Optimal Mix of Monetary, Macroprudential and Fiscal Policies

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Motivation

Since the global financial crisis, the Canadian economy has faced challenges in achieving economic and financial stability:

- Downside risks to the real economy due to external headwinds
- Household debt has reached historically high levels

Policies prescribed in Canada

- Keep the nominal interest rate low to stimulate the economy
- Tighten mortgage lending standards to limit risks in the housing sector.

Questions

- Is this a good policy mix?
- Should monetary policy instead lean against financial instability?
What we do in this project

- Examine quantitatively how to coordinate (i) the policy rate, (ii) regulatory LTV ratio and (iii) government-spending.
  - This analysis is conditional on a particular scenario of the Canadian economy involving high HH debt and external headwinds.
  - Use BoC’s MP2 model (Alpanda, Cateau and Meh, 2014), which features the nexus between real and financial sectors.

- Derive the optimal mix of policies by minimizing a loss function that penalizes deviations of inflation from target and the output gap.
  - Financial stability concern captured by anticipated financial shocks.
  - The severity of the shock depends on the level of HH debt.
  - This gives the government an incentive to moderate HH debt.
Main results

Given the baseline scenario, the optimal policy mix prescribes:
- a reduction of the policy rate
- a reduction in the LTV ratio
- an increase in the government spending.

Qualitatively, this is consistent with what is happening in Canada.

Similar results when fiscal policy cannot provide additional stimulus.
- Monetary policy becomes a bit more expansionary.
- However, inflation goes back to the target, and output gap closes more slowly than in the fully optimal policy mix.
Financial frictions

- Lenders pay monitoring costs of loans
  - This generates spreads on interest rates
    - e.g. mortgage rate > bank’s funding rate
- Monitoring costs increase with borrower’s leverage and generate financial accelerator mechanism
  - Two-way interactions between spread and leverage
  - Between (i) patient HHs and banks, (ii) banks and impatient HHs, (iii) banks and entrepreneurs
- Financial accelerator mechanisms interact to create further amplification.
  - monitoring costs↑, bank’s retained earnings↓, banks’ leverage↑, deposit rate↑, mortgage rate↑
Pecuniary externality

- A key is that monitoring costs increase when the borrowers’ net worth declines relative to what they need.

- In MP2, this is characterized in a reduced-form, increasing function:

  \[ \text{monitoring cost} = f \left( \frac{(1 - m) qh}{n} \right), \]

  where:
  - \( m \): regulatory LTV ratio,
  - \( qh \): value of houses,
  - \( n \): borrower’s net worth.

- This captures the tightness of borrowing constraints in a collateral model.

- Importantly, this function is not internalized by economic agents.

- As a result, the externality leads to inefficiencies and provide reasons for policy intervention.
How can policies mitigate inefficiencies arising from financial frictions? Consider how each policy can moderate HH debt.

- **Macro-prudential policy**: A reduction in the regulatory LTV ratio.
  - Raises the required down payment. Mortgage rate increases.

- **Monetary policy**: An increase in the policy rate.
  - Raises the funding cost of banks, translating into higher mortgage rates.
  - A decline in aggregate demand also reduces housing demand.

- **Fiscal policy**: A reduction in government spending.
  - A decline in aggregate demand reduces housing demand.

Coordination of these policies is a quantitative issue.
We are interested in the optimal paths of:

- the policy rate
- the regulatory LTV ratio for mortgage loans
- government spending on goods and services.

We solve for the optimal policies given the baseline scenario of the Canadian economy going forward:

- High levels of household debt
- Weakening of foreign demand for Canadian goods
- Anticipated financial crisis in 6th year of simulation

The way to solve for optimal policy mix:

- Allow policy paths to deviate from the baseline scenario, and find the one that maximizes the welfare.
Baseline scenario

- Generate high HH debt and external headwinds by feeding in relevant structural shocks.

- In addition, financial shocks occur in the 6th year of simulation.
  - Rebalance patient HHs’ asset portfolio away from risky assets and toward safe assets. This flight-to-quality will increase mortgage and business loan rates.

- Particular form of financial shock:
  \[ \varepsilon_{x,21} = \alpha \max \{ \hat{b}_{l,20}, 0 \} \]
  - The severity of financial shocks depends on the size of HH debt gap.
  - Incentive to avert a crisis by reducing HH debt before the shock arrives.
  - Agents do not internalize this when they make their decisions.
To evaluate the welfare under different policies, we use the loss function:

\[
L_t = \sum_{t=1}^{100} \beta^{t-1} \left\{ (\pi_t - \pi^*)^2 + \lambda \hat{y}_t^2 \right\}
\]

Alternatives?
Comparing different policies

- We allow three policy instruments to deviate from the baseline paths:
  - Introduce additional *policy* shocks while keeping other shocks the same as in the baseline scenario
  - Additional policy shocks affect policy profiles through policy rules

- Given these shocks, we simulate the model under perfect foresight, and compute the loss.
  - To solve for the equilibrium paths, we use the log-linearized equilibrium conditions.
  - Nonlinearity due to ZLB of nominal interest rate as well as the financial shocks.
It is very challenging to search optimal policy paths in an entirely unrestricted way.

The dimensionality problem associated with the length of simulation.

We restrict our focus on a particular set of policy paths.

- Adopt an initial guess of the optimal policy profiles
- Allow additional policy shocks implied by the guessed policy profiles to shift up or down

The size of each shift is controlled by a scalar.

- Allow these scalars to be picked from a wide range of intervals

After all, we find a combination of three scalars that minimizes the loss function.
Initial guess for the optimal policy paths

- Relative to the baseline policy profile, our initial guess for the policy paths implies that
  - the policy rate cumulatively increases by 100 bps over 4 quarters
  - the LTV ratio permanently decreases by 5 p.p.
  - government expenditure cumulatively increases by 5% over 4 quarters

- Note that scalars on the initial guesses can be positive or negative.
  - Positive: the policy rate rises to lean against financial imbalances.
  - Negative: the policy rate might hit ZLB

- This approach allows us to compare policies with different implications even though the range of policy profiles is restricted.
## Results: optimal policy paths

<table>
<thead>
<tr>
<th>Year</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policy rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimal mix</td>
<td>-0.6</td>
<td>-0.06</td>
<td>+0.4</td>
<td>+0.6</td>
<td>+0.7</td>
</tr>
<tr>
<td>Optimal excl. fiscal</td>
<td>-0.6</td>
<td>-0.15</td>
<td>+0.25</td>
<td>+0.47</td>
<td>+0.52</td>
</tr>
<tr>
<td><strong>Regulatory LTV ratio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimal mix</td>
<td>-3.5</td>
<td>-5.6</td>
<td>-5.6</td>
<td>-5.6</td>
<td>-5.5</td>
</tr>
<tr>
<td>Optimal excl. fiscal</td>
<td>-3.3</td>
<td>-5.3</td>
<td>-5.3</td>
<td>-5.3</td>
<td>-5.3</td>
</tr>
<tr>
<td><strong>Government expenditure to GDP ratio</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimal</td>
<td>+0.9</td>
<td>+1.4</td>
<td>+1.3</td>
<td>+1.1</td>
<td>+0.9</td>
</tr>
</tbody>
</table>
## Results: key variables

Changes from the baseline (in percentage points)

<table>
<thead>
<tr>
<th>Year</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inflation rate</strong></td>
<td></td>
<td></td>
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<tr>
<td>Optimal mix</td>
<td>+0.10</td>
<td>+0.17</td>
<td>+0.25</td>
<td>+0.30</td>
<td>+0.27</td>
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<tr>
<td>Optimal excl. fiscal</td>
<td>+0.06</td>
<td>+0.10</td>
<td>+0.18</td>
<td>+0.23</td>
<td>+0.22</td>
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<tr>
<td><strong>Output</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Optimal mix</td>
<td>+0.78</td>
<td>+0.90</td>
<td>+0.79</td>
<td>+1.06</td>
<td>+1.36</td>
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<tr>
<td>Optimal excl. fiscal</td>
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<td>-0.05</td>
<td>+0.18</td>
<td>+0.67</td>
<td>+1.13</td>
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<tr>
<td><strong>Household debt</strong></td>
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</tr>
<tr>
<td>Optimal</td>
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<td>-3.79</td>
<td>-4.83</td>
<td>-5.44</td>
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<tr>
<td>Optimal excl. fiscal</td>
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<td>-2.31</td>
<td>-3.78</td>
<td>-4.85</td>
<td>-5.45</td>
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</tbody>
</table>
Intuition

The results do not support the leaning of monetary policy against HH imbalances.

1. Regulatory LTV policy is more efficient than monetary policy in addressing housing sector issues.
   - Regulatory LTV policy can directly affect the housing sector.
   - Monetary policy affects all sectors in the economy.

2. Monetary policy is more effective against external headwinds that negatively affects the aggregate economy.
Conclusion

- Given the scenario for the Canadian economy, the optimal policy mix calls for a tightening in the regulatory LTV ratio and expansionary monetary and fiscal policies.

- Monetary authority may have to be cautious about leaning against financial imbalances if macro-prudential policy can directly and more efficiently address risks in the financial sector.

- However, more research needs to be done to deepen the understanding of policy mix.
  - A more elaborate endogenous channel to generate financial crises.
  - Ramsey policies taking into account heterogeneity of agents and contingent future paths.