Applying Macro-Prudential Instruments—Cross Country Experiences

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Roadmap

- Use of MAP Tools
- Evidence from Cross-Country Studies
- Evidence from Six Case Studies
- Evidence from Loan-by-Loan (Micro) Supervisory Data
Use of MAP Tools
Tools Address Specific Types of Vulnerabilities

- **Broad-based (Capital) tools** to address risks from credit booms
  - Countercyclical Capital Buffer (CCB), Dynamic Provisions, Time-varying leverage ratio; Macro-Supervisory Stress Test (ex, CCAR)

- **Sectoral capital and asset-side tools** to address corporate and household vulnerabilities
  - Risk-weight floors, caps on exposure shares, Loan-to-Value (LTV), Debt Service-to-Income (DSTI), Loan-to-Income (LTI)

- **Liquidity tools** to address funding and FX risks
  - Differentiated reserve requirements, Basel III Liquidity Coverage Ratio (LCR), Core Funding Ratios, Levy on volatile funding, Caps on Loan-to-Deposit ratios

- **Structural tools** to address risks from interconnectedness
  - D-SIB and G-SIB surcharges, Systemically Important Insurers surcharges, additional loss-absorbency requirements, risk weights and large exposure limits, G20 initiatives for central clearing of OTC derivatives,
Increasing Use of MAP Instruments, by Region

Macroprudential Policies: Cumulative Actions by Region
(Average per country in each region: 2000Q1-2013Q1)

Index summing up housing-related measures, credit measures, reserve requirements, dynamic provisioning and core funding ratio. Simple average across countries within country groups.

Source: Zhang and Zoli, 2014
Increasing Use of MAP Instruments, by Type

Cumulative Usage of Macroprudential Tools

Sources: 2011 IMF Survey, BIS database (Shim et al., 2013, “Database for policy actions on housing markets”), ESRB database, central bank, BCBS and FSB websites, IMF papers, Article IVs, FSAPs and survey with IMF desk economists. The database covers 64 countries, of which 32 are advanced economies according to IMF (World Economic Outlook) classification.
LTV Usage as Countercyclical Tool

Figure 1. Use of LTV and DTI as Macroprudential Tools 2000–13

Countries that changed loan-to-value ratios since 2000

Africa
- Bangladesh
- China
- Hong Kong SAR
- India
- Korea
- Indonesia
- Malaysia
- Nepal
- Singapore
- Thailand

Asia & Pacific
- Bulgaria
- Cyprus
- Hungary
- Israel
- Netherlands
- Norway
- Poland
- Romania
- Spain
- Sweden

Middle East & Central Asia
- Oman
- Pakistan

Western Hemisphere
- Argentina
- Bahamas
- Brazil
- Canada
- Chile
DTI Usage as Countercyclical Tool

Countries that changed debt-to-income ratios since 2000

Sources: Global Macroprudential Policy Instruments database; IMF staff calculations.
Range of LTV Across Countries

Figure 2. Range of Limits on LTV and DTI, 2013

Limits on loan-to-value ratios
Range of DSTI Across Countries

Limits on debt-to-income ratios

Sources: Global Macroprudential Policy Instruments database; IMF staff calculations.
Note: A few countries, like Norway, do not have strict regulatory limits, but only supervisory guidance on such limits.
Combining Tools

<table>
<thead>
<tr>
<th>Number of Countries with Sectoral Macroprudential Tools</th>
<th>Sectoral Capital Requirements</th>
<th>Limits on LTV Ratio</th>
<th>Caps on DSTI Ratio</th>
<th>Limits on LTV and DSTI ratios</th>
<th>At least One tool</th>
<th>More than two tools</th>
<th>All three tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Countries (Total = 46)</td>
<td>24 (52 percent)</td>
<td>24 (52)</td>
<td>15 (33)</td>
<td>13 (28)</td>
<td>38 (83)</td>
<td>20 (43)</td>
<td>5 (11)</td>
</tr>
</tbody>
</table>

Source: IMF staff calculation.
Note: Numbers in () shows the proportion of countries with a specific instrument among the sample.

Number of Macroprudential Measures—Tightening or Loosening (2008–13)

<table>
<thead>
<tr>
<th></th>
<th>Tightening</th>
<th>Loosening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital requirements</td>
<td>19 (39)</td>
<td>7 (12)</td>
</tr>
<tr>
<td>Limits on LTV ratios</td>
<td>54 (76)</td>
<td>9 (19)</td>
</tr>
<tr>
<td>Caps on DSTI ratios</td>
<td>14 (26)</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Total</td>
<td>87 (141)</td>
<td>19 (35)</td>
</tr>
</tbody>
</table>

Note: Data in Kuttner and Shim (2013) and Lim and others (2013) are combined by IMF staff. Table shows tightening and loosening of three sectoral tools over 2008–13 and 2001–13 (in parenthesis).
Effectiveness: Evidence from Cross-Country Studies
Are MAPs Effective? Few Consensus

Increasing body of research on effectiveness, but few consensus in cross-country studies

- Lowers credit growth during upswing (LTV, DSTI, Risk Weight, Reserve Requirements)
- Support credit growth during downswing (Capital, Dynamic Prov)
- Resilience during downswing (Capital, LTV)
- Limited or no impact on house price growth (Capital, LTV, DSTI)
- Limited evidence on liquidity risk

Impact on House Price Levels in CESE, by Instrument

Impact on Credit, House Price Growth and Funding Risk, by Instrument

Note: 38 countries, 2000-2011.
Impact on Housing Credit, by Instrument and Phase

Note: 60 countries, January 1990 – June 2012.


Effectiveness: Evidence from 6 Country Cases

LTV and DTI Limits: Going Granular
### Summary of 6 Case Studies, Time-Series Evidence

<table>
<thead>
<tr>
<th></th>
<th>Asia</th>
<th>Europe</th>
<th>Latin America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>Hong Kong SAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Korea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emerging</td>
<td>Malaysia</td>
<td>Poland Romania</td>
<td>Brazil</td>
</tr>
</tbody>
</table>

- Worked with six central banks
- Country experiences with limits on LTV and DTI
  - Monitoring & Triggers
  - How Much to Tighten?
  - Enforcement
  - Effectiveness

Monitoring & Triggers

- Countries use granular data
  - Property sector, banks, nonbanks, households, speculative activities and more
  - Vintages of NPLs: by LTV, loan tenor, income levels

- They combine micro information with macro data to create indicators to monitor systemic risks
- With a strong eye on whether there could be debt-servicing difficulties in the future
- Mortgage loan growth + longer loan tenors + high LTVs, or with rising number of multiple mortgage loans, send out an alert
How Much to Tighten?

• No magic number, microdata helps

  ➢ LTVs: 60–85%, DTIs: 30–50%
  ➢ Varies by type of loan (FX, overseas income, maturity, speculative prone area)

• Changes (mostly discretionary, chasing leakages)

• Numerator of LTV changes (some countries add other debts)

• Numerator of DTI changes (debt service on mortgage loans vs. debt service on all loans)
Example from Brazil, Auto Loans

- Consumer (Auto) Loans NPLs
- Same LTV: Higher maturity ➞ Higher NPL ratio
- Same maturity: Higher LTV ➞ Higher NPL ratio

NPLs for different LTVs and Maturities...

Inform Risk Weights for auto loans...

<table>
<thead>
<tr>
<th>LTV (in percent)</th>
<th>Maturity (years)</th>
<th>1 &amp; ≤ 2</th>
<th>&gt; 2 &amp; ≤ 5</th>
<th>&gt; 5 &amp; ≤ 8</th>
<th>&gt; 8 &amp; ≤ 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 60</td>
<td></td>
<td>1.0</td>
<td>1.9</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>&gt; 60 &amp; ≤ 70</td>
<td></td>
<td>2.0</td>
<td>3.4</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>&gt; 70 &amp; ≤ 80</td>
<td></td>
<td>3.0</td>
<td>3.5</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>&gt; 80 &amp; ≤ 100</td>
<td></td>
<td>3.4</td>
<td>4.0</td>
<td>5.9</td>
<td></td>
</tr>
</tbody>
</table>

Source: Jacome and Mitra, Forthcoming

Maturity and LTV

<table>
<thead>
<tr>
<th>Change of Risk Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3 and LTV &gt; 80</td>
</tr>
<tr>
<td>3-4 and LTV &gt; 70</td>
</tr>
<tr>
<td>4-5 and LTV &gt; 60</td>
</tr>
<tr>
<td>More than 5 and any LTV</td>
</tr>
</tbody>
</table>
Example from Romania, NPLs, Income, LTVs

- NPL ratio for real estate loans
- Stock of NPLs on real estate loans (RHS)

Net monthly income:
- <= 700
- (700;1500)
- (1500;2500)
- (2500;3500)
- (3500;5000)
- (5000;7000)
- > 7000

LTV for real estate loans valued at 2013 house prices
- NPL ratio for real estate loans (RHS)

Enforcement Difficult, Immediate Application Helps

• Coped with diverse sources of leakages
  ➢ Non-regulated entities (bring to regulation, cooperation)
  ➢ Modifying loans to meet standards (ensure DTI entire life)
  ➢ Cross-border mortgage lending (supranational authorities)
  ➢ Foreign bank branches (become subsidiaries in both countries)

• Other policies to deal with leakages
  ➢ Applied right after the announcement
  ➢ Complement with other policies
Effectiveness: Mixed Results

- Effective in reducing loan-growth and improving debt-servicing performances

- Not effective in curbing house price growth
  - When countries faced strong capital flows into banks
  - Or high demand for houses from cross-border sources
  - Better results when measures were targeted (speculative properties)

- To analyze effectiveness ➔ need to use rich micro data
Panel Evidence: Small, Limited Impact

- Effect of 10pp Lower LTV Limit on Mortgage Credit Level (percent)

\[ \Delta C_{it} = \alpha_0 + \alpha_i + \sum_{s=1}^{30} \beta_i \Delta LTV_{it-s} + \sum_{i=1}^{24} \rho_i \Delta C_{it-i} + e_{it} \]

- 5 economies

- Reduced form; lags take into account other policy actions and persistent impacts

- 10pp lower LTV limit leads to maximum cumulative impact of lowering credit growth by 0.7 percent

- No impact on house prices
Time Series Evidence: Richer Details

• Korea: Larger Time Series Effects

<table>
<thead>
<tr>
<th>Long run effect on: (in percent)</th>
<th>Ten percentage point lower LTV limit</th>
<th>Ten percentage point lower DTI limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortgage loans</td>
<td>-2.1</td>
<td>-0.8</td>
</tr>
<tr>
<td>House prices</td>
<td>-3.5</td>
<td>-0.2</td>
</tr>
<tr>
<td>Real GDP</td>
<td>-0.5</td>
<td>-0.02</td>
</tr>
</tbody>
</table>
## Time Series Evidence: Richer Details

### Objectives

<table>
<thead>
<tr>
<th></th>
<th>Romania</th>
<th>Hong Kong SAR</th>
<th>Korea</th>
<th>Malaysia</th>
<th>Poland</th>
<th>Brazil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curbing excessive credit growth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer/auto loans</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortgage</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Curbing house price growth</td>
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<tr>
<td>Improving the resilience of the system to future adverse shocks</td>
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<tr>
<td>Curbing household leverage</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Curbing banks’ NPLs</td>
<td></td>
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</tbody>
</table>

### Methodology

<table>
<thead>
<tr>
<th></th>
<th>Dynamic Panel Data, Generalized Method of Moments (GMM)</th>
<th>Vector Auto-Regression (VAR); Demand-Supply econometric model for mortgage loans</th>
<th>Global Vector Auto-Regression (GVAR)</th>
<th>Event Study; Quadratic regression</th>
<th>Survey data analysis</th>
<th>Difference-in-Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td>LTV, DTI: together</td>
<td>LTV, DTI: together</td>
<td>LTV, DTI: separately</td>
<td>LTV</td>
<td>LTV, DTI: separately</td>
<td>Capital risk weights based on LTV</td>
</tr>
<tr>
<td>Other policy instruments</td>
<td>Stamp duties</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
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1Stated objective, successful (Green), Stated objective, unsuccessful (Pink); Not a stated objective (Blank).
Main Takeaways from the 6 Cases

- In measuring systemic risk ➔ creative use of both macro and micro data
- Be alert when high LTV loans, long maturities, speculation
- Most changes in LTV/DTI are discretionary
- Looking at LTV-specific loan vintages is useful for calibration
- Introducing simultaneously prudential and/or fiscal measures helps
- Execute immediately after announcement
- Expect leakages
- More effective on credit growth and loan servicing
Effectiveness: Evidence from Micro Data
India and Ireland
India

- Used loan-level data on over a million loans disbursed in India between 1995 and 2010...
- ...to understand how changing regulation impacted mortgage lending and risk.
- Changes in risk weights on mortgages with different LTV ratios ➔
  - when risk weights on mortgages disbursed at LTV ratios at and just under 75% are relatively lower, the subsequent delinquency rates on these mortgages are relatively higher, after accounting for interest rates at loan issuance.

Ireland

- Originating LTV and LTI, and **difference in default rates** between first-time buyers and others.
- Difference increases as LTV increases up to 85 percent.
- Difference falls as levels of Loan-to-Income ratio increase.


Summary

- **Use of MAP Tools**
  - Increasing and Extensive

- **Evidence from Cross-Country Studies**
  - Few Consensus on Effectiveness, works on credit growth, resilience in crisis

- **Evidence from Six Case Studies**
  - Use of both micro and macro data for monitoring and calibrating
  - Helped in credit growth, debt servicing

- **Evidence from Loan-by-Low (Micro) Supervisory Data**
  - Lower risk weights raise delinquencies in India
  - First time property buyers not necessarily more risky than others
Thank you