonical model to think of these issues:

  ⇒ Results are suggestive since they are model dependent.
Outline

- The model.
- Description of policy environments.
- Results.
- Final remarks.
Setup

- No common conceptual framework to study these issues. Our approach: simple, reduced-form model accounting for the interaction between standard macroeconomic setup and some financial variables (following Sámano, 2011; in the spirit of Woodford, 2012).
  - Append a macroeconomic financial block to a SOE New Keynesian model.
  - The model features macro-financial linkages that allow for the propagation of shocks into the financial sector and vice versa.

- The elements of the financial block include semi-structural equations by credit sector of the following variables:
  - Interest rate lending spreads.
  - Delinquency indexes.
  - Credit growth rates.
  - A coverage ratio (ratio of loan-loss reserves to non-performing loans) → policy instrument when macroprudential authority is active.
Core macro model

1) Inflation:
\[ \pi_t = \omega_c \pi_t^c + \omega_{nc} \pi_t^{nc} \]

2) Core Inflation:
\[ \pi_t^c = a_1 \pi_{t-1}^c + a_2 E_t[\pi_{t+1}^c] + a_3 x_t + a_4 (\Delta e_t + \pi_t^{us}) + \varepsilon_{\pi^c,t} \]

3) RER:
\[ rer_t = c_0 rer_{t-1} + c_1 (E_t[rer_{t+1}] + (r_t^{us} - r_t)) + \varepsilon_{rer,t} \]

4) IS:
\[ x_t = b_0 + b_1 x_{t-1} + b_2 E_t x_{t+1} + b_3 r_{t-1} + b_4 x_{t-1}^{US} + b_5 \ln (rer_t) + \varepsilon_{x,t} \]

5) Interest rate rule:
\[ i = f(\text{monetary authority's loss function, the rest of the economy}) \]
Financial block

- **Interest rate spreads:**
  
  \[ spread_t^j = \beta_0^j + \beta_1^j \text{spread}_{t-1}^j + \beta_2^j \text{delin}_t^j + \beta_3^j CRR_t + \varepsilon_{\text{spread},t}^j \]

- **Delinquency indexes:**
  
  \[ \text{delin}_t^j = \alpha_0^j + \alpha_1^j \text{delin}_{t-1}^j + \alpha_2^j x_t + \varepsilon_{\text{delin},t}^j \]

- **Credit growth rates** (residual variable):
  
  \[ \Delta \text{cr}_t^j = \gamma_0^j + \sum_{i=1}^{2} \gamma_{1,i}^j \Delta \text{cr}_{t-i}^j + \gamma_2^j x_t + \gamma_3^j \text{spread}_t^j + \varepsilon_{\Delta \text{cr},t}^j \]

  where \( w_j \) for \( j = \{\text{corporate, consumption, mortgages}\} \) is the weight accounting for the proportion of sector’s \( j \) credit from total credit.
The financial block is closed with a coverage ratio rule: a dynamic provisioning instrument aimed at reducing financial system procyclicality.

- Allows for the build-up of reserves in good times that serve as buffers in bad times.
- Smooths credit growth throughout the business cycle.
- Shields the real economy from shocks originated in the financial sector.
- Optimal CRR when macroprudential authority is active:

\[
CRR = f(\text{macroprudential authority's loss function}, \text{the rest of the economy})
\]

- AR(1) when it is assumed to be inactive:

\[
CRR = \rho_{CRR} CRR_{t-1} + \varepsilon_{CRR,t}
\]
Financial block (contd.)

- Key mechanism: commercial banking sector adjusts its interest rate spreads in reaction to coverage ratio provisions and delinquency indexes so as to maintain profits roughly constant.

- The financial block affects the output gap of the core model through interest rate spreads:
  - An increase in the aggregate interest rate spread reduces economic activity (following Sámano, 2011 and MAG, 2010).
  - Modified IS equation:

\[
x_t = b_0 + b_1 x_{t-1} + b_2 E_t x_{t+1} + b_3 r_{t-1} + b_4 x_{t-1}^{US} + b_5 \ln (rer_t) + b_6 \text{spread}_{t-1} + \varepsilon_{x,t}
\]
Monetary and macroprudential policy interaction (from Smets, 2013)
Policy objectives

- The stabilization of macroeconomic and financial fluctuations implies the minimization of certain loss functions.
  - Loss function associated to monetary authority:
    \[
    L_m \equiv \alpha_x \sigma_x^2 + \alpha_\pi \sigma_\pi^2 + \alpha_{\Delta i} \sigma_{\Delta i}^2
    \]
  - Loss function associated to macroprudential authority:
    \[
    L_{mp} \equiv \alpha_{delin} \sigma_{delin}^2 + \alpha_{spread} \sigma_{spread}^2 + \alpha_{\Delta CRR} \sigma_{\Delta CRR}^2
    \]
Interaction of monetary and macroprudential policy

- Three scenarios to analyze the interaction of monetary and macroprudential policies are considered:
  2. Coordinated case (policy committee case): monetary policy & macroprudential policy set jointly to stabilize the economic system as a whole. Participation of both authorities is conditioned to meet certain participation constraints.
  3. Uncoordinated policy case: monetary policy & macroprudential policy set independently to meet their own objectives.

- Monetary policy is the incumbent.
Baseline Case

- Represents a pre-crisis policy environment where the central bank stabilizes “traditional” macroeconomic variables, while the financial sector is let alone from any stabilization effort (i.e. macroprudential policy is inactive).

\[
\min_{i_t} \left\{ L_m = \alpha_x \sigma_x^2 + \alpha_\pi \sigma_\pi^2 + \alpha_{\Delta i} \sigma_{\Delta i}^2 \right\}
\]

s.t. equations (1) to (10)
\[
CRR_t = \rho_{CRR} CRR_{t-1} + \varepsilon_{CRR, t}
\]
Joint stabilization plan put in place by the policy:

\[
\min_{i_t, CRR_t, \Omega \in [0, 1]} \{ \Omega L_m + (1 - \Omega)L_{mp} \}
\]

s.t. equations (1) to (10)

\[L_{mp} \leq \bar{L}_{mp}\]
\[L_m \leq \bar{L}_m\]

\(\bar{L}_m\) and \(\bar{L}_{mp}\) denote the values of \(L_m\) and \(L_{mp}\) in the baseline case.

\(\Omega \in [0, 1]\) is the weight assigned to the monetary authority’s objectives versus the ones of macroprudential authority.
Uncoordinated Policy Case

- Both authorities simultaneously choose their optimal policy instrument taking into account the best response of the other authority (i.e., a Nash equilibrium).

\[
CRR_t^* = \text{Arg min}_{CRR_t} \left\{ L_{mp} = \alpha_{\text{delin}} \sigma^2_{\text{delin}} + \alpha_{\text{spread}} \sigma^2_{\text{spread}} + \alpha_{\Delta CRR} \sigma^2_{\Delta CRR} \right\}
\]

s.t. equations (1) to (10) given \(i_t^*\)

\[
i_t^* = \text{Argmin}_{i_t} \left\{ L_m = \alpha_x \sigma^2_x + \alpha_{\pi} \sigma^2_{\pi} + \alpha_{\Delta i} \sigma^2_{\Delta i} \right\}
\]

s.t. equations (1) to (10) given \(CRR_t^*\)
Baseline vs uncoordinated policy case

As in Sámano, 2011, the model is estimated for the Mexican economy using SUR.

Uncoordinated policy case Pareto-improves the baseline case.

Results hold under different assumptions about the type of shocks disturbing the economic environment and central bank’s preferences for inflation relative to output stabilization.

<table>
<thead>
<tr>
<th>$\alpha_\pi = \alpha_\pi$</th>
<th>Baseline case</th>
<th>Uncoordinated Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_m$</td>
<td>212.64</td>
<td>&gt; 209.99</td>
</tr>
<tr>
<td>$L_{mp}$</td>
<td>113.86</td>
<td>&gt; 69.54</td>
</tr>
</tbody>
</table>

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<tr>
<th>$\alpha_\pi &gt; \alpha_\pi$</th>
<th>Baseline case</th>
<th>Uncoordinated Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_m$</td>
<td>254.24</td>
<td>&gt; 251.64</td>
</tr>
<tr>
<td>$L_{mp}$</td>
<td>174.12</td>
<td>&gt; 102.62</td>
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</table>

<table>
<thead>
<tr>
<th>$\alpha_x &gt; \alpha_\pi$</th>
<th>Baseline case</th>
<th>Uncoordinated Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_m$</td>
<td>159.67</td>
<td>&gt; 157.67</td>
</tr>
<tr>
<td>$L_{mp}$</td>
<td>63.50</td>
<td>&gt; 40.89</td>
</tr>
</tbody>
</table>
Baseline vs policy committee case

- $L_m < \bar{L}_m$ when $\Omega > 0.91$
- $L_{mp} < \bar{L}_{mp}$ when $\Omega < 0.98$
- Policy committee case Pareto-improves the baseline case when $\Omega \in [0.92, 0.97]$
  - Results hold under different assumptions about the type of shock disturbing the economy.
  - The main driver of the benefits for the monetary authority is the stabilization of the output gap.
  - Case with $\alpha_\pi = \alpha_x$.

<table>
<thead>
<tr>
<th>Baseline Case</th>
<th>Policy Committee Case</th>
<th>$\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.99</td>
<td>0.98</td>
</tr>
<tr>
<td>$L_m$</td>
<td>212.64</td>
<td>201.79</td>
</tr>
<tr>
<td>$L_{mp}$</td>
<td>113.86</td>
<td>342.52</td>
</tr>
</tbody>
</table>
IRF: lending spreads shock

- Spread
- Delinquency Index
- CRR
- Inflation
- Output Gap
- Interest Rate

Baseline, Committee, Independence
The source of the gains

- The range for $\Omega$ that ensures Pareto-improvements changes when the monetary authority places a different weight to inflation relative to output stabilization (i.e., $\alpha_\pi \neq \alpha_x$):
  - When $\alpha_\pi > \alpha_x$, the range shrinks and shifts upwards, $\Omega \in [0.94, 0.98]$.
  - When $\alpha_x > \alpha_\pi$, the range widens and shifts downwards, $\Omega \in [0.90, 0.96]$.
  - A monetary authority more intolerant to output fluctuations finds relatively higher benefits from being complemented by a macroprudential authority.
IRF: lending spreads shock
Conclusions

- We analyze the interaction and complementarity between monetary and macroprudential policy.

- In our model:
  - A policy committee through which both the monetary and macroprudential authorities coordinate and in which $\Omega$ is high is Pareto-improving versus a situation in which the monetary policy is the only instrument used to stabilize the economy. In this cases their complementarity improves the outcome.
  - If $\Omega$ is low enough the stabilization of financial variables would occur at the expense of higher inflation volatility from a stressed effort to stabilize the output gap which would generate losses for the monetary authority.

- Results are suggestive since they are model dependent. Further work must be done to generalize our findings.