Macroprudential Policies: Korea’s Experiences

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Ⅲ Estimated Policy Effects

Ⅳ Challenges Ahead
Background: Targeted Risks

1. Housing sector related risks
2. FX related risks
Housing Booms and Bank Lending

- Housing booms in the early and mid 2000s were fueled by rapid increases in home mortgage lending by banks.

**Household Loans and Home Mortgage Loans**

**Housing Price**

Notes: 1) The darker red areas indicate the amounts of mortgage loans among household loans.
2) Compared to previous years.

Source: Bank of Korea
Capital flows have been volatile and pro-cyclical at the back of high trade and financial openness.

Notes: 1) 12-month moving average  
2) Shaded area for cyclical upswings  
Source: Bank of Korea
Large currency and maturity mismatches prior to GFC were key source of systemic risk.

Notes: Currency mismatches = foreign liabilities – foreign assets
Maturity mismatches = short-term foreign liabilities – short-term foreign assets
Source: Bank of Korea
Post-GFC Inflow Surge

- Resumed inflow surge after GFC (fueled by abundant global liquidity) amid weak domestic recovery

**Net Non-FDI Liability Flows**

![Graph showing Net Non-FDI Liability Flows from Sep 2008 to Jan 2010.](image)

**Pre- and Post-Crisis Capital Flows**

*(Monthly average)*

![Graph showing Pre- and Post-Crisis Capital Flows.](image)

**Source:** Bank of Korea
1. Housing Sector Related: LTV and DTI
2. FX Related: Leverage Caps and Levy
# Housing Sector Related Measures (1/2)

<table>
<thead>
<tr>
<th>Measures</th>
<th>Time</th>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTV</td>
<td>Sep. 2002</td>
<td>Limit LTV ratio to under 60%</td>
</tr>
<tr>
<td></td>
<td>Mar. 2004</td>
<td>Raise LTV ratio for installment loans: 60% → 70%</td>
</tr>
<tr>
<td></td>
<td>Jul. 2009</td>
<td>Lower LTV ratio in Seoul Metropolitan area: 60% → 50%</td>
</tr>
<tr>
<td>DTI</td>
<td>Aug. 2005</td>
<td>Limit DTI ratio to under 40% for cases of single households under 30 years old or existence of loans by spouses within speculation areas</td>
</tr>
<tr>
<td></td>
<td>Nov. 2006</td>
<td>Expand areas subject to DTI regulation (speculation-prone Seoul Metropolitan area)</td>
</tr>
<tr>
<td></td>
<td>Sep. 2009</td>
<td>Expand areas subject to DTI regulation (non-speculation Seoul Metropolitan area)</td>
</tr>
</tbody>
</table>

* Refer to Annex 1 and 2 for technical details of LTV and DTI regulations
Housing Sector Related Measures (2/2)

Evolution of LTV and DTI Regulations

Source: Bank of Korea, Kookmin Bank
FX Related Measures

- Leverage caps (as % of bank capital) tightened recently
- Stability Levy imposed on banks’ non-deposit FX liabilities

Source: Bank of Korea
Estimated Policy Effects
LTV and DTI regulations appear to have had intended effects on housing prices and mortgage lending.
Leverage caps appear to have had effects even before actual implementations (as they were pre-announced).

![FX Derivatives Position (vis-à-vis Shipbuilders)](image1)

![Total FX Derivatives Position (% of bank capital)](image2)

Source: Bank of Korea
Stability levy has reduced arbitrage margin and raised FX funding cost

Incentives for Arbitrage Transaction
(Foreign bank branches)

Ratio of Levy to Net Profit
(As of end 2012)

Notes: 1) Interest differential (3M)-Swap rate (3M)
Source: Bank of Korea

Notes: 1) Estimated ratio
Source: Bank of Korea
Policy Effects: Cursory Look (4/4)

- Banks’ external debt structure improved after introducing FX-related macroprudential measures

Maturity Composition of External Debt

(Domestic banks)

(Foreign bank branches)

Note: 1) Black and green vertical lines refer to the dates of the introduction of Leverage Cap and Stability Levy.
Source: Bank of Korea
Policy Effects: Empirical Analysis

- Highly preliminary and subject to limited data availability—particularly FX-related macroprudential policies

- LTV and DTI regulations: Dynamic simulation based on Panel VAR for housing price and home mortgage/equity loans (43 areas over the period of 2003.II-2012.II)

- Leverage caps and stability levy: Conditional forecasting (with or without policy measures) based on estimated capital flow equations

- See Annex 3-7 for further detail
LTV and DTI Regulations: Panel VAR

- LTV and DTI dummies are of expected sign and significant
  * See Annex 7 for full results

Regression Results

<table>
<thead>
<tr>
<th>Mortgage Loan</th>
<th>Housing Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTV40(-1)</td>
<td>-3.157***</td>
</tr>
<tr>
<td>LTV50(-1)</td>
<td>-2.056***</td>
</tr>
<tr>
<td>DTI40(-1)</td>
<td>-0.346</td>
</tr>
<tr>
<td>DTI50(-1)</td>
<td>0.128</td>
</tr>
<tr>
<td>DTI60(-1)</td>
<td>-0.191</td>
</tr>
<tr>
<td>call rate(-1)</td>
<td>-0.251**</td>
</tr>
<tr>
<td>Tax(-1)</td>
<td>-1.650***</td>
</tr>
</tbody>
</table>

Note: 1) *, **, and *** refer to 10%, 5%, and 1% significance level respectively
2) Other explanatory variables not reported
LTV and DTI Regulations: Dynamic Simulation

- LTV and DTI both put brake on housing price (H) and bank mortgage lending (L)
- With no LTV and DTI in place, H and L would have been 75% and 137% higher than actual by 2012
Both leverage caps and financial stability levy helped reduce short-term FX borrowings and improve maturity structure.
Effects on Systemic Risk

Bank mortgage loan default rate

Bank mortgage loan VaR

Composition of mortgage loans by type

Duration of mortgage loans

Source: Bank of Korea
Concluding Remarks
Key Take Away

- Broad evidence for Korea suggests that macroprudential policies could be a useful and effective tool to manage macro-financial stability

- Country-specific circumstances may matter in important ways for policy design and effectiveness

- Should be mindful of unintended consequences (e.g., procyclicality of LTV regulations, higher sensitivity to interest rate risk, circumvention, etc.)

- More study is needed to answer how best to combine macroprudential and monetary policies
Thank you!
Annex 1: LTV regulation

- LTV ratio = \frac{\text{mortgage loan} + \text{unsubordinated debt} + \text{rental deposit}}{\text{collateral value}}

- Collateral value of the property is based on housing prices collected by a major commercial bank (KB)

- Regulated institutions: Banks, insurance companies, savings banks, mutual CIs, credit-specialized FIs

- Regulated loans: All mortgage loans
Annex 2: DTI regulation

- **DTI ratio**: Ratio of annual repayment to debtor’s annual income when loan offered

  \[
  \frac{\text{annual repayment of principal and interest on mortgage} + \text{repayment of interest on other debt}}{\text{debtor’s annual income}} \times 100
  \]

  - **Bullet loans**: annual interest + (principal/loan maturity)
  - **Installment loans**: annual repayment of principal and interest (after grace period if any)
  - **Debtors’ annual income**: annual composite income of the previous year

- **Regulated institutions**: Banks, insurance companies, savings banks, mutual CIs, credit-specialized FIs

- **Regulated loans**: Mortgage loans in Seoul metropolitan area
Annex 3: Conditional Forecasting

- Counterfactual analysis: Estimate policy effects using conditional forecasts

![Diagram showing before and after MaPMs with BVAR Model and conditional forecasts]
Annex 4: Conditional Forecasting Specification

- VAR models of banks’ foreign borrowings

\[ Y_t = \Phi_0 + \sum_{j=1}^{p} \Phi_j Y_{t-j} + e_t, \quad e_t = P\varepsilon_t \]

- Variables for each model

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign bank branches</td>
<td>4-variable model: VIX index, covered interest parity deviation, FBBs’ foreign borrowings to GDP ratio, FBBs’ FX derivative ratio</td>
</tr>
<tr>
<td></td>
<td>3-variable model: Covered interest parity deviation, foreign borrowings to GDP ratio, FBBs’ FX derivative ratio</td>
</tr>
<tr>
<td>Domestic banks</td>
<td>4-variable model: VIX index, borrowing spread, DBs’ foreign borrowings to GDP ratio, DBs’ FX derivative ratio</td>
</tr>
<tr>
<td></td>
<td>3-variable model: Borrowing spread, DBs’ foreign borrowings to GDP ratio, DBs’ FX derivative ratio</td>
</tr>
</tbody>
</table>
Annex 5: Panel VAR Specification

- Panel VAR model for mortgage loans (L) and housing prices (H)
- Control variables and policy dummy variables are all lagged once to control for endogeneity bias
- Lagged policy dummies (i.e., LTV and DTI dummies) are consistent with policy implementation (i.e., policy changes are pre-announced one month or earlier) and also with actual lending practice (i.e., processing loan applications takes 1-2 months on average)
- Effects of monetary policy (interest rates), tax policy, and specific areas where real estate market is plagued by speculation are controlled
Annex 6: Panel VAR Data

● Panel sample consisting of 43 areas over the period of 2003.II~2012.II

Definition of Variables

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
<th>Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_{i,t}$</td>
<td>Growth rates of s.a. mortgage loans in 43 regions</td>
<td>$Call_t$</td>
<td>Interest rate in call market</td>
</tr>
<tr>
<td>$H_{i,t}$</td>
<td>Growth rates of s.a. housing prices in 43 regions</td>
<td>$dTTax_t$</td>
<td>Dummy for 50% capital gains tax rate</td>
</tr>
<tr>
<td>$Y_t$</td>
<td>Growth rates of s.a. nominal GDP</td>
<td>$dLTV4_{i,t}$</td>
<td>Dummies for regions where LTV cap ratio is 40% (50%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$(dLTV5_{i,t})$</td>
<td></td>
</tr>
<tr>
<td>$dSPA_{i,t}$</td>
<td>Dummy for speculative areas</td>
<td>$dDTI4_{i,t}$</td>
<td>Dummies for regions where DTI cap ratio is 40% (50%, 60%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$(dDTI5_{i,t})$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$(dDTI6_{i,t})$</td>
<td></td>
</tr>
</tbody>
</table>
Annex 7: Panel VAR Full Results

<table>
<thead>
<tr>
<th></th>
<th>$L_{i,t}$</th>
<th>$H_{i,t}$</th>
<th></th>
<th>$L_{i,t}$</th>
<th>$H_{i,t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_{i,t-1}$</td>
<td>0.228***</td>
<td>0.042**</td>
<td>dLTV4$_{i,t-1}$</td>
<td>-3.157***</td>
<td>-1.587***</td>
</tr>
<tr>
<td>$H_{i,t-1}$</td>
<td>0.052(0.038)</td>
<td>0.477*** (0.024)</td>
<td>dLTV5$_{i,t-1}$</td>
<td>-2.056***</td>
<td>-0.954***</td>
</tr>
<tr>
<td>$Y_{t-1}$</td>
<td>-0.373*** (0.056)</td>
<td>0.0790** (0.039)</td>
<td>dDTI4$_{i,t-1}$</td>
<td>-0.346(0.323)</td>
<td>0.178(0.189)</td>
</tr>
<tr>
<td>dSPA$_{i,t-1}$</td>
<td>2.211**(0.867)</td>
<td>1.694*** (0.493)</td>
<td>dDTI5$_{i,t-1}$</td>
<td>0.128(0.335)</td>
<td>-0.370(0.233)</td>
</tr>
<tr>
<td>dCS$_{t}$</td>
<td>-0.880*** (0.252)</td>
<td>-0.819*** (0.167)</td>
<td>dDTI6$_{i,t-1}$</td>
<td>-0.191(0.552)</td>
<td>-1.241*** (0.379)</td>
</tr>
<tr>
<td>Call$_{t-1}$</td>
<td>-0.251** (0.104)</td>
<td>-0.255*** (0.069)</td>
<td>C</td>
<td>5.152*** (0.602)</td>
<td>0.679* (0.385)</td>
</tr>
<tr>
<td>dTax$_{t-1}$</td>
<td>-1.650*** (0.352)</td>
<td>0.781*** (0.225)</td>
<td>Obs</td>
<td>1,505</td>
<td>1505</td>
</tr>
</tbody>
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