

**FOR
INFORMATION**

SM/20/143

September 10, 2020

To: Members of the Executive Board

From: The Secretary

Subject: **Republic of Korea—Publication of Financial Sector Assessment Program
Documentation—Technical Note on Macprudential Policy Framework and
Tools Submission**

Board Action: Executive Directors' **information**

Additional Information: Completed in connection with the Financial Sector Assessment
Program

Publication: Yes, after Thursday, September 17, 2020

Questions: Mr. Das, MCM (ext. 36330)



REPUBLIC OF KOREA

FINANCIAL SECTOR ASSESSMENT PROGRAM

September 1, 2020

TECHNICAL NOTE

MACROPRUDENTIAL POLICY FRAMEWORK AND TOOLS

The content of this Technical Note is based on information available as of end-June/December 2019, before the global intensification of the COVID-19 outbreak. It focuses on the Republic of Korea's medium-term challenges and policy priorities and does not cover the outbreak or the related policy response, which has since become the overarching near-term priority.

Prepared By
**Monetary and Capital Markets
Department**

This Technical Note was prepared in the context of an IMF Financial Sector Assessment Program (FSAP) in the Republic of Korea in August 2019 and December 2019 that was led by Udaibir Das. Further information on the FSAP can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

CONTENTS

Glossary	4
EXECUTIVE SUMMARY	5
INTRODUCTION	8
INSTITUTIONAL FRAMEWORK	9
A. Principle 1: Willingness to Act	10
B. Principle 2: Ability to Act	13
C. Principle 3: Effective Coordination and Cooperation	14
D. Recommendations	15
COMMUNICATION	16
A. The Role of Communications	16
B. Recommendations	18
SYSTEMIC RISK MONITORING	19
A. Approach to Risk Monitoring	19
B. Recommendations	22
MONETARY POLICY AND FINANCIAL STABILITY	22
A. Sources of Policy Interactions	22
B. Recommendations	26
SYSTEMIC RISKS AND MACROPRUDENTIAL TOOLS	27
A. Broad-Based Vulnerabilities	27
B. Vulnerabilities from Housing and the Household Sector	32
C. Vulnerabilities from the Corporate Sector	40
D. Liquidity and Foreign Exchange-Related Vulnerabilities	43
E. Non-bank and Structural Vulnerabilities	46
F. Recommendations	49

BOX

1. Effects of Household-Sector Macroprudential Tools	39
--	----

FIGURES

1. Institutional Schematic	12
2. Broad Financial Indicators and Bank Capital Buffers	28
3. Real Estate Valuations	34
4. The Effect of Tighter Macroprudential Measures on the Distribution of Real Apartment Price Growth	38
5. Corporate Indebtedness	41
6. FX and Liquidity Metrics	48

TABLES

1. Macroprudential Policy and Framework Recommendations	7
2. Division of Systemic Responsibilities	9
3. Selected Special Topics in Recent Financial Stability Reports	20
4. Indicators Guiding Calibration of the Counter-Cyclical Buffer	30
5. Selected Measures to Curb Risks in Household Lending	37
6. Impact of Household Debt Service Ratio Policy on Banks	37
7. Institutional Coverage of Policy Measures for Foreign Exchange Risks	44
8. A Comparison of the Active Macroprudential Tools in Select Countries	52

APPENDIX

I. Regional House Price Dynamics	53
References	61

Glossary

AMC	Asset Management Company
BCBS	Basle Committee on Banking Supervision
BIS	Bank for International Settlements
BOK	Bank of Korea
CCyB	Countercyclical Capital Buffer
CFM	Capital Flow Measure
CGFS	Committee on the Global Financial System
D-SIB	Domestic Systemically Important Bank
DTI	Debt (repayments)-to-Income ratio
DSR	Debt Service Ratio
DSTI	Debt Service-to-Income ratio
ESF	(Foreign) Exchange Stabilization Fund
ESRB	European Systemic Risk Board
EWI	Early Warning Indicator
FSB	Financial Stability Board
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSC	Financial Services Commission
FSS	Financial Supervisory Service
FSR	Financial Stability Report
GFSR	Global Financial Stability Report
HQLA	High Quality Liquid Assets
IMF	International Monetary Fund
KAMCO	Korea Asset Management Company
KEXIM	Export-Import Bank of Korea
KHFC	Korea Housing Finance Corporation
KHUG	Korea Housing and Urban Guarantee Corporation
LAR	Liquid Asset Ratio
LGD	Loss Given Default
LTV	Loan-to-Value ratio
MOEF	Ministry of Economy and Finance (formerly the Ministry of Strategy and Finance, MOSF)
MOU	Memorandum of Understanding
MPM	Macroprudential Measure
MSL	Macroprudential Stability Levy
OECD	Organization for Economic Cooperation and Development
ODI	Other Depository Institution
OFI	Other Financial Institution
SCCyB	Sectoral Countercyclical Capital Buffer
SOHO	Small Office Home Office
UAMCO	United Asset Management Company

EXECUTIVE SUMMARY¹

Past experience with financial crises places systemic risk oversight at the core of Korea's approach to the financial system. The Korean authorities have amassed over a decade of experience with macroprudential policies. They have put in place rigorous and sophisticated processes for risk monitoring. They publish first-rate analysis. And they have actively developed measures to mitigate risks to the financial system—notably from FX exposures, and from household indebtedness—as circumstances have changed. But their system has evolved to be highly complex, which poses challenges for coordination, communication, and transparency; moreover, their toolkit needs to be extended. These areas should be the focus of efforts to strengthen the policy framework.

Responsibility for macroprudential oversight in Korea is shared between financial regulators, supervisors, the central bank, and the government ministry. There is no single source of authority in the system, and no one institution where expertise in macroprudential policy is concentrated. Instead, there exists a delicate balance of implicit and explicit responsibilities amongst the agencies, each of which seeks to guard its own area of competency. So although formal power to deploy macroprudential tools rests with the Financial Services Commission (FSC), the financial regulator, the Bank of Korea (BOK) has the analytical resources to conduct system-wide risk assessments and uses its position to shape the financial stability narrative. Furthermore, a meeting of deputy-level officials of the main agencies—the Macroeconomic and Finance Meeting (MEFM)—convened within the Ministry of Economics and Finance (MOEF) effectively decides what macroprudential measures should be taken. But that body possesses neither statutory status nor legal powers to act itself.

Inter-agency cooperation is mostly good, but coordination between macroprudential and monetary policies needs to be strengthened. The effectiveness of the system that Korea has in place for macroprudential oversight depends on close cooperation between agencies with overlapping responsibilities. To facilitate that cooperation, working groups have been established to oversee key areas including household indebtedness, the real estate market, and credit union policy. And at the policymaker level, the MEFM enables representatives from the principal agencies to debate—and decide on—policy. Meanwhile, the Bank of Korea has responsibility for price and financial stability, but no direct power over macroprudential tools. The Bank is represented on macroprudential decision-making bodies (its Deputy Governor serves on the FSC board and attends the MEFM). But the system as presently constituted does not provide any direct means by which

¹ The author of this note is Roland Meeks (IMF), member of the FSAP 2019 team led by Udaibir Das. The analysis has benefitted from discussions with the staff of the BOK, FSC, FSS, MOEF, the Korea Development Institute, the Korea Institute of Finance, the Korea FSAP team, reviewers at the IMF, and academic experts.

tensions between the Bank's objectives can be effectively resolved in the preferred manner—that is, by recourse to macroprudential measures.

One agency should be assigned the sole primary responsibility for macroprudential oversight.

To avoid the trade-offs and potential for inaction bias that can arise when multiple agencies have multiple primary objectives, clear priority should be given to a financial stability objective by establishing one body as a focal point for macroprudential (system-wide) oversight. Within Korea's current framework, the MEFM is the most obvious choice for such a body. Assigning macroprudential oversight as its sole primary objective—perhaps along with a limited number of secondary objectives—would bring clarity to the institutional setting in which macroprudential policy is decided. That clarity would strengthen the processes for decision making and enhance accountability. Implementing the recommendation would further ensure that the goal of safeguarding financial stability cannot be subordinated to other objectives, thereby limiting the extent to which macroprudential powers can be exercised in the absence of systemic risk considerations. To ensure policymakers are alerted to the most germane risks in a timely fashion, an interagency team should be tasked to synthesize, prioritize, and direct regular assessments to the MEFM.

Developing a macroprudential policy strategy, along with a revised communication strategy, is needed to improve the transparency, accountability, and predictability of policy decisions.

A macroprudential strategy sets out how the stages of the policy cycle unfold to ensure identified risks lead to policy action, effective implementation, monitoring of effects, and policy review. With an increasing number of tools being deployed, an overall approach needs to be developed that can be consistently applied, that is commonly understood between the various agencies, and that takes account of the complementarities (or otherwise) between different macroprudential policy measures. The interactions between monetary and macroprudential policies must also be taken into account, by establishing a protocol that ensures that the actions of the FSC, or other designated macroprudential authority, have been taken with due regard for the ability of the Bank to fulfil its price and financial stability roles. To support these efforts to make policy more systematic and predictable, a revised communication strategy is called for that clearly delineates the responsibilities of each agency.

A sectoral countercyclical buffer for secured and unsecured household lending would build resilience and complement existing borrower-based measures. The FSAP has highlighted the elevated level of household indebtedness as a medium-term vulnerability. Banks, including internet-only banks, and other depository institutions are heavily exposed to households. So far, the authorities have focused efforts to limit risks from household debt on borrower-based measures such as limits on loan-to-value, debt-to-income, and debt service-to-income ratios. Especially when used in concert, they improve the resilience of household balance sheets, but may also suffer from diminishing effectiveness. A sectoral countercyclical buffer (SCCyB) targeting household exposures would allow banks to build up and release capital as risks from the household sector wax and wane over the credit cycle. It would further provide a buffer that could be released in the event that risks crystalize, helping to mute pro-cyclicality in bank lending.

Table 1. Korea: Macroprudential Policy and Framework Recommendations

	Recommendations and Responsible Agency	Timing *	Priority **
1.	The MEFM (or a body empowered for the equivalent purpose) should be assigned macroprudential oversight as its sole primary objective.	ST	H
2.	The authorities should undertake a thorough review of their financial stability communication strategy with the aim of improving transparency.	ST	M
3.	An interagency team should be established to synthesize, prioritize, and direct regular assessments to the MEFM.	ST	H
4.	The formal mechanisms for coordination between monetary and macroprudential policies should be strengthened.	ST	H
5.	A stock-take of the interactions between existing microprudential, macroprudential, and fiscal and regulatory policy measures should be undertaken.	ST	M
6.	A review should be undertaken of the quantitative guides used in deciding the level of the CCyB.	ST	H
7.	The sectoral countercyclical buffer for household exposures should be introduced as soon as is practical.	ST	H
8.	Introduce a framework in which to assess sources of structural risk and to develop mitigating policy measures.	MT	M
9.	An over-arching macroprudential strategy should be developed.	ST	M
* C= Continuous; I (Immediate) = within one year; ST = Short Term (within 1–2 years); MT = Medium Term (within 3–5 years)			
** H = High; M = Medium; L = Low.			

INTRODUCTION

1. **Past experience with financial crises places systemic risk oversight at the core of**

Korea's approach to the financial system. Korea today has one of the largest capital markets in Asia, sizeable banking and insurance sectors, and a burgeoning FinTech industry. The Asian Financial Crisis of 1997-98 interrupted decades of strong growth in the Korean economy, growth that had elevated it from amongst the world's poorest countries to the brink of advanced economy status. The crisis affected liquidity and solvency problems amongst Korean banks, which had borrowed heavily abroad to fund loans to domestic industrial conglomerates, many of which failed. Recovery from the crisis spurred a new financial boom, this time in credit card lending. As the boom turned to bust, 2003 saw heavy losses for banks and card issuers, and negative spillovers to the real economy and asset prices. The Global Financial Crisis saw liquidity problems re-emerge amongst Korean banks, again thanks to their exposure to non-core foreign exchange funding. And in 2011, the mutual savings bank sector came under stress after real estate loans went bad amid drastic under-provisioning by lenders.

2. **Korea was an early adopter, and is an active user, of macroprudential policies.**

Macroprudential policy is the use of primarily microprudential tools to achieve system-wide financial stability goals. Macroprudential policy aims to mitigate tendencies within the financial system towards procyclicality, by reducing financial vulnerabilities and raising the resilience of borrowers and lenders to shocks. The Korean authorities have amassed well over a decade of experience with macroprudential and other financial policies. Over that period, the institutional framework in which prudential policies are set has undergone various changes—notably after the global financial crisis—and new measures have been introduced to meet evolving financial stability threats. The rigorous approach towards monitoring risks, and its record of acting to containing them, has made Korea a leader in macroprudential policy (see Table 8).

3. This technical note evaluates the macroprudential framework in Korea, and its ability to address emerging vulnerabilities. It assesses: (i) Korea's institutional framework; (ii) the systems in place for monitoring systemic risk; (iii) the coverage and calibration of macroprudential policy tools; (iv) interactions between monetary and macroprudential policy areas; and (v) how policy is communicated. Recommendations in each of these areas appear in the relevant sections of the note. The analysis and recommendations in this note follow IMF Staff Guidance (IMF, 2014a; IMF, 2014b), IMF Board Papers, other IMF policy papers, and emerging international good practices, as noted throughout the text. Except where translation is explicitly noted, references to official documents refer to their published English version.

Table 2. Korea: Division of Systemic Responsibilities

	FSC	FSS	BOK	MOEF
Identifying the build-up of systemic risk	✓	✓	✓	✓
Recommending macroprudential policy action	✓	✓	✓	✓
Deciding macroprudential policy action	✓			✓
Implementing and enforcing macroprudential decisions	✓	✓	✓	✓
Assessing the impact of macroprudential measures	✓	✓	✓	✓
Reporting to national assembly	✓		✓	✓
Source: Country authorities.				

INSTITUTIONAL FRAMEWORK

4. Strong institutional arrangements are essential to ensure that macroprudential policy can work effectively. A strong institutional framework should generate the *willingness to act* and thereby overcome the biases that may exist towards inaction, or insufficiently timely action. These biases result from the cost of policy actions occurring before and being more easily observable than their potential benefits. Biases are often exacerbated by lobbying by the financial industry and political pressures.² Of equal importance, the institutional arrangement should foster the *ability to act* when systemic risk is building up. It further needs to promote *effective cooperation* in risk assessment and mitigation, in a manner that preserves the autonomy of separate policy functions. And finally, the framework should include strong *accountability mechanisms*, based on clear objectives that can guide the exercise of macroprudential powers, and strong *communication* to create public awareness of risks and understanding of the need to take mitigating action.

5. Macroprudential frameworks show notable variation between countries. In assessing the adequacy of institutional arrangements, it should be borne in mind that there is no “one-size-fits-all” template that should be applied in every jurisdiction (IMF-FSB-BIS, 2016). Amongst those jurisdictions that have assigned responsibility for systemic risk monitoring and oversight to a specific macroprudential body, a variety of arrangements have been tried. Some vest responsibility and power exclusively in the central bank, while others divide responsibilities between prudential regulators and government ministries. For example, in Australia the Australian Prudential Regulation Authority (APRA) exercises macroprudential powers, and the Reserve Bank of Australia (RBA) has an implicit financial stability mandate. In Switzerland, the Financial Market Supervisory Authority (FINMA) and the Swiss National Bank (SNB) play monitoring and surveillance functions, while the Federal Department of Finance (a central government ministry) reserves for itself most macroprudential power.³ Whatever macroprudential frameworks are in place, it is important that they should not remain static. As new vulnerabilities emerge, and as experience with policy frameworks accumulates, countries should adapt and modernize their institutional set-ups to make them responsive, inclusive, and transparent. This note will argue that there are areas in which Korea

² Political pressure may also produce bias towards policy actions that are insufficiently targeted towards mitigating systemic risks.

³ See IMF Macroprudential Policy Survey (2017).

could better align elements of its policy strategy—the process by which risks are identified, and policies are decided and evaluated—with the strongest frameworks elsewhere.⁴

A. Principle 1: Willingness to Act

6. The 2013 FSAP recommended that a dedicated macroprudential council be established. The IMF identifies the assignment of a macroprudential mandate to a body or committee as a key element of frameworks that deliver “willingness to act” (IMF, 2014 ¶79). To that end, the macroprudential council proposed by the FSAP would have had the power to recommend actions to responsible agencies on a “comply-or-explain” basis. The FSAP further recommended a stronger role for the Bank of Korea (BOK), and in particular that it should provide regular assessments of systemic risk to the proposed council, along with proposals for policy action where appropriate (IMF, 2014a ¶80).

7. The authorities have maintained a multi-agency system where key macroprudential responsibilities are shared. A high-level summary of the responsibilities falling to the principal agencies involved in macroprudential oversight and policy appears in Table 2, with an accompanying schematic in Figure 1. These responsibilities are broadly unchanged since the last FSAP. The main actors are:

- The Financial Services Commission (FSC)—the financial regulatory agency of the Korean government, with broad supervisory powers.
- The Financial Supervisory Service (FSS) —responsible for on-going supervision of financial institutions and markets.
- The Bank of Korea (BOK)—the independent central bank, responsible for price stability, financial stability, and emergency liquidity assistance, and has power to conduct bank examinations. It conducts foreign exchange operations in consultation with the MOEF.
- The Ministry of Economy and Finance (MOEF)—overall authority over foreign exchange policy, including FX-related macroprudential measures the foreign exchange stabilization fund (ESF).

This Technical Note will not be specifically concerned with the operations of the KDIC or SFC.

8. The legal mandates of the principal agencies include a financial stability objective. The alignment of objectives in a multi-agency framework can be useful where it encourages cooperation (IMF 2014a, ¶88). In Korea, the FSC and FSS share a common legal mandate to ‘promote the stability of financial markets’, while the BOK’s legal mandate requires it to ‘pay attention to financial stability’.⁵ In addition, the MOEF oversees measures relating to stability risks arising from foreign

⁴ A detailed discussion of macroprudential strategy can be found in ESRB (2014).

⁵ The Act on the Establishment, Etc. of Financial Services Commission (April 17, 2018; English version) [hereafter, the “FSC Act”] Art. 1 specifies the roles of the FSC and FSS as being: “to contribute to the growth of the national economy by promoting the advancement of the financial industry and the stability of financial markets, by

exchange markets directly, as part of general government policy. In this context it should be noted that a potential drawback of an overlap between mandates is that it may risk obscuring who is ultimately responsible and accountable for financial stability, and that that may lead necessary actions to be delayed.

9. Financial stability is not the *sole primary objective* of any agency in Korea. Financial stability is one primary objective amongst others set for the FSC/FSS and BOK. As a result, at times a trade-off between objectives may arise. Where trade-offs are present, tensions both *within* and *between* agencies on the direction of policy will need to be resolved. That process of resolution may help policymakers to internalize the spillovers of policy actions in one policy domain onto the objectives of another domain (for example, between micro- and macroprudential policies). But it may also make decisions harder to reach, and harder to communicate, reinforcing inaction bias.⁶

10. Formal macroprudential powers rest with the government-appointed FSC. FSC commissioners are the ultimate decision-takers for most measures relating to regulated financial institutions. This includes decisions relating to macroprudential measures, but also decisions in many other spheres of financial supervision and regulation. The FSC commissioners meet on a regular basis. The commissioners comprise the FSC Chairperson and Vice Chairperson, the Vice Minister of the MOEF, the President of the KDIC, the Senior Deputy Governor of the BOK, the Governor of the FSS, and two financial experts and one business representative recommended by the FSC Chairperson and the Chairperson of the Korea Chambers of Commerce and Industry, respectively.⁷ The FSC Chairperson is a government appointee, who in turn nominates the FSC Vice Chairperson, and the Governor of the FSS. The commissioners are appointed for a term of three years (renewable once) and cannot be dismissed except on serious grounds.⁸ However, since March 2013 there have been four FSC Chairmen.⁹ The relatively rapid rate of turnover has allowed the government ample opportunity to decide or influence key financial leadership roles since 2013.

establishing sound credit order and fair financial transaction practices, [and] by protecting financial consumers, such as depositors and investors". The Bank of Korea Act (2011) [hereafter the "BOK Act"] is discussed under ¶42.
(continued)

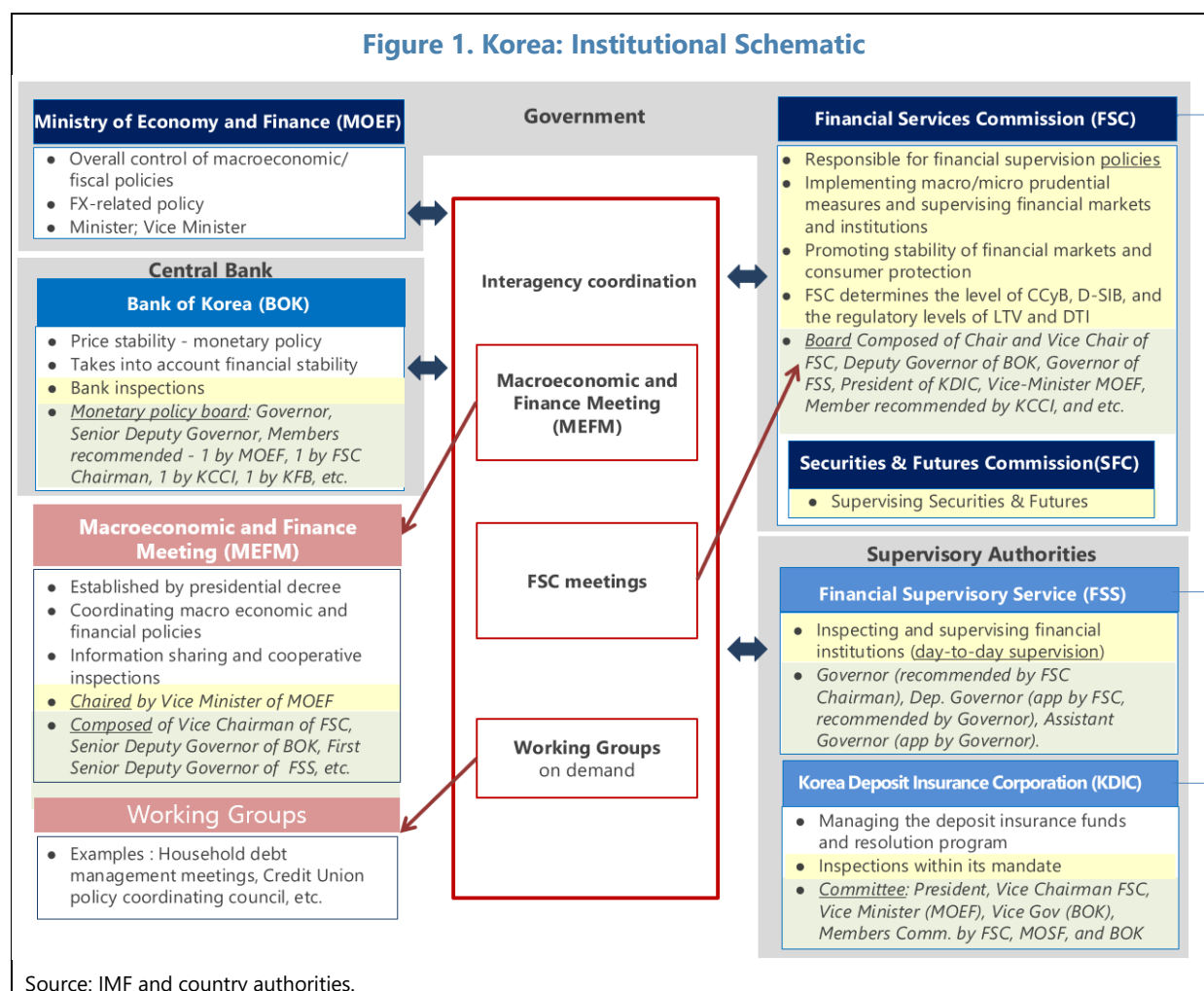
⁶ The responsibility of the BOK for financial stability has implications for its conduct of monetary policy, which are discussed below (see ¶42).

⁷ The FSC Vice Chairperson serves concurrently as Chairperson of the Securities and Futures Commission (FSC Act, Art. 20.2).

⁸ FSC Act, Art. 6. The Senior Deputy Governor of the BOK is also appointed for three years (versus four for the Governor; BOK Act, Art. 36).

⁹ The Chairmen were: Shin Je-Yoon (2013-15), Yim Jong-yong (2015-17), Choi Jongku (2017-19), and Eun Sung-soo (2019-present).

11. The inter-agency Macroeconomic and Finance Meeting (MEFM) serves as the central forum for financial stability matters. Along with the FSC meeting, the MEFM is the most important element of Korea's macroprudential policymaking framework. It is intended to foster 'close cooperation' between Korea's main macroeconomic and financial agencies in several areas: (i) Analysis and monitoring of macroeconomic and financial developments; (ii) Foreign exchange market monitoring and policy; (iii) Other elements affecting the economy, recently including global monetary policy, trade, and geopolitical developments.¹⁰



12. The MEFM exists within the MOEF and is chaired and run by government officials. The MEFM is a deputy-level body that brings together the First Vice Minister of Finance (who acts as chair), the Vice Chairperson of the FSC, the Senior Deputy Governor of the BOK, the first senior

¹⁰ For example, topics for discussion in recent meetings have included: the behavior of capital flows in response to changes in the interest rate differential between Korea and the United States (December 2018); and a summary of the state of trade negotiations between China and the United States, along with possible Korean policy responses (May 2019). See MOEF, Macroeconomic and Finance Meeting press release (various dates) [in Korean].

Deputy Governor of the FSS, and President of the KDIC.¹¹ The MEFM is explicitly created within the MOEF, and the body's supporting secretariat—which is responsible for setting meeting agendas, and composing post-meeting communications—is based in the MOEF. The MEFM is established by Presidential Decree, and under the most recent of these will run until 2020.¹² Multiple channels of involvement therefore exist between the government and the MEFM. IMF guidance recognizes political influence as a risk factor for delays in macroprudential action and can compromise the independence of participating agencies (IMF, 2014a, ¶82). But it also acknowledges that the involvement of government in macroprudential policy can be beneficial when changes in legislation are required, or when fiscal measures are called for to mitigate systemic risks (IMF, 2014a, ¶81).

13. Experience shows the Korean authorities are willing to act on identified risks, but formal safeguards for independent decision-making are lacking. The authorities involved in macroprudential oversight and mitigation policies in Korea have been active in developing responses to some developing risks. In the past three years, most activity has been focused on measures to curb risks from the household sector (discussed in further detail below, ¶61). Many of the measures introduced have had potential to be politically sensitive, as they have aimed to curb the ability of borrowers to obtain credit secured against real estate. In other jurisdictions, such measures are more common where an agency independent of government takes the lead in policymaking, precisely for this reason.¹³ The demonstrated willingness to act in this area supports the view that the framework is operating in a healthy manner. But it does not follow that equal willingness exists in all domains. And looking further back, the authorities have at times made macroprudential policy decisions on shakier grounds (see ¶46).¹⁴ The macroprudential framework does not have formal protections that might prevent policy from being diverted away from its primary responsibility to limit systemic risk in future.

B. Principle 2: Ability to Act

14. The ability to act is underpinned by the broad regulatory powers granted to the FSC. The FSC exercises macroprudential power via its ability to issue regulations that are binding on a broad range of regulated entities (so-called 'hard powers'; IMF 2014a, ¶87). For example, the FSC has the power to designate banks or bank holding companies as D-SIBs; it can set loan standards for residential mortgages; and it can set various capital standards for banks and insurers. The FSC also has the power to recommend actions (so-called 'soft powers'), for example in the area of corporate

¹¹ In addition, representatives of the Ministry of Trade, Industry and Energy, the Korea Center for International Finance, and other relevant bodies may attend meetings as required.

¹² The meeting was first held in 2012. It replaced the previously-established Economic and Finance Status Review Meeting. For details of its legal basis see "Regulations for the establishment and operation of macroeconomic and financial policy meeting", Presidential Directive No. 396. December 10, 2018 (in Korean); hereafter the 'MEFM decree'.

¹³ For evidence that an institutional set-up giving macroprudential power to an independent central bank made activation of politically-sensitive borrower-based tools more likely in Europe, see Gadatsch and others (2018).

¹⁴ For a report of political pressure on the FSC, see comments in Simon Mundy and Laetitia Ock, "S Korean household debt hits critical point", *Financial Times*. August 21, 2012.

restructuring.¹⁵ The Financial Supervisory Service (FSS), the integrated supervisor, is responsible for implementation and enforcement. The presence of a strong central authority ensures that actions can be taken when required.

15. Ability to act also depends on the capacity within the agencies. Some capacity to support macroprudential oversight activity exists in designated teams within each agency. The BOK has a financial stability department with a staff of around 100 under a Deputy Governor, and the FSS has a dedicated department and specialized teams for macroprudential supervision. The FSC also employs teams for macroprudential policy, as well as teams specializing on issues including housing, banks, and non-banks. However, some teams are assigned wide-ranging briefs that, given resource constraints, give rise to challenges in supporting the macroprudential policy process.

16. Although the MEFM lacks formal powers (including semi-hard powers), in practice its proposals are enacted by the relevant decision-making bodies. The decree that establishes the MEFM describes its functions as deliberation and consultation, which resembles the functions given to Sweden's Financial Stability Council.¹⁶ At the same time, and somewhat in opposition to the notion of a consultative body, the decree describes its decision-making procedure.¹⁷ However, the decree does so without specifying any powers that the MEFM may have (for example, the 'semi-hard' power to make recommendations to competent agencies on a comply-or-explain basis). However, decisions on FX measures have often been taken at the MEFM—for example, the adoption of LCR-FX regulations (¶180). Discussions at the MEFM on the use of borrower-based measures on households (¶161) have also produced policies that were effectively decided, and later taken up by the FSC commissioners.

C. Principle 3: Effective Coordination and Cooperation

17. Cooperation is facilitated by the relevant laws and MOUs. The set of overlapping responsibilities in the Korean system place a premium on effective mechanisms for coordination and cooperation between agencies. Any agency may request materials from a sister institution, under a presumption that requests will be granted (FSC Act, Art. 65). Further, the government is obliged to consult with the MPB when formulating important money and credit policies (BOK Act, Art. 93). Otherwise confidential regulatory information held by the FSS is shared with the BOK on the basis of a MOU, and in addition the BOK can request a joint bank examination with the FSS. In practice, however, sharing of information is not seamless, and no cross-agency committee for the oversight of data sharing presently exists to review independently-made decisions. For overseas cooperation, the FSC and FSS have signed MOUs for the exchange of financial information with forty-eight institutions in twenty-six out of the thirty-four overseas jurisdictions in which Korean financial

¹⁵ See IMF AREAER-Macroprudential Survey (2019), Section I.B.

¹⁶ MEFM Decree, Art. 2.

¹⁷ MEFM Decree, Art. 5.

companies are active—including banks, insurers, asset managers, and credit-specialized finance companies—as well as with two international organizations (as of end-2018).

18. Topic-focused meetings enhance working-level coordination and cooperation. While the MEFM (¶11) is a meeting of senior officials, the Macroprudential Analysis Council (MAC) holds staff-level meetings. The council was introduced in March 2019 to improve channels of communication between the main official agencies, and to bring in the views of researchers and experts outside the official sector. So far, MAC risk discussions have included in repo markets, insurers' foreign exchange hedging, and project finance loans. Where potential systemic risks are identified, matters can be elevated to the MEFM for discussion. Meanwhile, the Household Debt Management Council, constituted of subject experts from across the main agencies, has been an important forum for information-sharing and cooperation preceding the recent strengthening of borrower-based measures. Finally, the BOK's Financial Stability Forum is another opportunity for outsiders to provide perspective and challenge to institutional views.

D. Recommendations

19. The MEFM (or a body empowered for the equivalent purpose) should be assigned macroprudential oversight as its sole primary objective. To avoid the difficulties mentioned under ¶9, clear priority should be given to a financial stability objective by establishing one body as a focal point for macroprudential (system-wide) oversight. The term macroprudential oversight is intended to mean the assessment of systemic risks, and consideration of measures to mitigate those risks. The intention of this recommendation is to:

- Bring clarity to the institutional setting in which macroprudential policy is decided, thereby strengthening the processes for decision making and enhancing accountability.
- Ensure that the goal of safeguarding financial stability cannot be subordinated to other objectives, thereby limiting the extent to which macroprudential powers can be exercised in the absence of systemic risk considerations.

20. The macroprudential oversight objective should specify the interlocking intermediate objectives that ensure financial stability (IMF, 2014a, ¶13), namely to:

- Build resilience to shocks, for example by moderating the leverage available to borrowers and financial institutions and encouraging them to maintain buffers of high-quality loss absorbing capital.
- Contain the build-up of vulnerabilities over time, for example due to excessive credit growth and maturity mis-match.
- Mitigate structural vulnerabilities, for example due to interconnectedness.

21. The macroprudential oversight objective may be combined with secondary objectives—that is, goals that should be pursued *subject to* ensuring financial stability (IMF, 2014a, ¶83)—but such objectives, if any, should not be too wide-ranging.

The most obvious choice for a responsible body within the legal framework currently in force in Korea is the MEFM.

- The decree establishing the MEFM already comes close to giving the body an objective to ensure financial stability, albeit an insufficiently explicit one.
- In the system as it stands, the MEFM is the focal point for discussion of systemic risk and the formulation of policy options, and moreover matters of macroprudential policy are effectively decided at its meetings.
- Under a revised arrangement, the MEFM would continue to offer on-the-record recommendations for macroprudential actions to the FSC Meeting.

22. Note that the recommendation need not entail any reassignment of formal powers within the system, nor any new legal powers to be granted, should such steps not be desired.¹⁸ However, it would be desirable to strengthen the MEFM by placing it on a statutory basis and by ensuring that its composition is appropriate to its mandate.

23. The recommendation pertains to macroprudential policy and should not be understood to impinge on the ability of competent agencies to deploy crisis management tools, such as BOK provision of emergency liquidity assistance, or KDIC use of the deposit insurance fund, which is a separate issue.

24. Giving one body a sole primary financial stability mandate might have implications for the laws governing other institutions, which should be carefully considered. For example, whether other agencies should be assigned secondary financial stability objectives or whether co-equal financial stability objectives should be retained.

COMMUNICATION

A. The Role of Communications

25. Successful macroprudential policy requires a supporting communication strategy. The strategy sets out the goals of communication, and the means to achieve them. Communications in the area of financial stability policy are challenging (Stankova, 2019): The financial system is complex; deals fundamentally with uncertain and contingent events; and is the domain of distinct but overlapping policy responses (for example, between micro- and macroprudential regulators). An overriding goal for any strategy is to ensure the objectives of financial stability policy are

¹⁸ If instead a formal macroprudential council were to be established, that body would naturally be granted new powers, or be assigned powers currently held by (primarily) the FSC.

understood by stakeholders. Clear statements of policy intentions improve the effectiveness of macroprudential measures, both on activation and on release (IMF, 2014a, ¶150). And successful communication increases an authority's reputation for predictable, consistent policymaking (CGFS, 2016).

26. Financial stability messages are sent on multiple channels. The ability of the legislature and the public to hold agencies to account is aided by the publication of the minutes of key financial stability meetings. However, the proliferation of forums in which financial stability is discussed complicates the task of understanding policy, and of ensuring accountability. Multiple communication channels are employed by the various agencies charged with financial stability: In-depth systemic risk analysis is published by the BOK in its twice-yearly FSR;¹⁹ In addition, its Monetary Policy Board publishes minutes of its quarterly Financial Stability Meetings; Summaries of the inter-agency Macroeconomic and Finance Meeting are published by the MOEF-based secretariat after each meeting (at least quarterly); and the MOEF announces decisions on FX regulations. Yet other macroprudential decisions are announced via FSC press release.

27. Financial stability messages need a dedicated channel. A further complication is that within the many channels mentioned above, some are used to send messages on other topics too. For example, minutes of FSC commissioners' meetings cover a broad range of micro- and macroprudential issues;²⁰ the MEFM covers a broad range of macroeconomic policy issues, albeit with a focus on financial vulnerabilities; and financial stability issues often crop up in monetary policy communications. Combining financial stability messages alongside other—conceptually distinct—issues, rather than devoting a specific 'channel' to them (as with the FSR) can obscure their content or weaken their impact.

28. Financial stability messages are targeted towards experts. Because the channels used for communication are monitored mostly by the specialized media and experts in industry and academia, and as the messages are often very detailed and technical, official messages are unlikely to reach beyond their traditional consumers.²¹ Although recent editions of the FSR were widely reported by the Korean press (79 stories appeared across print, broadcast, and online media following the June, 2019 edition), even amongst the financial institutions consulted during the FSAP few if any proved able to identify the key elements of the authorities' policy strategy (beyond 'cooling the housing market'). And despite a consistent message sent by the authorities in recent

¹⁹ Under Art. 96 of the BOK Act, the BOK is obliged to produce an FSR twice a year, and its Governor may be called to the assembly to answer questions. The MPB signs off on the FSR, and it is transmitted to the National Assembly as part of the BOK's reporting responsibility.

²⁰ Minutes of FSC Commissioners meetings are published on the [FSC website](#) shortly after the meeting takes place.

²¹ The June 2019 edition of the FSR was 138 pages long in its Korean version, and 150 pages long in English.

times that household debt was unlikely to cause a systemic risk, precisely that risk has consistently featured near the top of those named by respondents to the BOK's Systemic Risk Survey.²²

29. Accountability may be hampered by opaque decision-making structures. At present, much of the decision-making process is invisible to those outside government. In part, this is because responsibilities are widely divided or shared between a number of agencies, meaning that relevant information is dispersed. It is also because the MEFM and its role in the policy process is not well known.

B. Recommendations

30. The authorities should undertake a thorough review of their financial stability communication strategy with the aim of improving transparency. The review should seek to bring Korea to the forefront of financial stability communication practice by considering the stakeholders that need to be reached by financial stability messages; the channels through which messages should be sent; and the design of messages with comprehensibility, priority, and accountability in mind.

- *The authorities should consider broadening the group of stakeholders that financial stability communications reach.* Support for the policy framework would be aided by helping the general public relate to and act on financial stability messages. Introducing layers of messaging is one means to achieve this.
- *Each agency involved in financial stability communications should have clearly delineated areas of responsibility under a revised strategy.* Rationalizing the number of channels used and ensuring that dedicated channels are prioritized should work best. The body with sole primary responsibility for macroprudential oversight would naturally take the lead in communicating policy actions.
- *Communications should also bear in mind the need to link risk assessments to mitigating policy actions.* Linking vulnerabilities to specific policy actions builds understanding of those measures amongst private sector actors. Information on the macroprudential measures in force at any given time, along with a summary of the risks being targeted by each measure, and an assessment of the progress made towards the goal of mitigating those risks should be readily available. It would be desirable if the body assigned the sole primary responsibility for macroprudential oversight were to own the process by which such information is collated and disclosed.

²² For example, see FSC Press Release (October 18, 2018): "It is unlikely that household debt would pose a systemic risk to the Korean economy in the near future"; and BOK Systemic Risk Survey (May 21, 2019): "considering accumulation of household debt and uncertainty in the housing market as a single item, the ... frequency of response [to being asked to name the top five risk factors] was 70 percent [for housing risk]" which was higher than "US-China trade disputes (67 percent) and slowing domestic economic growth (66 percent).

- *The review should consider the appropriate level of disclosure for meetings that discuss, recommend, or decide financial stability policy actions.* It is not necessarily desirable for detailed minutes of such meetings, or draft policy recommendations, to be disclosed. Neither is it desirable for the record of such meetings to be entirely or effectively withheld from public scrutiny. The timing and content of disclosure should aim to foster accountability and guide private sector expectations.
- *Availability of documents in translation.* Consideration might be given to increasing the availability of English translations of key documents, beyond the FSR.

SYSTEMIC RISK MONITORING

A. Approach to Risk Monitoring

31. The authorities undertake wide-ranging risk monitoring activities. The FSC, FSS, MOEF, and BOK all undertake monitoring activities. The perimeter for monitoring is set broadly to capture banks, nonbank depository institutions, other financial companies, public guarantee institutions, and others. High-frequency monitoring of markets is mostly overseen by the FSC and FSS. The BOK has teams with very good analytical capacities, and is the principal agency charged with communicating risk assessments to stakeholders. The BOK Act requires it to conduct financial stability assessments and to publish a biannual *Financial Stability Report* (see ¶42). The Bank's FSR is underpinned by a wealth of data and analysis covering credit and asset markets, financial institutions, capital flows, and financial market infrastructure, amassed by the Bank's Financial Stability Department. Cooperation and coordination with risk assessments produced by the FSC and FSS is supported by the processes described above (see ¶17-18).

32. The process supporting the BOK's analysis of financial institutions is systematic and well-developed. A 'desk-based' analysis track and a 'bank examination' track run in parallel. The first of these works around the FSR cycle, and has a broad institutional scope: (i) the bank and non-bank teams look across their respective sectors to assess asset management, asset soundness, and profitability; (ii) where vulnerabilities are found in institutions' business lines, there is internal reporting and in-depth follow-up analysis; and (iii) when necessary, matters are elevated to the Financial Stability Meeting of the MPB. The second track is on an annual cycle, and has been mostly focused on larger banks.²³ It can take one of two forms: individual bank-focused; or sectoral, with a macroprudential focus. For the sectoral review, BOK examiners take the same issues to multiple banks. The main issues for sectoral reviews are approved by the MPB, and in recent years have included SOHO lending, household debt, and corporate loans. The risk analysis developed by Bank teams may be published in the FSR, often as in-depth topical issue boxes, some recent examples of which are summarized in Table 3.

²³ A formal criteria is set out to select institutions for examination, of which roughly half depends on systemic importance.

Table 3. Korea: Selected Special Topics in Recent Financial Stability Reports

Recent lending to self-employed business owners and soundness assessment	June 2019	Assessment of domestic banks' cyber risk management	Dec. 2018
Overseas operations of domestic banks and implications		Current situation of recapitalizations of life insurance firms	
Overseas CLO investment by domestic institutional investors		Current state and assessment of unsecured household lending	June 2018
Securities companies' exposures to debt guarantees and potential risks		Factors behind the recent expansion in swap rate volatility	
Effects on household debt due to the government's recent strengthening of lending regulations	Dec. 2018	Stress tests of banking sector resilience to macroeconomic and financial shocks	
Factors behind expansion in commercial real estate market and implications		Internet-only banks' business operations and implications	
Source: Bank of Korea, Financial Stability Report. Various editions, as noted.			

33. Early warning systems covering a broad spectrum of financial risks are in use. The BOK publishes a 'financial stability index' (FSI) in its FSR (e.g. June 2019, p. 3), the purpose of which is to provide a headline signal of build-ups in systemic risk. The index has threshold values of 'warning' and 'crisis' and was calibrated on a very broad range of indicators.²⁴ Second, the FSS has put in place an early warning system for individual institutions that are subject to its supervision. The system provides a model-based assessment of the likelihood of capital shortfalls at individual institutions on a quarterly basis.²⁵ Several types of assessment follow: first, individual institutions that are found to be at risk are referred for examination; second, individual institution results are aggregated to perform industry-level solvency analyses. The FSC operates an early warning system for financial crises based on the signaling approach of Kaminsky and others (1998), information from which feeds into their monthly risk assessment. Finally, the MOEF operates a similar early warning system for key external sector variables, including the exchange rate and portfolio flows.

34. Sophisticated quantitative risk indicators draw on financial market data and are appropriately supplemented by qualitative information. Quantitative risk monitoring using market-based measures of systemic risk and interconnectedness are a useful way to keep abreast of information on the largest financial institutions that is 'in the market' outside of regular reporting windows. The BOK has implemented a suite of such models, including widely used CoVaR and SRISK approaches.²⁶ Qualitative information complements quantitative analysis. Twice a year, the BOK conducts a Systemic Risk Survey that covers close to one hundred employees and executives of

²⁴ Including measures of financial institutions' asset soundness, financial market prices, macroeconomic factors, and real-sector surveys. For a detailed description of the FSI, see FSR (April, 2012, Box IV-1).

²⁵ A model for credit unions has also been developed, but is less granular than that for banks, securities firms, or insurers. The specialized (state-owned) banks are excluded on account of their separate business model.

²⁶ See respectively Adrian and Brunnermeier (2016); Brownlees and Engle (2017).

domestic financial institutions, financial sector associations, research institutes, and foreign money managers. Qualitative monitoring is bolstered by interactions with relevant experts and market participants, including via the MAC.

35. Stress-testing is an important component of forward-looking risk assessment. Stress tests differ from other forms of risk assessment because they are explicitly based on prospective stress scenarios, in addition to the current state of the economy and current asset valuations. They therefore form an important component of the overall financial stability judgement. The BOK and FSS conduct annual joint stress tests, in addition to each agency's own individually-run tests. The scenario used in the joint solvency stress testing exercise is developed using inputs from teams across the BOK, and the baseline scenario for the test is consistent with the forecast used by the BOK MPB in its monetary policy deliberations. The BOK has capacity for top-down solvency and liquidity tests, while the FSS conducts both top-down and bottom-up tests that could feed into their supervisory activities.²⁷

36. A suite of analytical models has been developed to support stress testing. The Systemic Risk Assessment Model for Macroprudential Policy (2012); the Non-bank Financial Institution Stress Test Model (2019), which covers insurance companies, credit cooperatives, savings banks, securities firms, and credit-specialized finance companies;²⁸ and the Extensive Stress Test Model (2019), which integrates banks and non-banks.²⁹ This model incorporates a contagion module which analyzes spill-overs from losses incurred by a financial institution to other institutions across all financial sectors. The FSS developed the Stress Test for Assessing Resilience and Stability of the Financial System (STARS) in 2017, to aid its macroprudential supervision efforts. STARS includes a suite of models that capture contagion and macro-feedback effects developed with the BOK. Results from the BOK stress tests are published in the FSR, and those from joint BOK/FSS tests are shared with the MEFM. For recommendations relating to stress testing, see the accompanying Technical Note on Stress Testing.

37. Availability of data is generally very good, although some gaps remain. A licensed public credit registry, the Korea Credit Information Service (KCIS), records and manages information on household and business loans.³⁰ Access to the credit registry makes possible a very granular analysis of the financial state of debtors and supports policy implementation. Some gaps remain in the area of non-financial corporate businesses' financial exposures, which is relevant to solvency stress-testing. A second is related to the growth of FinTech, and in particular to peer-to-peer (P2P) lending. There has been rapid growth in P2P lending in Korea, but little information exists on the creditor base, the risks that they assume, or the extent to which borrowers have used P2P platforms

²⁷ Although its stress tests are top-down, the BOK consults with senior CROs from individual institutions on model assumptions, and to ensure that bank-specific data is correctly interpreted.

²⁸ BOK *Financial Stability Report*, June 2018, p. 85-97.

²⁹ BOK *Financial Stability Report*, December 2018, p. 95-102.

³⁰ See the Credit Information Use and Protection Act (2008).

to circumvent macroprudential measures that apply elsewhere in the system.³¹ However, legislation requiring P2P platforms to disclose more of their financial information may improve oversight is expected to be enacted.³² In particular, P2P lenders will in future be required to submit information to a credit agency to be used by banks to comply with DSR regulations (see ¶63).

B. Recommendations

38. An interagency team should be established to synthesize, prioritize, and direct regular assessments to the MEFM. The purpose of this recommendation is to ensure that the inter-agency system of risk monitoring is effective in (a) bringing together the analysis of separate agencies, (b) prioritizing identified risks, and (c) delivering warnings targeted to the responsible parties. Achieving these three goals will enhance the policy impact of risk assessment work.

The BOK is well-suited for this role as it already undertakes many of the necessary activities under existing legal reporting requirements, and already has supporting processes (such as quarterly financial stability meetings) in place. The new elements in this recommendation are:

- *Prioritization*: the principal macroprudential vulnerabilities identified by risk assessment should be clearly prioritized based on the likelihood that they will be the source of a systemic event, and their potential systemic impact. Identifying *amplifying factors* can aid understanding of the transmission channels associated with the crystallization of a particular macroprudential risk, and bolster the rationale for macroprudential policy actions.
- *Designated recipient*: the synthesized and prioritized risk assessment, along with warnings (if any), are to be directed to the body with sole primary responsibility for macroprudential policy.

In undertaking this task, the BOK will make use of existing mechanisms for working-level coordination and cooperation, such as those described under ¶17-¶18. This recommendation, along with the recommendation on monetary and macroprudential policy coordination in ¶47, below, would help to strengthen the capacity of the BOK to influence policy in ways that lead to effective macroprudential measures to mitigate financial stability risks.

MONETARY POLICY AND FINANCIAL STABILITY

A. Sources of Policy Interactions

39. Monetary policy impacts incentives for risk-taking, leverage, and liquidity creation. Monetary policy has the potential to affect financial stability through multiple channels (IMF, 2013; Box 2). For example, there is good evidence to suggest that low interest rates can induce banks to grant riskier loans (Dell'Ariccia and others, 2017). For the financial system beyond banks, the level of

³¹ For detailed discussion of FinTech issues, please see the *Technical Note on Systemic Risk Analysis and Stress Testing* accompanying the FSAP.

³² The law was passed by the National Assembly in October 2019.

short-term rates is a notable driver both of leverage (Adrian and Shin, 2008), and of risk-taking by liability-driven investors, the so-called ‘search for yield’ (Becker and Ivashina, 2015). Studies often find that the extent of this risk-taking behavior depends on lenders’ underlying balance sheet strength (Jiménez and others, 2014). That type of dependence highlights the importance of coordination between prudential and monetary policies to ensure financial stability.³³

40. The overall effect of monetary policy on the likelihood of financial crises is small.

Although monetary policy can encourage behavior that feeds financial vulnerabilities, its contribution to financial crises is indirect and, as a quantitative matter, thought to be relatively minor. The available evidence suggests that the nexus of credit growth and asset price spirals responds little to interest rates, so significant reductions in crisis probabilities would require substantial hikes in interest rates (Adrian and others, 2018).³⁴ A prolonged period in which monetary policy is kept tighter than warranted by broader economic conditions risks an undershoot of the central bank’s objectives for inflation and growth, damaging its credibility. This has led many economists to conclude that the costs of using monetary policy alone to deal with systemic vulnerabilities substantially outweigh the benefits (Svensson, 2017). However, this remains an actively-debated topic, and these conclusions are necessarily tentative.

41. Macroprudential policy should be used first to mitigate financial stability risks but is not omnipotent. When risks are sector-specific, or structural rather than time-varying, monetary policy would be an especially blunt tool to deal with them. Where targeted supervisory tools are available that avoid collateral damage to the broader economy, those are likely to be preferred.³⁵ However, prudential tools are subject to limitations due to leakages, potential inaction bias and political economy constraints, uncertainty over their transmission, and because forms of risk-taking may evolve faster than regulations do. Moreover, some vulnerabilities may be immune to effective remedy using macroprudential tools—for example, deeply negative term premiums in bond markets (Shin, 2015)—although such tools can help build resilience. Such arguments primarily reinforce the need for macroprudential frameworks to be strengthened. But they also point to the need for monetary policymakers to remain vigilant to financial stability risks, and to be ready to “lend a hand” if that is required (IMF, 2013; ¶138). Such assistance is particularly important when financial conditions undergo a material *tightening* that threatens financial stability. Monetary policy action might also be called for to offset the side-effects of some macroprudential actions, where these have an impact on aggregate demand.³⁶

³³ See IMF (2013, Part II.B) for a discussion of policy coordination. When macroprudential and monetary policy tools are assigned to different agencies or committees, lack of coordination can lead one decision-maker to take actions without internalizing their effect on the objectives of the other, leading to suboptimal outcomes. See De Paoli and Paustian (2017), Kang (2017), and Laureys and Meeks (2018).

³⁴ For example, Song (2008) judges monetary policy to have played a ‘trivial’ role in Korea’s house price boom.

³⁵ For a detailed discussion of the prudential tools employed in Korea, see *Systemic Risks and Macroprudential Tools*, below.

³⁶ For example, Meeks (2017) provides quantitative estimates of the effects of bank capital regulation on aggregate activity in the UK, and the stabilizing role played by monetary policy.

42. The Bank of Korea has financial stability responsibilities but owns no direct macroprudential policy tools. The Bank of Korea Act (2011) instructs it to pursue price stability while ‘paying attention’ to financial stability.³⁷ In the absence of direct macroprudential powers, the Monetary Policy Board (MPB) discharges its financial stability responsibilities in two ways.³⁸ The first is through its financial stability monitoring activities. The Board is briefed four times a year on financial stability matters and signs off on the analysis and recommendations in the *Financial Stability Report*.³⁹ The second is via its monetary policy strategy. The Board’s “General Principles of Monetary Operation” set out how the goal of financial stability is incorporated into its flexible inflation targeting framework.⁴⁰ The principles stress the need for cooperation between monetary and macroprudential policy functions, and acknowledge that monetary policy action may be required to manage the trade-off that arises when financial imbalances have not been adequately contained by macroprudential measures.

43. The Monetary Policy Board must judge when the incentives for risk-taking are being contained by current macroprudential measures, and when they are not. In cases where the MPB perceives the trade-off between its objectives to be unfavorable, two actions may be taken. The first is to communicate the need for a strengthening of macroprudential policies—for example through its FSR—and to influence the macroprudential policy process through its participation in cross-agency forums. Two examples of such actions are detailed in the following paragraphs. However, because macroprudential policies are often complex and can be slow to enact, in the interim it may be desirable for the policy horizon to be extended—that is, for inflation to be brought back to target more slowly than would otherwise be the case—to avoid worsening financial imbalances.⁴¹ The second, and more troublesome, possibility is that the fundamental limits on the ability of macroprudential policy tools to contain risks have been reached. Under those circumstances, monetary policy may be used to some degree to compensate—although the trade-offs involved are unlikely to be attractive (IMF, 2013, ¶139; IMF, 2014a, ¶176; Mester, 2017).

44. The BOK has multiple and partly overlapping roles as monetary policymaker, FX risk monitor, FX market agent, and key participant in the formulation of FX macroprudential measures through its seat on the MEFM. The combination of functions performed by the BOK in this policy domain act to enhance the effectiveness of both monetary and financial stability aspect

³⁷ The BOK interprets financial stability to be its (co-) primary mandate, although Art. 6 of the BOK Act instructs the Bank to “do its best to achieve the price stability target”.

³⁸ The BOK has the power to set reserve requirements but has not done so for macroprudential purposes.

³⁹ From 2017, the number of monetary policy meetings was reduced from twelve per year to eight. Four briefings dedicated to financial stability were added.

⁴⁰ The ‘General Principles’ were first published in December 2016 and appear in each edition of the BOK’s *Monetary Policy Report*. An analogous statement of a monetary policy strategy that accounts for ‘financial imbalances’ may be found in the NorgesBank’s *Monetary Policy Report with Financial Stability Assessment* (e.g. June 2019, p. 45 Box “Monetary Policy Objectives and Trade-offs”).

⁴¹ The monetary policy literature refers to the time that elapses between the recognition that action is required, and action being taken as the ‘inside lag’. If inside lags for macroprudential policy are lengthy, that might provide a justification for exploiting the flexibility of monetary policy as a temporary expedient. See Juyeol Lee’s ‘New Year Speech’ (2019, p. 4) for comments relevant to using the policy horizon flexibly.

of its mandate. Korea maintains a freely floating exchange rate (IMF, 2018), and is amongst the most open of the advanced economies. Its trade is also highly exposed to fluctuations in the US dollar exchange rate.⁴² Under these circumstances, recent research suggests that financial conditions in the US are likely to be an important source of external shocks for Korea, as well as a potential source of financial instability (Rey, 2016). To contain the risks that might arise when interest rate differentials between the Korean won and the US dollar become sizeable, the authorities have put CFM/MPMs in place that dull incentives to accumulate short-term foreign exchange liabilities (see ¶80-82, below). These measures attenuate the influence of the global financial cycle on domestic monetary policy.

45. The BOK has used its influence to strengthen macroprudential housing measures, helping to assuage debt concerns following recent monetary easing. The BOK cut its base rate twice in 2019, in response to weak growth and below-target inflation. A key concern for policymakers and observers of the Korean economy has been the possibility that easier monetary conditions could fuel renewed acceleration in household borrowing.⁴³ But as early as June 2016, the BOK was indicating the need to enhance the debt service capacity of borrowers.⁴⁴ BOK analysis underpinned its push—including at the MEFM—for strengthening the macroprudential framework through the introduction of DSR limits.⁴⁵ In this case, pre-emptive action on macroprudential policy has opened up some space for monetary policy to act towards its price stability objective; but trade-offs remain, and the Board has continued to discuss the risks posed by household lending growth and rising real estate prices.⁴⁶

46. Premature easing of macroprudential policy can complicate the task of monetary policy. An instructive counterpoint to recent experience is provided by the decision to relax macroprudential housing measures in 2014 amid a slowing economy. At the time, household loan growth was accelerating; Seoul property prices were up, and apartment vacancies were down.⁴⁷ That constellation of factors would not normally warrant an easing of policy. Nevertheless, the government announced a stimulus package that included measures to ‘normalize’ the housing market through a relaxation of LTV and DTI limits, as well as various technical adjustments to boost

⁴² Around 20 percent of Korea’s exports are to the US, but more than 80 percent of them are invoiced in US dollars (IMF, 2019a; Figure 2.1). More than two-thirds of respondents to a recent BOK *Systemic Risk Survey* named trade tensions as a financial system risk factor (see BOK press release 2019-5-25, in Korean).

⁴³ See Bae Hyun-jung, “BOK’s base rate cut rings alarm on household debts”, *The Korea Herald* (October 21, 2019). The Korean authorities have targeted sub-5 percent growth in household debt for 2019. For an analysis of household sector vulnerabilities see ¶56-60, below.

⁴⁴ BOK *Financial Stability Report*, June 2016.

⁴⁵ Analysis of the DSR regulations appear in the BOK’s *Financial Stability Report* (English version), December 2018.

⁴⁶ See BOK, *Minutes of the Monetary Policy Board Meeting*, Aug. 30, 2019.

⁴⁷ The minutes of the MPB meeting for August 2014 reveal members’ discomfort with the dynamics of household debt. One member suggested that it would be “necessary to *encourage financial institutions to manage household debt in a stable manner at their own initiative* and to pursue soundness in their operations, so that the *loosening of housing finance regulations* and the easing of monetary policy could achieve their intended effects *without undermining financial stability*” [emphasis added]. In other words, moral suasion would have to substitute for hard policy. A year later the BOK reported rapid growth in bank mortgage lending at higher LTVs (FSR, June 2015, Box I-1).

housing demand (MOSF, 2014).⁴⁸ That decision has been the subject of criticism by some observers, in part because it had the undesirable effects of worsening the macro-financial trade-off at a time when easier monetary policy was needed, and because it gave the appearance of short-termism (Kim, 2019).⁴⁹ Using macroprudential tools to manage aggregate demand is likely to overburden them, and should be avoided (IMF, 2014b, ¶84).

B. Recommendations

47. The formal mechanisms for coordination between monetary and macroprudential policies should be strengthened. To minimize the likelihood of undesirable trade-offs between monetary and macroprudential policy objectives, a mechanism is required to better internalize the spillovers between decisions in the distinct policy domains. This recommendation has two important elements:

- In enacting macroprudential policy decisions, the responsible agencies should show that due regard has been given to the dual responsibilities of the BOK.
- When the MPB judges that systemic risk concerns place a material constraint on their ability to achieve their price stability objective, formal notification should be given to the body responsible for macroprudential oversight.

The formal notification will be grounded in a risk assessment, which would naturally emanate from the BOK's activities under ¶38, and (optionally) a recommendation that specific policy actions be undertaken.⁵⁰

- If the assessment is accompanied by suggestions for mitigating actions, which would presumably be developed using the same inter-agency channels detailed in ¶18.

Note that the decision to place formal notifications in the public domain is a separate issue, but also that partial disclosure may be preferable to none (¶30). In implementing this recommendation, the independence of the Bank of Korea in the conduct of monetary policy shall be taken as absolute.

48. The BOK should enhance its capacity to quantify the macro-financial trade-off, and to model the effects of macroprudential policy actions over the policy horizon. Central bank models have increasingly come to reflect the importance of financial factors both as amplifiers of shocks, and as a potential source of disturbances to the broader economy (Lindé, 2018). Analysis of the trade-off policymakers must manage requires a structural model, and an appropriate

⁴⁸ The adjustments included: relaxing eligible income rules for DTI limits; raising the cap on didimdol ('stepping up') loans for lower-income borrowers; and expanding the definition of 'real' home buyers subject to looser borrowing limits.

⁴⁹ An environment of 'lower for longer' interest rates implies strong macroprudential measures will be all-the-more important for successful monetary policy (see IMF GFSR, October 2019).

⁵⁰ The BOK currently places its assessments on the official government record through communication with the MOEF/FSC.

assumption about how policy is set.⁵¹ The BOK's structural macroeconomic model (BOKDSGE) could be developed to include a richer set of financial markets, financial assets (in particular, housing), and financial institutions such as banks.⁵² Developing such a tool would assist policymakers in their efforts to balance their macroeconomic and financial stabilization goals when setting monetary policy.

SYSTEMIC RISKS AND MACROPRUDENTIAL TOOLS

A. Broad-Based Vulnerabilities

49. Overall credit conditions are accommodative, but few indicators point to exuberance.

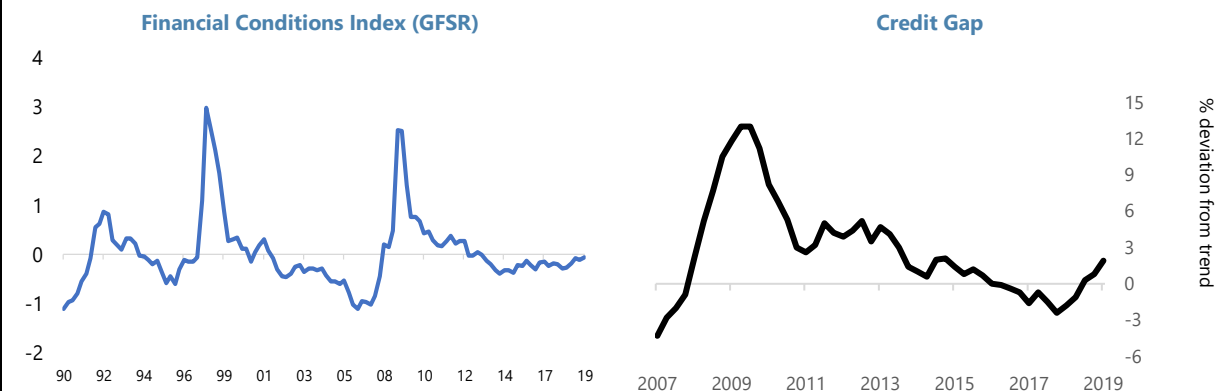
Financial conditions in mid-2019, as constructed using the methodology set out in IMF (2017b), were close to historical averages after several years in easy territory (Figure 2). Perhaps driven by easy credit conditions, the ratio of total non-financial private sector debt to GDP has reached an elevated level—to stand close to 189 percent—and core debt (debt of the non-financial sector owed to banks) stands at 131 percent of GDP, which is high in international comparison (similar to Malaysia, Sweden). But although the trend has been upward, an accelerating trend is not in evidence; indeed, the credit-to-GDP gap is close to zero (Figure 2). Overall credit growth slowed to around 5 percent for households (as of 2019 Q1), a level the government judges to be sustainable over the longer term. Overall corporate credit growth stands a little under 7 percent, about double the average rate for recent years. Real estate prices remain high particularly in the capital area, where some valuations may be stretched (Part B of this section). The funding arrangements of the core system appear solid, with banks exceeding their LCR and NSFR requirements, and having little exposure to foreign exchange (Part D of this section). And despite the weak external environment, the economy continues to run a current account surplus.

50. Korea has implemented the countercyclical capital buffer framework, but has yet to ever raise it above zero. The CCyB is intended to mitigate the likelihood of crises resulting from pro-cyclical movements in broad-based vulnerabilities. Korea's CCyB is currently set to zero.⁵³ In past advanced economy cycles, easy credit conditions during up-swings have facilitated build-ups in leverage, rapid credit growth, and inflated asset prices. All of these are known to be risk factors for financial crises and deeper-than-average recessions.

⁵¹ Structural models are considered appropriate when the question to be addressed requires consideration of alternative systematic policy settings, which may cause private agents to alter their own behavior (an observation known as the Lucas critique). The optimal trade-off could be computed under an optimal commitment policy which would provide information about the 'best achievable' outcomes, or under the optimal time consistent policy.

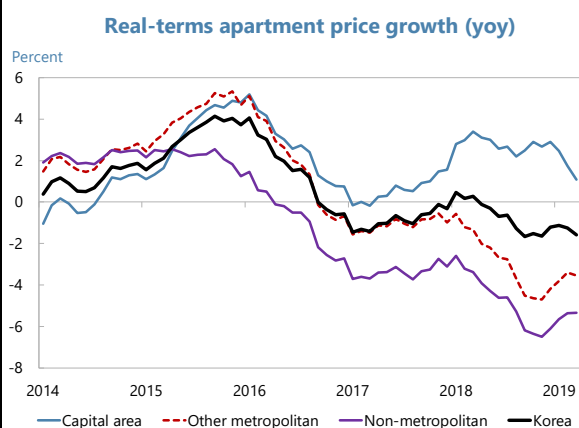
⁵² For a description of the BOKDSGE model, see Bank of Korea Quarterly Bulletin, March 2018 (pp. 15-47).

⁵³ In Korea, the CCyB entered the Regulation on the Supervision of Banking Business as of January, 2016. It was first set in March, 2016 (to zero percent). In implementing the CCyB, the authorities require banks to hold additional CET1 capital of no less than 0 percent of risk weighted assets on domestic exposures, which may vary over time (but not across banks) in response to evolving risks. Banks' total CCyB requirement is the weighted average of the buffer requirements in the jurisdictions where exposures are held, with the weight determined by the ratio of foreign to total RWA. See Regulation on the Supervision of Banking Business (Art. 26/3).

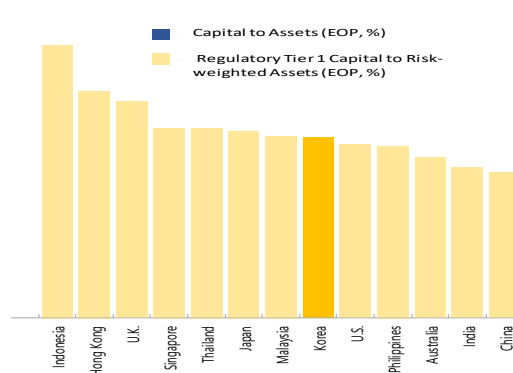
Figure 2. Korea: Broad Financial Indicators and Bank Capital Buffers

Source: IMF calculations.

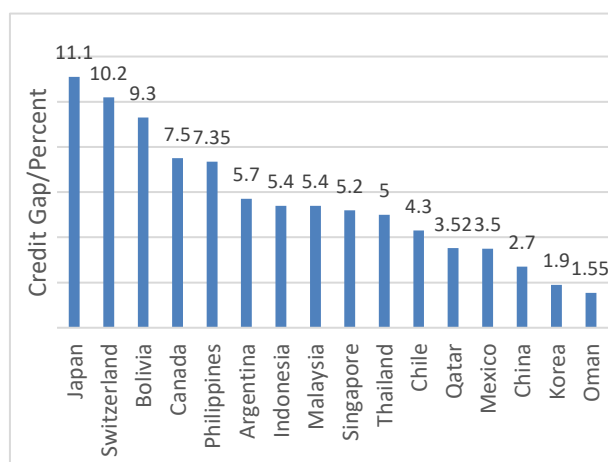
Note: Deviation of the ratio of private non-financial credit to GDP from its HP filtered trend. Source: Bank for International Settlements (Q:KR:P:A:C). Last observation is 2019Q1.



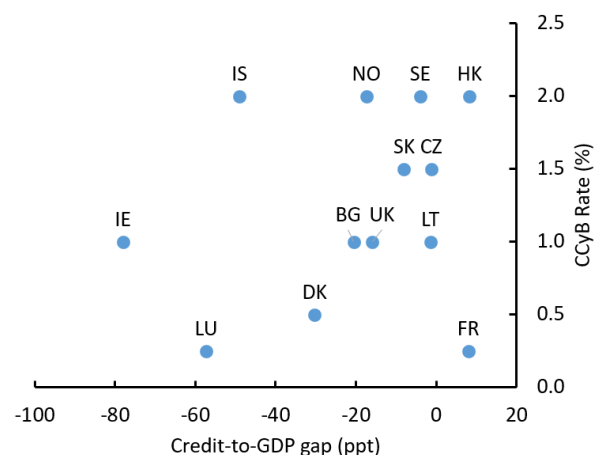
Source: IMF calculations.

Tier 1 capital ratios in selected jurisdictions

Source: IMF calculations.

Credit gap for selected countries with zero CCyB

Source: IMF calculations.

Credit gap for countries with positive CCyB

Source: BIS, ESRB, IMF AREAER-Macprudential Survey, IMF calculations. ISO country codes used.

In addition, it may attenuate cyclical build-ups in credit exposures. The CCyB has been widely implemented, but to date fewer than a score of countries have ever set a positive buffer. An advantage of maintaining a positive buffer, even in a normal risk environment, is the possibility of releasing it (reducing the buffer requirement) in the event of stress. Such actions help to reduce procyclicality by giving banks balance sheet space when constraints would otherwise be binding.

51. The authorities employ a range of indicators when considering the appropriate CCyB setting. Assessing the state of the financial cycle in real time is not straightforward, and in practice no single indicator is likely to provide a reliable guide. As a result, multiple indicators are typically considered. Further, although quantitative indicators can provide a guide to policymakers, it is important that they retain discretion when making decisions. In Korea, the FSS provides recommendations for the CCyB setting to the FSC on a quarterly basis.⁵⁴ (The BOK provides its own, separate, assessment.) Its recommendation is based on an assessment of vulnerabilities, and an assessment of resilience. On vulnerabilities, a single main indicator—the credit-to-GDP gap—and five ancillary indicators, shown in Table 4, are used. The indicators aim to pick up accelerations in overall credit, household debt, house prices, non-core funding, and foreign currency debt. Comparing indicator values to an alert threshold produces a signal that guides the overall recommendation. On resilience, capital adequacy and asset quality are assessed. Where indicators are below their thresholds, and overall resilience is deemed sufficiently high, a zero buffer is recommended.

52. The current approach to assessing the state of the credit cycle has a number of limitations. These fall into the following categories:

- *Some indicators should be related to the incidence of banking system problems.* To be effective, the CCyB should be activated in the up-swing of a credit cycle that has the potential to lead to a crisis. The chosen set of indicators may, or not, be systematically related to such events. However, the authorities have developed a number of early warning models that could already provide useful model-based input to the decision. An alternative to threshold-based EWMs is a binary classification model for crisis events.
- *The scope of indicators should be sufficiently broad.* At present, all indicators are quantity- (rather than price-) based. That makes it hard to pick up mis-pricing of risks (for example, compressed lending spreads). In general, it is desirable to define a set of risk buckets that encompasses all the relevant risk categories, and to select indicators within those. We note (without endorsement) that the core indicator set for the countercyclical buffer published by the Bank of England contains 18 indicators in three categories: non-bank balance sheet stretch; conditions and terms in markets; and bank balance sheet stretch. And the ECB's core indicator set includes the categories: credit developments; property price over-valuation; external imbalances; private sector debt burdens; and the mis-pricing of risk. A detailed list of potential indicators is

⁵⁴ We are grateful to the FSS for sharing the relevant documents with us.

discussed in IMF (2014b, ¶7-¶14 and Table 1), along with information on CCyB frameworks in other jurisdictions (Table 2).

Table 4. Korea: Indicators Guiding Calibration of the Counter-Cyclical Buffer		
	Indicator	Definition
Key indicator	Total credit-to-GDP gap	<i>Total credit</i> : financial institution loans to non-financial corporates and households, plus government loans
	Total credit gap	
Ancillary indicators	Household debt-to-disposable income gap	<i>Household debt</i> : aggregate loans extended by banks and other financial institutions.
	House prices-to-GDP gap	<i>House prices</i> : National housing sales price index.
	Direct financing-to-M2 gap	<i>Direct finance</i> : debentures, repos, certificates of deposit, bills sold, bills issued. <i>M2</i> : M1 + term deposits, debentures, bills sold, bills issued.
	Short term external debt-to-foreign exchange reserves gap	<i>Short-term external debt</i> : securities issued, borrowings, cash, deposits, trade credit, etc. <i>Foreign exchange reserves</i> : gold, SDRs, IMF position, foreign exchange.
Source: FSS. Note: Measures of the 'gap' are constructed using a Hodrick-Prescott filter.		

- *Computing 'gaps' using the HP filter has problems.* It has long been known that serious issues of interpretation attend the use of the HP filter, as the transformations it performs on the underlying data introduces spurious dynamic relations (Hamilton, 2018).⁵⁵ Practitioners have noted the downward bias to the credit-to-GDP gap following credit booms, and the undesirable increases that result from business cycle downturns. Criticism extends to the one-sided filter; although it avoids the 'end of sample' problem, others remain. Alternative methods of detrending that have a firmer statistical basis are available (Harvey, 1990; Hamilton, 2018). It is noteworthy that most countries that have activated the CCyB have a *negative* credit-to-GDP gap,

⁵⁵ Practical application of the filter requires a choice of 'smoothing parameter' as an assumption, and that should be made specific to the series at hand or estimated instead (e.g. Hamilton, 2018, p. 835).

and that amongst the jurisdictions with a zero buffer are a significant number whose credit ‘gap’ are well into positive territory (Figure 2).⁵⁶

53. The authorities have yet to set out how the CCyB will be used. There is an increased recognition that macroprudential policy should be guided by a strategy that set out how risks map into actions, and how the results of actions are assessed (see ¶97).⁵⁷ The CCyB is a useful place to trial such a strategy, as it is reviewed on a quarterly basis, and requires a holistic approach that encompasses broad categories of vulnerabilities. In many jurisdictions, the quarterly review round for the CCyB provides a useful focus for macroprudential risk assessment since the need to reach a decision spurs structured monitoring activity. Making clear in advance when the buffer will be released—a crucial phase of counter-cyclical policy—should help to reassure banks that they do not need to hold ‘buffers-on-buffers’.

54. More balanced arguments for a positive CCyB setting could be made. The costs and benefits of using the CCyB are not fully set out in the advice given to policymakers. Potential costs include potential spillovers to the real economy, and these should be quantified. Research suggests that such costs can be minimized by appropriate coordination between monetary and macroprudential policies (Meeks, 2017). The potential benefit of activating the CCyB in a period of still-easy financial conditions would be that ‘insurance’ (in the form of additional capital) can be purchased cheaply against the broad-based vulnerabilities created by the prolonged build-up of household indebtedness, and the banking system’s sizeable exposure to real estate. Finally, there are circumstances under which microprudential and macroprudential objectives are in apparent conflict, and as a consequence there are risks to entrusting a microprudential supervisor with primary responsibility for making CCyB recommendations.

55. Other broad-based tools include a limit on the leverage ratio and forward-looking provisioning. Estimates of the risk attending banks’ exposures are uncertain and vary depending on whether standardized or IRB schemes are used to compute them. They may also fail to account for risks that fall outside historical experience—or experience recent enough for good data to be available for modeling—and they may become inaccurate when changes occur in the structure of the financial system, financial products, or financial regulation itself.⁵⁸ For these reasons, an unweighted leverage ratio provides a useful back-up to the standard risk-weighted capital ratio. Because it does not seek to account for the relative riskiness of different exposures, it protects banks against errors of miscategorization, where assets are assessed as low risk when they are not; as well as errors of commission. Leverage limits disincentivize banks from responding to tighter risk-based capital requirements by shifting out of high-risk weight assets (for example, SME loans in the denominator of the ratio) rather than raising additional capital (the numerator). Finally, IFRS9 was introduced for Korean banks in 2018, and so are required to make provisions on the basis of

⁵⁶ Drehman and Yetman (2018) argue that HP-filtered credit gaps perform well in a certain class of crisis prediction model.

⁵⁷ For one such example, see Banka Slovenije (2017).

⁵⁸ See BOK, *Financial Stability Report*, June 2017 (pp. 106–113).

expected losses rather than realized impairments. As discussed elsewhere, Korean banks are also active sellers of NPLs to AMCs.

B. Vulnerabilities from Housing and the Household Sector

56. Elevated household indebtedness is viewed as a potential vulnerability. Respondents to the BOK's Systemic Risk Survey have consistently placed the 'household debt problem' or 'housing market instability' amongst their top five financial system risk factors.⁵⁹ The FSAP has identified concerns associated with pockets of at-risk debt owed by liquidity-constrained households, rollover risks associated with Korea's unique rental system (*jeonse*), and the potential for medium-term stress amongst older age cohorts as Korea undergoes a demographic transition. Fear of crises related to real-estate are well-founded. The Nordic banking crises of the early 1990s saw GDP decline at rates of almost 5 percent year-on-year in Sweden, and more than 6 percent in Finland.⁶⁰ And taken across advanced economies as a whole, Jordà and others (2016) report that the aftermath of mortgage booms are marked by deeper recessions and slower recoveries than others. Rapid expansion in other forms of household lending can also lead to trouble. Between 1999 and 2002, Korea's credit card lending boom saw a tripling of cards in issue, and a quintupling of outstanding balances (Kang and Ma, 2009). The crisis that followed in 2003 saw heavy losses for banks and card issuers, and negative spillovers to the real economy and asset prices.

57. Loans secured against housing collateral account for more than half of the assets of Korea's nationwide banks. Korean lenders' exposure to mortgages is systemically significant.⁶¹ Mortgage loans account for around a third of the assets held by domestic banks. Amongst the domestic banks, nationwide banks—the most significant grouping in terms of assets, accounting for 52 percent of the total banking system in 2018, or 83 percent of GDP—have the highest share, at around two-fifths of their total assets. In addition to mortgages, banks also make loans secured against *jeonse* (leasehold) deposits. Those deposits are a sizeable proportion of the value of the property being leased—67 percent on average, or 74 percent for apartments.⁶² Loans amount to some KRW100tn, or a little over 10 percent of the size of domestic banks' mortgage book—but are partly guaranteed, and so carry zero risk weight.⁶³ Finally, the past several years has seen rapid growth in SME lending to real estate leasing businesses. Loans to this segment, which include loans to sole proprietors or SOHOs—frequently residential landlords incorporated as small businesses—amounted to a tenth of domestic bank total assets in 2018.

58. Household lending is also important amongst some non-banks. Some ODIs are very exposed to households. For example, mutual credit cooperatives had exposures to households of

⁵⁹ See BOK Systemic Risk Survey, press releases (November 2018; May 2019; December 2019).

⁶⁰ OECD (2019), Quarterly GDP (indicator). doi: 10.1787/b86d1fc8-en.

⁶¹ Of the five specialized banks, only Nonghyup and Suhyup have substantial exposures to households. They also have significant exposures to corporates engaged in real estate leasing.

⁶² BOK (2017), *Financial Stability Report*, December; p. 39.

⁶³ Guarantees are written by the KHFC and the KHUG, and other specialist firms.

around KRW300tn in 2018, around 70 percent of their total assets. Historically, ODI lenders—which have a different capital adequacy regime—applied lower lending standards to their household loans than did the domestic banks. On the other hand, household lending by life insurance companies, which comprises just 3 percent of those companies’ total assets, has typically been on conservative terms.⁶⁴ New entrants to the lending business—such as the internet-only banks—have focused on growing their consumer credit businesses, and have issued very few mortgages.⁶⁵

59. Korea has not seen a real estate bust since 1997. Nationwide nominal prices have not undergone any significant decline since the Asian financial crisis. But in real terms, year-on-year price growth has been close to or below zero since the end of 2016. Figure 2 shows the rate of inflation-adjusted apartment price trends across three regional groups, along with the whole-country aggregate.⁶⁶ It is notable that real-terms price declines have largely been driven by developments outside of the capital city area. In the three capital-area regions of Seoul, Incheon, and Gyeonggi-do, prices have mostly grown above the rate of inflation. Price growth in the capital area is only weakly correlated with that in other regions of the country (see Appendix I Table 1).

60. The capital area real estate market is at greatest risk of over-valuation. The capital area is the center of the real estate market in Korea. It produces half of national GDP and contains half the country’s population. The median apartment price in Southern Seoul (the premier market within the capital city area) is three times the national median, and eight times the price in the cheapest region (Gyeongsangbuk-do), according to data from Kookmin Bank. Unsurprisingly, affordability in Seoul is very low (Figure 3). The unique pressures on the center market has made prices there more volatile, and more prone to speculative activity—evinced through widespread demand for multiple properties, and high rates of turnover—than is the case in other areas of the country.⁶⁷ Indeed, model-based valuation measures suggest that Seoul prices are somewhat above their equilibrium level (Figure 3).⁶⁸ But they are well below in non-metropolitan areas, and cities outside Seoul, in part due to the long-term structural changes affecting industrial cities such as Ulsan.⁶⁹

61. Macroprudential tools have been deployed to mitigate systemic vulnerabilities from the household sector. The systemic significance of household sector lending, and particularly of lending secured against real estate, has necessitated the deployment of a wide range of policy tools. The strong pull of the capital area real estate market has meant that policy measures have often been targeted there, with measures differentiated down to the level of individual districts (*si, gun,*

⁶⁴ The quoted figure is a median across institutions, although note that Samsung life stands out as more exposed with a share closer to 6 percent. Household real estate lending by life insurers does not show any marked trends over time.

⁶⁵ BOK, *Financial Stability Report* (June 2018, Box 4).

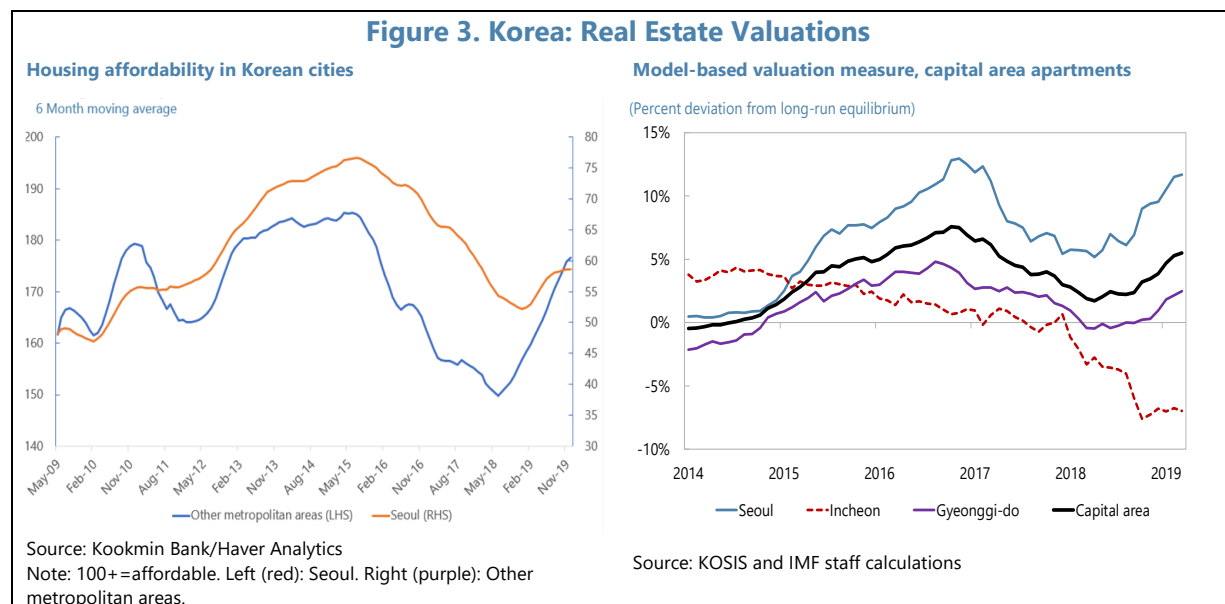
⁶⁶ To construct the growth rates in each group, we weight growth rates in the constituent regions by their respective nominal GDP shares. Real growth rates are computed using region-specific consumer price indexes.

⁶⁷ Kim (2011) finds little evidence of convergence in regional house prices over time but does find support for convergence ‘clubs’ amongst Korea’s major cities.

⁶⁸ The valuation metric derives from a vector equilibrium correction model. For details, see Appendix I.

⁶⁹ See Bryan Harris, “South Korea: The fear of China’s shadow”, *Financial Times* (Aug. 19, 2018).

and *gu*). Although borrower-based measures have received most attention, tax measures and even price caps have also been deployed.⁷⁰ The strong incentives that appear drive households' acquisition of real estate assets in Korea are likely to mean that sustained policy action is likely to remain appropriate, if the pro-cyclical effects of excess household credit are to be avoided. However, the authorities should be mindful that further tightening of borrower-based measures may not be as effective as past actions, and that unintended side-effects may emerge (Alam and others, 2019). That suggests a need for careful monitoring of the net benefits of future policy actions in this domain.



62. Policy measures have been aimed principally at limiting the ability of borrowers to take on excess leverage. The Korean authorities introduced borrower-based measures in 2002, starting with a cap on the maximum loan-to-value (LTV) ratio. Limits on the maximum repayments-to-income ratio for mortgages (a DTI cap) followed.⁷¹ The limits that are currently in place are set conservatively—as low as 40 percent in speculation-prone metropolitan markets, with yet lower limits for owners of multiple homes. For comparison, LTV limits in Croatia (another early adopter of borrower-based measures) are 75 percent; in Finland above 90 percent; and in Indonesia 75 percent. Limits in Bulgaria, Hong Kong, and Singapore are comparably tight.⁷²

⁷⁰ Caps on pre-sale prices of newly-built apartments in Seoul were instated in November 2019 (Korea Herald, “S. Korea adopts price ceiling on privately built flats”, 11/6/2019). Such measures were commonplace in the pre-deregulation era in the 1980s and 1990s.

⁷¹ The mortgage (principal and interest) repayment-to-income ratio mentioned in the text is referred to as a limit on the “Debt-to-Income” (DTI) ratio by the Korean authorities. Generally, DTI is taken to mean the ratio of the principal amount of debt outstanding to borrower income, and DSTI is taken to be the ratio of repayments to income. The alternative usage adopted in Korea should be kept in mind.

⁷² Based on data available with the paper of Alam and others (2019), see <https://www.imf.org/imapp>.

63. Recent measures have aimed to further strengthened borrowers' ability to repay loans.

- *Loan underwriting standards have been tightened.* As part of the measures introduced in October 2017, the FSC announced stricter standards for calculating DTI ratios.⁷³ These included eliminating anomalies in the treatment of existing debt for those taking second mortgages and improving documentation of income. Stricter income checks were also announced for cooperatives in June 2017.
- *Borrowers have been incentivized to take safer mortgages.* Policy measures aim to encourage borrowers to take out fixed interest rate amortizing loans, for example by easing LTV limits for such mortgages. Such loans carry a lower risk of becoming distressed in the event that interest rates rise, or property prices decline. The stock of outstanding mortgages at fixed rates increased from less than 10 percent of all mortgages in 2011 to 45 percent in 2018. The share of amortizing mortgages followed a similar pattern, and stood at a little over 50 percent in 2018.
- *Measures introduced to take account of overall household indebtedness.* When the availability of mortgage credit is limited, incentives may be created for households to obtain other secured or unsecured loans. Growth in unsecured lending can in turn raise the share of households vulnerable to increased debt service burdens should adverse shocks materialize. To gain better traction on risks from rising overall household indebtedness, the authorities introduced rules that restrict new lending at high-DSRs. These were fully implemented for banks in October 2018 and appear to have caused growth in non-mortgage lending to slow to close to zero in 2019Q1, as well as achieving a material reduction in the riskiest high-DSR lending (Table 6).⁷⁴

A summary of selected macroprudential housing actions appears in Table 5.

64. Regulatory leakage to non-bank lenders is minimized by alignment in LTV and DTI rules. Creating a level playing field for different categories of lender helps to remove incentives for borrowers to migrate towards lower-quality lenders when regulations are tightened. Historically, borrower-based measures were calibrated to be somewhat looser for NBDIs and finance companies than for banks and insurance companies. For example, when LTV limits were first introduced for savings banks, mutuals, and finance companies in 2005, the maximum possible was 80 percent for long-term loans secured on apartments in speculative zones, compared to 40 percent for banks. However, LTV and DTI rates were unified at 70 percent and 60 percent (respectively) for all lenders in 2014 as part of a package of measures to simplify regulations.⁷⁵ Since 2017, LTV and DTI limits have been differentiated once again, but only by region and not by institutional form. Some banks welcomed this regulatory alignment, reporting that it had improved their ability to compete for borrowers. By contrast, DSR targets are different for non-banks, reflecting their diverse borrower base and variety of loan types.

⁷³ FSC press release, "Comprehensive measures for household debt management". October 24, 2017.

⁷⁴ See also BOK, *Financial Stability Report* (June 2019, p. 27).

⁷⁵ Ministry of Strategy and Finance (2014).

65. Tighter macroprudential measures crimped house price appreciation and lessened the risk of sharp house price corrections. Although affecting real estate prices is not a primary goal of LTV and DTI measures, research has shown that tighter measures have cooled the housing market (Box 1). Recently, there has also been interest in understanding how such policies may also affect downside *risks* in real house prices, rather than simply their effect on the average price (IMF, 2019b). This new approach, known as housing at risk (HaR) can shed light on how macroprudential measures map into household sector vulnerabilities and financial stability, and so is more closely linked to the underlying objective of the measures. HaR measures the magnitude of house price declines that occur with a given probability.⁷⁶ Figure 4 shows how the unconditional distribution of year-on-year real apartment prices is affected by a 10ppt tightening in both the LTV and DTI ratios.

66. In the case of the nation as a whole (left panel), tighter policy appears to damp down the likelihood of rapid appreciations; the probability of seeing a rise in prices greater than 5 percent (in real terms) goes from 21 percent in the baseline to 16 percent when macroprudential measures are tightened. But for Seoul, where macroprudential policies were applied most frequently, there are notable effects on downside risks too: In the baseline, there is a one-in-twenty chance of prices falling by 7.5 percent over the course of a year; when policy is tightened, the corresponding decline is only 6.6 percent (put differently, the 5 percent HaR or the 5th percentile of the distribution of house prices goes from -7.5 percent to -6.6 percent). These findings show that Korea's borrower-based macroprudential measures can be thought of as an effective risk management policy. But at the same time, real-terms declines in prices cannot be ruled out.

⁷⁶ Computing HaR requires a statistical model linking house prices to its main determinants, such as incomes, rents, and financial conditions. The elements of the FSAP's model of real regional apartment prices are summarized in the Annex to this report.

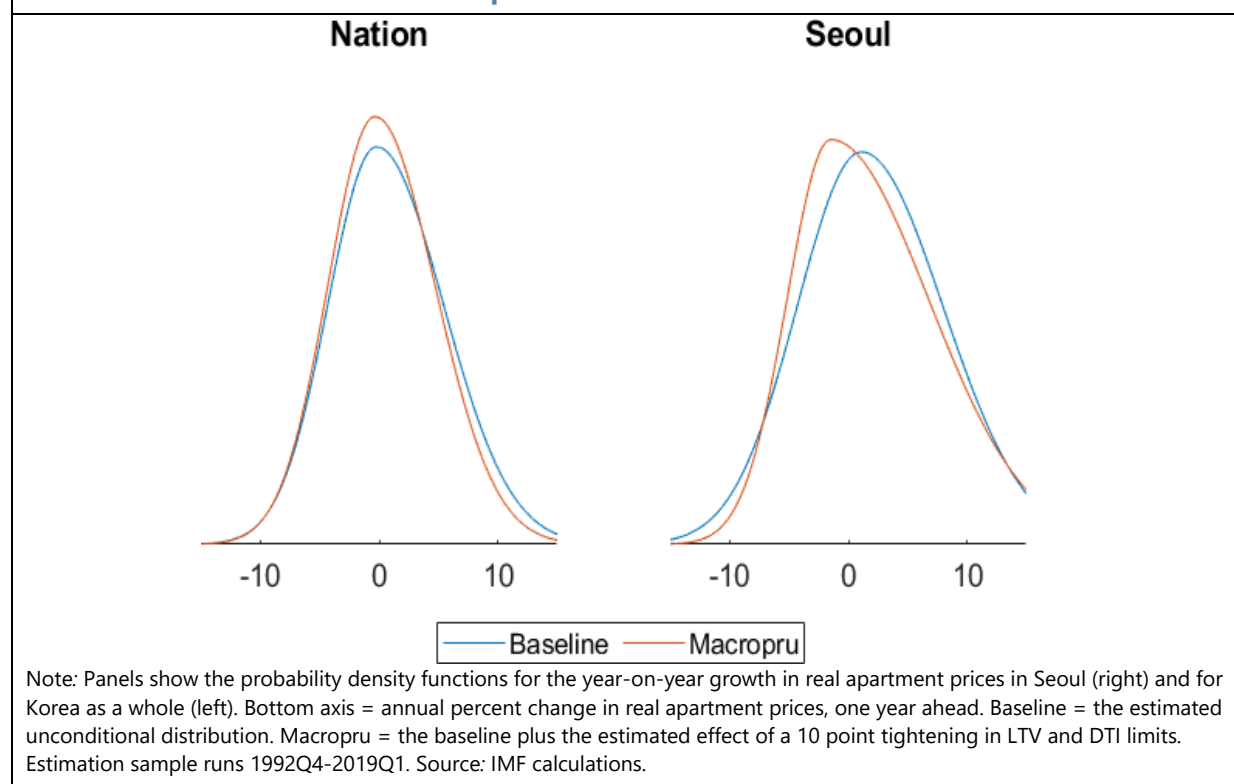
Table 5. Korea: Selected Measures to Curb Risks in Household Lending

Date	Measure
8/2017	<ul style="list-style-type: none"> LTV and DTI ratios on mortgages tightened for all loan types in overheated markets Additional tightening of LTV and DTI ratios for multiple homeowners
10/2017	<ul style="list-style-type: none"> Tougher eligibility rules announced for the purposes of calculating debt and income in the DTI ratio
3/2018	<ul style="list-style-type: none"> Pilot implementation of limits on high DSR loans for banks. (Full roll-out to banks as of 10/2018)
4/2018	<ul style="list-style-type: none"> Limits on leasehold deposit guarantees for high-income borrowers and multiple housing owners Cap on amount of deposit that can be guaranteed by KHFC and HUG
9/2018	<ul style="list-style-type: none"> LTV limits on loans to housing rental businesses tightened Loan underwriting standards for housing rental businesses tightened Limits placed on the rental income-to-interest expense ratio for real estate rental businesses
7/2019	<ul style="list-style-type: none"> Limits on lending at high DSRs extended to loans from non-bank financial institutions
Source: FSC press releases (various dates); BOK <i>Financial Stability Report</i> (various dates); and country authorities.	

Table 6. Korea: Impact of Household Debt Service Ratio Policy on Banks

	Average DSR (Percent)			Percent of loans with DSR > 70 Percent			Percent of loans with DSR > 90 Percent		
	Target	Before	After	Target	Before	After	Target	Before	After
Commercial	40	52.4	41.2	15	19.6	7.8	10	15.7	5.3
Special Purpose	80	128.2	68.6	25	40.1	24.6	20	32.8	18.1
Regional	80	122.6	72.4	30	35.9	21.8	25	30.3	18.1
All	-	71.9	47.5	-	23.7	11.5	-	19.2	8.2
Source: FSC and FSS. <i>Target</i> is the threshold level in each category, to be achieved by 2021. <i>Before</i> refers to June 2018. <i>After</i> refers to 2019Q1.									

Figure 4. Korea: The Effect of Tighter Macroprudential Measures on the Distribution of Real Apartment Price Growth



67. A sectoral countercyclical buffer for household exposures would complement existing measures and add flexibility to respond to changing risks. Borrower-based measures improve the resilience of household balance sheets. The purpose of a SCCyB is to do the same for banks, in the context of slowing growth in household exposures but a sizeable stock of past loans. The SCCyB requires banks to build up a capital buffer on a demarcated segment of exposures deemed to pose risks beyond those accounted for by Pillar I rules (see BCBS, 2019a). A SCCyB on household exposures has been proposed by the FSS, and the FSC is reviewing plans to introduce it.⁷⁷ The authorities already impose higher risk weights on some categories of household exposure, which means more capital must be held against them, but these weights are time-invariant. By contrast, the SCCyB would allow capital to be built up and released as risks from the household sector wax and wane over the credit cycle, and when risks crystalize. An ancillary effect of the SCCyB might be to slow the pace of household lending, with possible knock-on effects for housing valuations. However, affecting credit growth and house prices is not its primary purpose.⁷⁸

⁷⁷ See “Work Plan for Financial Services Commission 2019” (in Korean). March 7, 2019. FSC.

⁷⁸ The effect on overall credit growth depends on how banks respond to changes in capital requirements. It has been shown empirically that banks can react to higher requirements by undertaking less risky lending—for example, lending at lower LTV ratios—which reduces risk weighted (but not necessarily total) assets; see BCBS (2019a).

Box 1. Korea: Effects of Household-Sector Macroprudential Tools

Quantifying the effects of macroprudential policies (MPPs) is far from a straightforward task because:

- a) MPPs respond to the same developments in credit and asset markets that they aim to affect, raising concerns of reverse causation;
- b) MPPs are frequently used in concert with other monetary, micro-prudential, and fiscal measures that share some of the same transmission channels, which complicates the task of isolating their impact;
- c) The most readily measurable outcomes of policy—for example, the rate of growth in household credit or house prices—are imperfect indicators of the systemic vulnerabilities that policy aims to address.

In spite of these problems, a body of research supports the prediction that borrower-based MPPs can materially affect credit and house price growth. As Korea stands out from its peers both in terms of the length of time over which borrower-based MPPs have been in place, and in terms of the number of adjustments that have been made to both their magnitude and their scope, it has been the subject of particular attention.

Kuttner and Shim (2016) focus on the effects of macroprudential policies on imbalances in the housing market across 57 EME and AE jurisdictions, including Korea. They employ a conventional dynamic panel estimator with country fixed effects, and report that: (a) tightening DSTI limits slows real credit growth; and (b) increases in housing-related taxes tend to slow both real credit and real house price growth. Interestingly, they also report that excluding Korea from their sample ‘tangibly weakens’ their principal results.

Akinci and Olmstead-Rumsey (2018) undertake a simple event study analysis, focusing on house price growth in Korea around macroprudential tightenings between 2000 and 2013. They conclude that there is good prima facie evidence in favor of their moderating effect on prices, a result that carries over to a formal regression analysis along the lines of Kuttner and Shim.

Igan and Kang (2011) use household survey data to tease out the causal effects of policy on property purchase decisions and house price expectations. They report that tighter borrowing limits lead both to a delay in property purchases, and to expectations of a slower pace of property price appreciation. They argue that an important aspect of the effect of policy on overall house prices may be due to an ‘expectations channel’ of policy, that is absent from other studies.

Jung and Lee (2017) exploit the variation in policy intensity across the regions of Korea, and the types and value of housing involved. They consider the impact on housing values of LTV and DSTI regulations at the level of individual transactions in 74 sub-regions. Their pooled estimates point to a significant effect on house prices from tighter DSTI limits, after controlling for local economic conditions, mortgage rates, and region-specific fixed effects.

68. The SCCyB brings a number of potential benefits, including enhancing resilience to a targeted set of risks, providing a releasable buffer in the event risks crystalize, and complementing borrower-based measures. The key benefits are as follows:

- *To enhance or maintain banks’ resilience to sector-specific risks.* The primary purpose of the CCyB, and its sectoral counterpart, is to generate a capital cushion that can be used in the event that unanticipated losses occur. This cushion will allow banks to support valuable economic activity through continued lending, even in the event of a sector-specific shock.

- *To provide a targeted and efficient capital-based tool.* The SCCyB is targeted to specific lending segments, and affects the relative cost of lending to different borrower types. The effect of a positive SCCyB can therefore be to make lending to a targeted segment less attractive. Relative to the CCyB, which has a uniform impact on all exposures, the SCCyB may therefore be a more efficient means of containing sectoral imbalances. Moreover, early decisions on activation and release would potentially be more straightforward than in the case of the CCyB.
- *To provide a releasable buffer in the event of stress.* Under some circumstances it may be desirable to release the SCCyB. IMF (2014b, ¶121-¶125) suggests that countercyclical capital-based tools should be released in an incipient crisis, but that measures should be taken to ensure that banks use the released capital to absorb losses, rather than distributing via dividends or otherwise.
- *To complement borrower-based macroprudential measures.* Tools such as maximum LTV ratios act to enhance the resilience of borrower balance sheets. They tend to curtail the current demand for housing credit as they require households to take actions that may include accumulating additional financial resources or purchasing lower value properties. These channels of transmission are likely to complement measures that on the margin affect the cost to financial institutions of extending household credit, such as the SCCyB.
- *Improved policy mix.* Alam and others (2019) show that, in the case of LTV limits, tightening borrower-based measures can lead to declining benefits, and rising costs. An active (non-zero) SCCyB may also allow the use of some borrower-based tools to be scaled back, resulting in a better policy mix.

To date, only Switzerland and Spain have introduced SCCyB frameworks, and only Switzerland has used the buffer (Jahn and Pirovano, 2019).

C. Vulnerabilities from the Corporate Sector

69. The indebtedness of Korean corporates is above the G20 average. Total non-financial corporate credit stands at around 100 percent of GDP, roughly unchanged from 2013 (see Figure 5). This level is about 4ppt higher than the G20 aggregate, and 6ppt higher than the advanced economy aggregate reported by the BIS. For comparison, this level of indebtedness is comparable to that of Japan, Portugal, and Chile. On the other hand, it is far lower than in France (152 percent), Sweden (160 percent), or Ireland (202 percent).⁷⁹ Of the total debt owed by corporates in Korea, KRW843tn (46 percent) was due to banks (as of 2019-Q1), with the remainder being capital market funding.⁸⁰ Banks have very low levels of foreign exchange denominated loans, and regulations often

⁷⁹ Reported as of 2018-Q4, BIS Statistics Table F4.1. Further information on corporates can be found in the FSAP *Technical Note on Non-financial Corporations and Household Sector Vulnerabilities*.

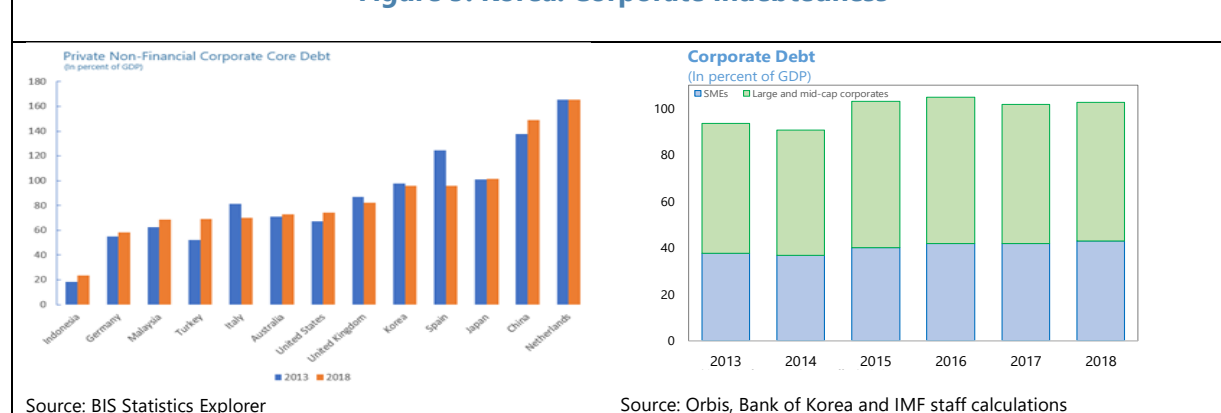
⁸⁰ Although high and rising levels of advanced economy corporate debt have been highlighted as a concern in a number of jurisdictions, information gathered from the IMF's AREAER-Macroprudential Survey shows only a handful cases in which countries have introduced measures to address the vulnerabilities that may emerge as a result.

require asset-liability matching (natural hedges) where longer-term loans are made (see also Part D of this section).

70. Most bank lending to non-financial corporates is directed to SMEs. Large corporates are by-and-large cash rich, and able to tap local and global capital markets where funding needs arise. Direct lending to large corporates therefore makes up only around one fifth of banks' overall corporate book, around KRW160tn. Indirect funding via corporate bond holdings is negligible. Most lending—some KRW700tn (20 percent of system assets)—goes instead to SMEs. Korean SMEs are able to borrow on relatively favorable terms. The spread between average SME loan rates and that of large firms has been less than 0.5 percent for the past five years, which is low in international comparison (OECD, 2019; latest available figures are for 2017). However, low spreads may also reflect conservative lending practices.⁸¹ NPL rates on bank balance sheets are low, in part because of Korea's comprehensive corporate restructuring provisions, and the existence of asset management companies specialized in bad loan recovery.⁸² Most of the recent slow-down in SME lending growth can be attributed to stricter rules on SOHO loans related to real estate leasing businesses (discussed in Part A of this Section).

71. Government supports SMEs in a variety of ways. Around 10 percent of total SME lending is backed by a government loan guarantee, and a little under 1 percent is made directly from government (OECD, 2019). The Korean government also directs spending worth 3 percent of GDP towards SMEs, through procurement and subsidies (Tierno, 2019). In addition to this direct support, Korea also has five specialized banks whose role is to provide funding to industry, three of which are government-controlled.⁸³ These banks are a significant source of SME funding—for example, some four-fifths of IBK's loans were made to SMEs in 2018.

Figure 5. Korea: Corporate Indebtedness



⁸¹ Lee and Lim (2017) report that there are few apparent signs that SMEs face credit rationing. Anecdotal evidence suggests there is pent-up demand for loans, and that banks (other than policy banks) focus on higher-tier borrowers.

⁸² See FSAP *Background Note on Insolvency and Creditor Rights*. There are a number of AMC's the most important of which are KAMCO and UAMCO.

⁸³ They are: Nonghyup Bank (a designated DSIB, owned by the National Agricultural Cooperative Federation), the Industrial Bank of Korea, the Korea Development Bank, the Export-Import Bank of Korea, and Suhyup Bank (owned by the National Federation of Fisheries Cooperatives).

72. Risks to the core banking system from exposure to corporates appear to be contained under stress.

The principal near-term risk to SMEs is posed by their direct exposure to export markets affected by the ongoing US-China trade war; and indirect exposures to larger firms that are also being impacted. The results of the FSAP solvency stress tests show that across the banking system as a whole, SME exposures imply loss rates that exceed their portfolio shares, particularly for the regional banks. This indicates the heightened vulnerability of SMEs under the scenario considered. That said, losses are not sufficient to drive the system to insolvency. But that conclusion should be taken with caution to the extent that the exercise may not fully capture the knock-on effects of a large firm failing onto the SME sector. The health of the specialized lenders is also key to supporting SME credit, which amounted to a third of their loan books as of end-2018. The capitalization of specialized banks is therefore an important factor for maintaining the supply of credit to SMEs. In that context, it should be noted that the specialized banks' regulatory capital ratios are somewhat below those of nationwide banks, and that their capital depletion is more sizeable under the adverse scenario considered in the FSAP's solvency stress test than that of nationwide and regional banks. But overall, the combined effects of government's direct and indirect involvement in the SME sector, forward-looking provisioning, and the framework for recovering loans are together likely to help avoid excessive pro-cyclical contractions in credit if negative shocks occur.

73. Regulators have recently issued new rules on loan-to-deposit ratios designed to incentive corporate lending by banks.

The authorities appear to wish banks to rebalance their loan portfolios away from households and towards corporate borrowers—the majority of which are SMEs as outlined above. To do this, they have announced that the flat 100 percent LTD ratio, which was applied across exposures, will be replaced by differential weights to household and corporate exposures. Specifically, starting in 2020 the LTD ratio will be calculated with a weight of 115 percent for household lending, versus 85 percent for corporates.⁸⁴ If banks start out with equal exposures to the two sectors, which is approximately the case at present, no immediate changes would be necessary. However, under some circumstances banks may have an incentive to issue more corporate loans than household loans. For example, if the aggregate demand for deposits is highly price inelastic, so that banks as a whole would struggle to increase their deposit funding, the tighter requirement could place a brake on household credit growth. For that to occur, the LTD requirement would have to be binding—which is not certain, given that banks are also subject to the NSFR.

74. The change in LTD rules is of dubious value and should be revisited. The purpose of macroprudential tools is to increase the resilience of borrowers and lenders to shocks, thereby mitigating procyclicality in the financial system. As a by-product, they may often cause private agents to alter their mix of exposures. However, if policymakers wish to achieve sectoral rebalancing of credit as an end in itself, independent of systemic risk concerns, macroprudential tools should not be used. Indeed, even capital-based prudential tools appear to have little impact on SME lending (FSB, 2019). In the present case, perceived risks in corporate lending could be dealt with by changing risk weights on SME lending—or more likely, through microprudential actions aimed at bolstering

⁸⁴ The weight on SOHO loans will remain at 100 percent.

the capital positions of the weaker specialized banks. If instead risks are thought to lie primarily with high levels of household exposures, then were the authorities to implement the SCCyB on household exposures, there would likely be a natural re-balancing of bank exposures towards SME loans as a result. Changing exposure weights for the LTD ratio is unlikely to have a material effect on SME lending, and may have unintended consequences in situations of liquidity stress, given the already complex set of liquidity regulations that they face.

D. Liquidity and Foreign Exchange-Related Vulnerabilities

75. A principal source of systemic liquidity risk is over-reliance on non-core funding. Core funding at banks, coming from domestic deposits, grows in line with the fundamentals of household wealth and the economic cycle. In small and financially open economies, non-core funding—especially from foreign wholesale sources—is driven in large part by global risk appetite.⁸⁵ The pro-cyclical nature of foreign liabilities at domestic banks exposes them to capital flow reversals, which can result in the crystallization of systemic risks, for example from asset fire sales and liquidity hoarding (Shleifer and Vishny, 2011). Such risks are the fundamental justification for mitigating macroprudential policy actions.⁸⁶

76. Korea experienced foreign currency liquidity shortages during the Asian financial crisis. The 1997-98 crisis saw severe liquidity problems emerge amongst Korean banks, which had borrowed heavily abroad to fund loans to domestic conglomerates. For example, in 1996 the ratio of foreign liabilities to assets to BIS reporting banks was 332 percent (Corsetti and others, 1999, Table 28), and much of this borrowing was short-term. Banks were heavily exposed to rollover risk, which crystalized as losses on loans to the troubled corporate sector mounted.⁸⁷

77. Difficulties re-emerged during the 2008 Global Financial Crisis. In the decade following the Asian crisis, reforms were made to financial regulation, and the balance sheets of Korean banks were materially strengthened. But Korea's highly export-oriented economy generated a significant structural demand for foreign exchange hedges, which themselves became a source of systemic risk.⁸⁸ And the won-dollar carry trade led to large-scale and short-term dollar borrowing, particularly by branches of foreign banks. When global banks scrambled for liquidity after the collapse of a US investment bank in March 2008, the won-dollar swap market experienced severe dislocation, with

⁸⁵ For a summary of the push- and pull-factors driving capital flows, and an overview of the empirical evidence linking global risk appetite to EM flows in a Korean context, see Chung and others (2014).

⁸⁶ Foreign currency non-core funding ratios have been shown to be positively correlated with market perceptions of bank risk, as measured by their CDS premiums (Cho and Hahm, 2014).

⁸⁷ A number of industrial conglomerates either collapsed or defaulted on their financial obligations in the first half of 1997. To make matters worse, a number of private banks in Korea were themselves controlled by industrial conglomerates, which had used them to raise cheap funding (Corsetti and others, 1999).

⁸⁸ In particular, ship builders (who were paid in dollars) sold foreign exchange forward to Korean banks. The banks hedged their foreign exchange risk by borrowing dollars short-term. This activity transformed the original FX mismatch into a maturity mismatch, exposing banks to a classic creditor run.

deviations from covered interest parity (CIP) in excess of 1,000 bps.⁸⁹ There were sizable outflows of foreign exchange from domestic banks and foreign branches, as well as large-scale intervention by the Korean government and central bank.⁹⁰ A swap line with the Federal Reserve, which was in place until 2010, gave the BOK access to US dollar funding and—along with similar arrangements with the People’s Bank of China and the Bank of Japan—helped to ease pressures in the swap and forward markets.

78. Foreign exchange market developments are closely watched by the authorities. Korea’s adverse experiences with foreign exchange stress have shaped an official approach to the markets that is highly sensitive to incipient pressure. Monitoring of developments in the foreign exchange markets is carried out by the MOEF and BOK, with the MEFM serving as the principal venue for information exchange and policy discussion. The MEFM has been convened as often as twice a week during the period of global trade tensions that intensified during 2019. The MEFM takes the lead on formulating measures to counteract emerging foreign exchange risks, while implementation rests with the BOK and supervisory authorities.

Table 7. Korea: Institutional Coverage of Policy Measures for Foreign Exchange Risks

	Large banks*	Other banks	Foreign branches	NBFIs*
Liquidity buffer requirements				
LCR/FX	●			
LAR/FX		●		●
Stable funding requirements				
Maturity mismatch limits		●		●
Limits on foreign exchange positions				
Net open position leverage limits [♦]	●	●	●	○
Derivative net position leverage limits ^{§♦}	●	●	●	○
Levies or changes on non-core funding				
Macroprudential stability levy [§]	●	●	●	●
Source: IMF AREAER-Macroprudential Survey and country authorities. Key: ● measure applies to all institutions in the named category; ○ measure applies to selected institutions in the named category. For the rules to apply, firms foreign exchange liabilities must exceed a given threshold share of their total liabilities.				
* The ‘large banks’ category includes all domestic banks with foreign exchange liabilities above a given threshold (excluding KEXIM) which in practice captures all the large nationwide banks. NBFIs include insurance companies, securities companies, and credit-specialized financial companies.				
§ Measure is classified as a CFM/MPM under the IMF Institutional View on Capital Flow Measures (IMF, 2012).				
♦ Insurers and credit-specialized finance companies are excluded from derivative limits; Credit-specialized finance companies are excluded from net open position limits.				

⁸⁹ FX swaps remain the most widely-used derivative instrument for won trades, with daily volumes running to some \$17.8bn in 2016 (versus \$9bn per day for other derivatives), according to the BIS Triennial Survey. CIP deviations are symptomatic of a lack of balance sheet capacity amongst FX-active banks to exploit otherwise profitable arbitrage opportunities.

⁹⁰ The amount of intervention has not been officially disclosed. Estimates are given in Cho and Hahm (2014, p. 6), and Baba and Shim (2014, pp. 146-9).

79. A portfolio of policy measures has been introduced to limit systemic risks. A summary of the policy measures, along with the institutional forms they cover, appears in Table 7.⁹¹ Some measures, such as the limits on net open positions and forward positions, are common in many jurisdictions. A LAR ratio limit differentiated by foreign currency, first introduced in 1997, was aimed at reducing foreign exchange mismatch. Shortcomings revealed in FX regulations in 2008 led to complementary measures being introduced to achieve greater coverage of potential vulnerabilities, including the derivatives cap and the macroprudential stability levy (MSL) discussed below, as well as modifications to liquidity rules.⁹² The LAR-FX was superseded by the LCR-FX for large domestic banks in 2017. It was maintained for insurers and other non-banks, small domestic banks, and KEXIM, to which the LCR-FX does not apply.⁹³ In addition to the measures listed in Table 7, certain fiscal measures have at times been used to influence capital flows—notably exemptions for capital gains and interest earned on foreign investors' bond portfolios between May 2009 and January 2011 (Hwang, 2017, Table 1).

80. An LCR differentiated by foreign currency helps address short-term liquidity risks. Korea has adopted the LCR-FX as a requirement (not simply a monitoring tool) alongside the Basel III LCR requirement. Both measures came fully into force in 2019. The LCR-FX requirement serves the macroprudential purpose of improving the resilience of the banking system in the event of shocks to funding liquidity in foreign currencies. Domestic commercial banks with FX liabilities above a threshold amount, and specialized banks (such as IBK) must hold a stock of high-quality liquid assets in foreign currency sufficient to cover a 30-day net cash outflow. The floor is set slightly lower than its local currency equivalent (80 percent vs. 100 percent). The following institutions are excluded from the LCR-FX: (i) KEXIM, (ii) foreign bank branches, and (iii) banks with foreign-currency denominated debt below USD 0.5bn, or with a foreign currency-denominated debt to total debt ratio of less than 5 percent.

81. Net derivative positions are limited to a multiple of bank capital. The measure requires banks to hold costly capital against net FX derivative positions, which acts to shrink the arbitrage profits that can be earned (for example) through won-dollar swap transactions (Hwang, 2017).⁹⁴ It also has the effect of improving banks' resilience to FX shocks. The limit was introduced in 2010, adjusted in 2011 (tighter), 2013 (tighter), and 2016 (looser) in response to swings in global liquidity (Figure 6). The limit is set at a higher ratio to capital (that is, looser) for foreign branches, whose business models are different from domestic banks—requiring them to take overall larger positions—and who have greater access to foreign exchange via global parent banks.

⁹¹ Greater detail on the nature of the policies and a history of the changes made to them can be found in the IMF AREAER-Macroprudential Survey (2018).

⁹² For further discussion, see the Korean [Case Study](#) in IMF (2017a).

⁹³ Some categories of depository institution (e.g. mutual savings banks and credit cooperatives) are prohibited accepting from foreign currency deposits, and their foreign currency activities are limited to basic exchange services. As a result, the measures trivially do not apply to them.

⁹⁴ The stated purpose of the measure is to curb FX transactions driven by 'speculative demand' and to limit the accumulation of short-term borrowings. See IMF AREAER-Macroprudential Survey (2018), Korea, Part V.E.

82. The macroprudential stability levy acts as a tax on activities that may give rise to systemic risks. Introduced in 2011, the levy aims to discourage risky foreign exchange exposures, especially those involving excessive short-term maturity mismatches on financial institution balance sheets. It does so by applying a flat fee of 10 basis points on non-deposit foreign exchange denominated liabilities with remaining maturity of a year or less. Hahm and others (2012) identify three desirable properties of the levy: (1) it acts directly on the identified source of systemic vulnerability; (2) as the ‘tax base’ of the levy varies over the cycle, it acts as an automatic stabilizer; and (3) it acts on financial vulnerability without impacting banks’ core intermediation function. Price-based measures, such as the levy, can be a useful complement quantity-based liquidity ratios and exposure limits. An important aspect of the levy’s design is that proceeds from it feed into a ring-fenced account of the ESF, to be used to support FX liquidity in times of stress.

83. The portfolio of enacted policy measures has been successful in extending the maturity of external debt and reducing maturity mismatches. Given the incentives for risk-taking in foreign exchange markets, the potential for circumventing restrictions, and the risks that can crystalize, putting in place several complementary measures is likely to bring benefits.⁹⁵ The tools deployed by Korea have different design features and transmission mechanisms and combine price- measures (such as the MSL) with quantity-based backstops (such as the LCR-FX). Quantitative studies of Korea’s FX policies indicate that they have broadly achieved their intended effects. For example, Choi (2014) attributes sizeable reductions in short-term external borrowing to the suite of measures introduced after 2011, while finding virtually no reductions in longer-term borrowing. In their bank-level study, Cho and Hahm (2014) report that the macroprudential levy reduced non-core liability ratios by close to 10 percentage points. Kim and Lee (2017) argue that the policies have curbed FX market vulnerabilities, with the levy having been particularly effective at limiting foreign borrowings of domestic banks. Hwang (2017) reports that tighter derivative limits curtailed the volatility of banks’ FX liabilities, especially amongst foreign branches; and that overall, banks have remained well inside the prudential limits set for derivative exposures (Figure 6).

84. The FX services that the financial system offers to the real economy are not unduly restricted. The effect of the measures introduced has been to raise the cost of providing services that entail systemic risks—for example, those that produce foreign exchange maturity mismatches. The measures do not entail any form of residency-based discrimination. In assessing the overall appropriateness of the policy measures that the authorities have introduced, it is therefore important to bear in mind that their intent is not to prohibit economically valuable financial sector activity.

E. Non-bank and Structural Vulnerabilities

85. Financial sector structure may give rise to ‘cross-sectional’ risk. Structural aspects of the financial system—its concentration, the balance of different types of institution, the extent of interconnections between institutions, institutions’ opacity and complexity—give rise to risks that

⁹⁵ This was also the position taken by the previous FSAP, and in subsequent Article IV Staff Reports.

are primarily ‘cross-sectional’, in the sense that they do not show marked cyclical variation (although of course, structures can and do change over time). In addition, there may be macroprudential risks that derive from the real economy that are not captured by Pillar I capital requirements. (Korea does not currently impose Pillar II requirements on banks.) An example of the latter is the common exposures to real estate shared by Korea’s banks (₩157).

86. The Korean financial system is modestly concentrated. Concentration in the banking system is one indication of the systemic risk posed by individual institutions. Looking across developed countries using the World Bank’s Global Financial Development database, the Korean system is relatively less concentrated than most. By their definition (based on the size of the three largest banks relative to the system), Korea ranks similarly to Japan and the UK, and well below countries such as Singapore and Finland. But in an absolute sense, Korea’s system is dominated by a few large entities. The largest four nationwide banks plus the largest two specialized banks account for 60 percent of system assets. Around 90 percent of system assets are held inside one of thirteen financial conglomerates (with or without holding group structures). Korea also has an active and growing non-bank financial sector. The number of investment companies stood at 501 in 2018 (from 315 in 2013), and the number of credit-specialized finance companies stood at 105 (from 76 in 2013).⁹⁶

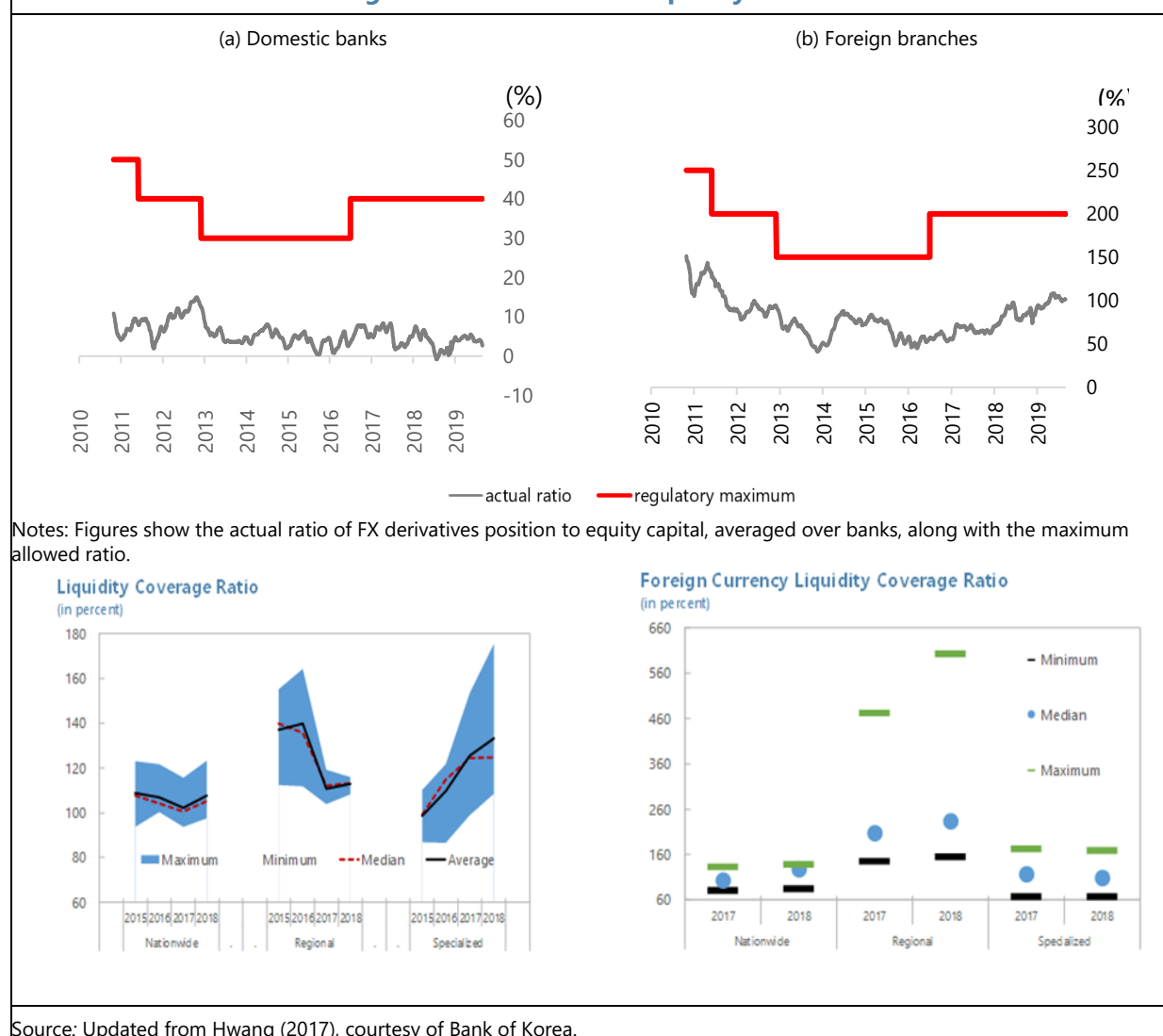
87. Systemically important banks must hold additional capital buffers. The purpose of the D-SIB buffer is to protect the domestic economy from the impact that the distress or failure of a bank would cause. The FSC designated four financial groups (Shinhan FG, Hana FG, KB FG, NongHyup FG), their subsidiary banks, and Woori Bank as DSIBs for 2019. Although size is not the only criteria for D-SIB designation, the D-SIB list does cover the top five banks by size.⁹⁷ D-SIBs must meet a risk-weighted common equity tier 1 capital ratio that is 1ppt higher than other banks. The extent of the financial linkages between firms (‘interconnectedness’) is one determinant of an institution’s systemic importance.

88. Network-based contagion analysis reveals the systemic importance of financial sectors. The FSAP has simulated the financial system using data on bilateral exposures between 64 individual entities. The analysis shows that, as expected, the nationwide banks are systemically significant, in the sense that failure of that sector would cause sizeable direct losses in other sectors, particularly investment firms (whose capital would be fully depleted).⁹⁸ However, the specialized banks are, as a group, about as systemic as the nationwide banks, and their default could significantly deplete the capital of the core banking system. Some banks appear to be vulnerable to the failure of investment firms.

⁹⁶ The Korean insurance sector is covered a separate note.

⁹⁷ No Korean bank is designated as a GSIB.

⁹⁸ Note, the analysis does not account for second-round effects stemming from the impact of failure on the wider economy. The analysis assumes a 100 percent rate of LGD.

Figure 6. Korea: FX and Liquidity Metrics

89. Structural risks need to be carefully assessed. The existence of risks may indicate the need for additional capital to protect banks. The principal sources of structural risk appear to be as follows.

- *Concentration of real estate exposures.* Although real estate lending standards are in general set prudently, the exposures that individual institutions have to the market are very highly correlated. Were problems to materialize in real estate markets, attempts to unwind correlated positions would be likely to place banks, guarantee funds, and AMCs under stress.
- *Opacity and complexity.* When key aspects of the financial system are obscured due to opaque organizational structures or the inherent complexity of financial transactions, risks can develop which markets cannot price and regulators cannot mitigate. For example, the regime currently governing oversight of financial conglomerates, particularly non-holding groups (which include Samsung, Hanwha, and Kyobo), may not allow supervisors sufficient insight into

the risks that businesses are running.⁹⁹ And the pursuit of returns in a low interest rate environment has seen rapid growth in complex financial products such as equity-linked securities, which may imply step-in or reputational risks for issuers.

- *Structural changes due to FinTech.* The FSAP's solvency stress test has highlighted the potential for greater competition due to the entry of new technology platforms to weaken the core banking system's resilience to stress. Should banks find that more intense competition impairs their ability to generate earnings, capital buffers may need to be widened in order that they remain resilient through periods of stress.
- *Interconnectedness between banks and other financial companies.* Spillovers between regulated and unregulated entities, and between banks and other financial institutions, are an important source of systemic risk. The ongoing monitoring of such connections is challenging, and although systems are in place (see ¶134), the financial network may evolve faster than can be reasonably tracked.
- *Geographic concentration.* Regional banks exposures are clearly concentrated in particular geographic regions. But even the nationwide banks may find themselves effectively concentrated due to the size and economic pull of the capital area.

F. Recommendations

90. The foregoing analysis of has highlighted the broad range of macroprudential tools deployed by the authorities. It has also highlighted the willingness of the authorities to develop the toolkit to meet evolving risks. The following recommendations are aimed towards ensuring that existing tools are deployed in a consistent and predictable fashion, and at closing the gaps in coverage that might remain.

Broad-based Risks

91. A review should be undertaken of the quantitative guides used in deciding the level of the CCyB. The goal of the review should be to provide policymakers with an indicator that:

- Signals a crisis with sufficient lead-time for the CCyB to be a relevant tool—at least a year in advance. A suitable approach may already be contained in the authorities' existing set of models and indicators.
- Has coverage that encompasses macro risk, credit risk, funding risk, and foreign exchange risk. Covering the major potential sources of risk is important for constructing the policy narrative.
- Covers instances where the buffer may be released (IMF, 2014b, ¶121-¶125).

⁹⁹ Powers of regulation and supervision do not currently extend to non-holding financial groups, making the information necessary to gauge risks harder to come by.

The process for setting the quantitative guides should allow the relevant technical teams latitude to review and revise the guides as situations warrant. A particular set of quantitative guides should not be prescribed in regulations.

92. Greater disclosure of the considerations behind CCyB decisions is desirable. Present announcements are terse.¹⁰⁰ Disclosure consistent with the Recommendations for Communication would help to guide expectations for CCyB settings and may make policy more effective. Understanding would be enhanced by publishing the core CCyB indicators, taking into account the recommendations in ¶91, along with the policy decision.

93. The FSC should set forth a strategy for its use of the CCyB. The quarterly cycle for making decisions on the CCyB (and SCCyB, were its implementation proceed as recommended in ¶95) should take place in the context of an improved, transparent overall strategy for its activation and release. Development of a CCyB strategy could provide a useful anchor for a broader review of the integrated use of the full range of macroprudential tools at the disposal of the authorities (see ¶97).

Housing and the Household Sector

94. A stock-take of the interactions between existing policy measures should be undertaken. There are obvious interactions between policy measures that should be systematically explored to aid the policy decision-making process. For example, requiring longer-term mortgages slows the effect of changes in LTV and DTI ratios on the stock of outstanding loans; DTI and DSR limits share common channels of transmission; and tightening borrower-based and lender-based tools in concert has reinforcing effects on resilience via direct reductions in leverage and indirect reductions in PDs and LGDs.

95. The SCCyB should be introduced as soon as practical. Implementation of the SCCyB in Korea should be completed following appropriate review by the relevant agencies. The review should consider the following elements:

- *Objective:* The primary objective of the SCCyB shall be to build lenders' resilience to the unwinding of cyclical imbalances associated with household sector lending.
- *Exposures covered:* All secured and unsecured household exposures should be subject to the SCCyB. Alternatively, consideration could be given to a SCCyB targeted at real estate encompassing exposures to households and leasing businesses, if complementary measures can effectively contain spill-overs to unsecured and other secured lending (for example, the DSR tool).
- *Activation and release:* As with other macroprudential tools, the authorities should set out the considerations that are likely to lead to the activation or release of the buffer. A set of *indicators*

¹⁰⁰ See FSS press release, "FSC announced CCyB rate for South Korea", March 30, 2016.

should be devised to guide decision making, with an emphasis on forward-looking measures associated with build-ups of system-wide risk. Ideally, the core indicators would be a sub-set of those used to inform the setting of the CCyB.

- *Interaction with CCyB.* The BCBS recommends using the SCCyB and the CCyB as additive complements (BCBS, 2019b). SCCyB requirements are then the difference in the SCCyB and the CCyB rates applied to sectoral exposures.¹⁰¹
- *Calibration:* A review of the possible methods for calibrating the SCCyB must be undertaken with an emphasis on enabling the tool to meet its resilience objectives, while minimizing imbalance and loss spillovers.
- *Implementation:* As with other capital-based measures, it would be appropriate to allow banks to meet higher requirements over a period of up to one year. Relaxations of the buffer can apply with immediate effect.
- *Frequency of review:* As an adjunct to the CCyB, it would make sense to review the SCCyB in concert with the broad buffer on a quarterly basis.

Structural Risks

96. Introduce a framework in which to assess sources of structural risk and to develop mitigating policy measures. Structural risks are often poorly understood and hard to monitor. Drawing on emerging international best practice, a framework for assessing these risks and developing measures to mitigate them should be introduced. A useful starting point might be the ongoing work on monitoring non-bank entities and activities, and the emerging FinTech sector.

Overall

97. An over-arching macroprudential strategy should be developed. A macroprudential strategy sets out how the stages of the policy cycle unfold to ensure identified risks lead to policy action, effective implementation, monitoring of effects, and policy review (ESRB, 2014). Within the macroprudential policy decision-making apparatus, the authorities have developed various approaches to the setting of macroprudential tools.

98. An overall approach should now be developed that:

- Can be applied systematically across policy tools;
- Is understood on common terms across agencies;

¹⁰¹ Additive complementary is the only approach considered by the BCBS that ensures higher CCyB or SCCyB rates satisfy the capital requirement principle (that bank-level capital requirements do not decrease); the marginal cost principle (that the marginal cost of providing credit to any credit segment should not decrease); and the risk counting principle (that risks should neither be omitted nor double-counted). See BCBS (2019b, p. 7).

- Sets out how the set of tools should be set in concert;
- Sets out who is responsible for monitoring and review;
- Is transparent about the resource requirements for effective implementation.

99. A benefit could therefore be gained by documenting a suitable strategy, and by making that strategy available to the public (Recommendation, ¶130). It would be natural for the body charged with sole primary responsibility for macroprudential oversight (Recommendation, ¶19) to coordinate the development of such a strategy, and to present a formal proposal to the FSC commissioners for its adoption by the appropriate bodies.

Table 8. Korea: A Comparison of the Active Macroprudential Tools in Select Countries					
	Korea	Japan	Australia	Singapore	Malaysia
Broad-based tools					
Countercyclical capital buffer (>0%)	No	No	No	No	No
Capital conservation buffer					
Limit on leverage ratio		No	No	No	No
Household sector tools					
Household sector capital requirement				No	
Cap on loan-to-value ratio		No	No		
Cap on debt-service to income ratio		No	No		No
Cap on household credit growth	No	No		No	No
Fiscal measures	No	No	No		
Corporate sector tools					
Corporate sector capital requirement	No		No	No	N.A.
Loan/eligibility restrictions	No	No	No	No	N.A.
Exposure caps on corporate credit	No	No	No		
Liquidity tools (banking sector)					
Liquidity buffer requirements					
Stable funding requirements		No			No
Limits on foreign exchange positions		No	No	No	No
Tools for systemic liquidity risk and nonbank sector					
Asset management industry		No			No
Pension funds		No		No	No
Insurance companies			No		No
Tools for SIs and interconnectedness					
Capital surcharges for SIs					No
Exposure limits/additional risk weights between financial institutions					No
Source: IMF-AREAER Macroprudential Survey (2018).					

Appendix I. Regional House Price Dynamics

1. This technical Annex gives background information on Korea's housing market. Some historical background and motivation for the analysis is discussed in Part A. Part B describes valuation trends; Part C describes the results of a modeling exercise geared towards determining equilibrium prices; Part D presents our results; and Part E gives details of data construction.

A. Background

2. South Korea has one of the highest population densities of any large country.¹ Notable constraints exist on the supply of land suitable for development, due to its rugged topography. Added to these physical constraints, government policies favoring industrial development led to under-investment in housing supply until at least the late 1980s (Kim, 2004). Housing finance was also heavily regulated, leading to widespread credit rationing. However, the past three decades have seen deregulation. As a result, the total number of dwelling units nearly doubled between 1985 and 2000, and has continued to expand to bring the number of dwellings per 1,000 people to 395 in 2017 from 214 in 1995.²

3. Housing finance was liberalized in the late 1990s. Before 1999, Korea had no mortgage 'market' to speak of, with loans provided primarily by public bodies (the National Housing Fund and the Korea Housing Bank). From 1999 on, a rapid expansion in the mortgage market has taken place, led by commercial banks. Loans secured by real estate total in excess of KRW700tn, amounting to roughly 43 percent of GDP, up from just 12 percent of GDP in 1997. For comparison, Korea's outstanding stock of government debt is a shade over 40 percent of GDP. Real estate assets now make up around two-thirds of household balance sheets—well in excess of the figures for comparable developed economies.³

4. Rapid appreciation in real estate prices is a perennial policy concern. The changes seen in the Korean real estate market have brought about major adjustments as market-determined prices have come to the fore. They have also made the market for real estate, and especially residential real estate, a subject of intense public interest, and continued policy focus. The Korean authorities have deployed a broad set of fiscal and macroprudential tools to prevent rapid growth in residential real estate prices. These measures were motivated by a number of underlying concerns, including affordability and access to housing, risks to the banking sector from over-exposure to real estate collateral, and risks to households themselves from over-stretched balance sheets. Even so,

¹ Korea's population density is 517 persons/sq. km (source: KOSIS). The only countries with a population over 10 million people and a higher population density are Bangladesh (1,164) and Taiwan (652).

² Ministry of Land, Infrastructure, and Transport: Number of houses per 1,000 people.

³ Total stock of mortgage credit at commercial and policy banks, other depository institutions, and Korea Housing Finance Corp.

there have been substantial periods where double-digit rates of nominal price appreciation have been sustained, especially in the capital city area where demand for real estate is strongest.⁴

Appendix I Table 1: Within—and Between—Group Correlations in Real Apartment Price Growth

	Capital	Other metropolitan	Non-metropolitan
Capital	0.74	—	—
Other metropolitan	0.16	0.47	—
Non-metropolitan	0.11	0.50	0.50

Note: (a) Capital area: N. and S. Seoul, Gyeonggi-do, Incheon; (b) Remaining non-metropolitan cities: Busan, Daegu, Gwangju, Daejeon, and Ulsan; (c) Other non-metropolitan areas: Gangwon-do, Chungcheongbuk-do, Chungcheongnam-do, Jeollabuk-do, Jeollanam-do, Gyeongsangbuk-do, and Gyeongsangnam-do. The figures are averages of pairwise sample correlations in the first difference of log real apartment prices. Sample runs June 2003 through March 2019.
Source: IMF calculations.

5. Regional differentiation in real estate markets is high. A complicating factor when analyzing the Korean market is the diversity of regional markets. The Seoul area is the center of the real estate market in Korea. The three capital area regions of Seoul, Incheon, and Gyeonggi-do together produce half of national GDP, and contain half the country's population (KOSIS). The median apartment price in Southern Seoul (the premier market within the capital city area) is three times the national median, and eight times the price in the cheapest region (Gyeongsangbuk-do), according to data from Kookmin Bank. The unique pressures on the center market has made prices there more volatile, and prone to speculative activity—evinced through widespread demand for multiple properties, and high rates of turnover—than other areas. As a result, policy measures have tended to be targeted specifically on the capital region.⁵

6. The purpose of this note is to provide a top-down assessment of valuation in Korea's principal residential real estate markets. The note details the evolution of real (inflation-adjusted) apartment prices across regions, and presents simple valuation measures based on incomes and rents. It then goes on to conduct a more formal analysis of the capital region, to get a composite picture of valuations that can take account of multiple possible influences on prices. The broad conclusion of the analysis is that there is scant evidence of serious over-valuation in any of the regional groups we consider. In the capital area, Seoul prices were around 10 percent above their equilibrium in the first quarter of 2019, but the surrounding areas are not overvalued. Internal migration, particularly out of Seoul and into Gyeonggi-do, likely provides a natural equilibrating force.

⁴ Seoul, Incheon, and Gyeonggi-do.

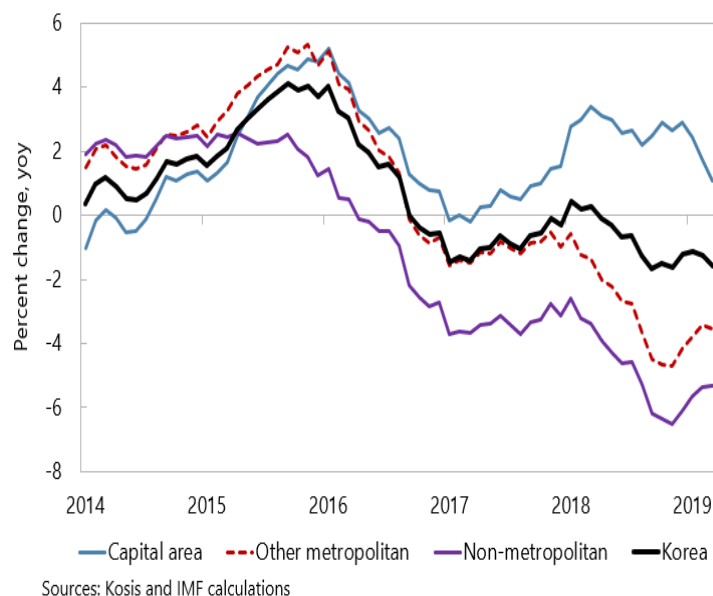
⁵ Kim (2011) finds little evidence of convergence in regional house prices over time, but does find support for convergence 'clubs' amongst Korea's major cities.

B. Price and Valuation Trends

7. Prices correlate strongly within regional groups, but those in the capital area stand apart. To shed light on the regional dynamics in property prices, we group the regions of Korea as follows: (a) Capital area; (b) Remaining metropolitan cities; and (c) Other non-metropolitan areas.⁶ The average correlation of real apartment prices within these regional groups are large and positive, and highest within the capital area (Appendix I Table 1). However, price growth in the capital area appears largely disconnected from other regions of the country. Metropolitan regions outside of the capital area have more in common with non-metropolitan regions than with Seoul.

8. Nationwide apartment prices are up 3 percent in real terms since 2014, but recent trends show both price declines and a return of regional disparities. Appendix I Figure 1 shows

Appendix I Figure 1: Real Terms Apartment Price Growth in Korean Regions

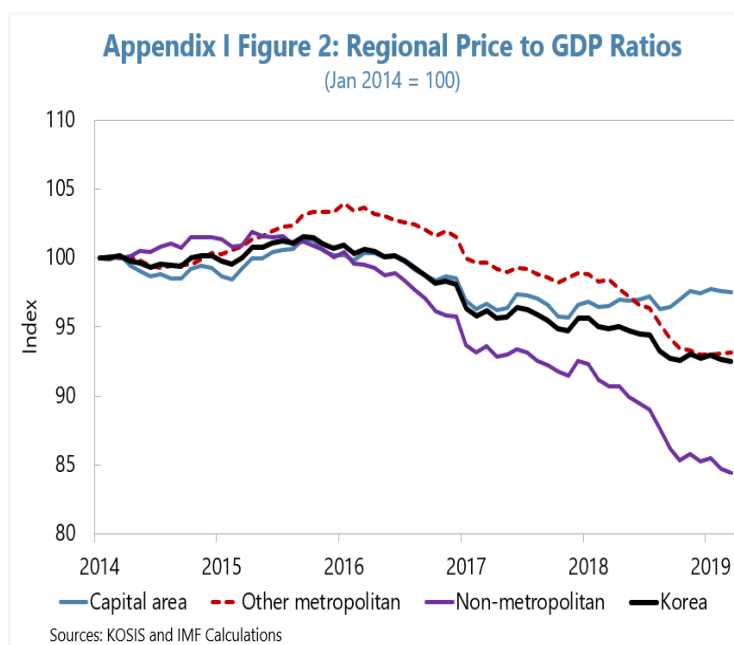


the rate of year-on-year growth in inflation-adjusted apartment prices across three regional groups, along with the whole-country aggregate.⁷ It is notable that across Korea as a whole, real price growth has been close to or below zero since the end of 2016. But these declines have largely been driven by developments outside of the capital city area. In Seoul and the surrounding provinces, prices have continued to grow above the rate of inflation. Taken across fifteen administrative regions of Korea, regional price disparities (measured by the cross-section variation in real growth rates) have grown markedly since 2017.

⁶ We do not consider either the special city of Sejong (due to short data history) or the region of Jeju (due to its special status).

⁷ To construct the growth rates in each group, we weight growth rates in the constituent regions by their respective nominal GDP shares. Real growth rates are computed using region-specific consumer price indexes.

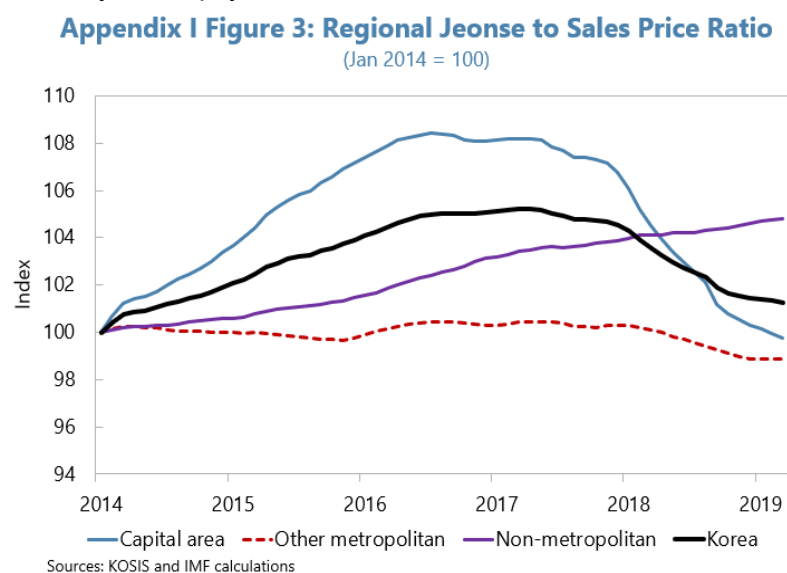
9. The trend in real estate prices is running below that of regional GDP. A simple approach



to gauging how valuations in regional housing markets are evolving is to compute the ratio of regional prices to regional incomes. In the long run, real estate prices are not expected to outstrip incomes, but trends can deviate from each other over extended periods for a variety of reasons. Appendix I Figure 2 shows that since 2014, average prices have run behind incomes in all three regional groups, but it is in the non-metropolitan areas that declines are most marked.⁸ In the capital area, only a slight decline is observed, and in other

metropolitan areas prices were running ahead of incomes up until 2018.

10. The price-to-rent ratio has softened. We measure the price-to-rent ratio using data on lease or jeonse prices. The jeonse price is a lump-sum deposit that tenants pay to landlords in lieu of monthly rental payments, and which is returned at the end of the lease. On average, jeonse prices



are around two-thirds of the value of the property being leased. One way to think about the jeonse contract is as a 'housing repo', in which an illiquid asset held by the landlord is exchanged for cash. The jeonse-to-sales price ratio can then be thought of as moving reciprocally with the haircut in that repo. Appendix I Figure 3 shows that jeonse prices have been falling relative to prices nationwide over the past two years, led by

declines in the capital area (equivalently, haircuts have been rising). Other things equal, lower average

⁸ We compute the change in the ratio of average apartment prices to GDP for each group by weighting the ratios in the constituent regions by their respective nominal GDP shares.

jeonse prices to imply lower average rental yields; standard pricing theory would predict downward pressure on sales prices to result.⁹

C. Model

11. A model-based analysis of equilibrium prices complements informal valuation approaches. The valuation metrics considered in the preceding section are useful as a first pass. In the present case, they point to softer conditions in real estate markets in the past two-to-three years. But they don't necessarily deliver a consistent message; for example, prices to GDP have held up well in the capital area, but price-to-rent ratios seem to be declining. A model-based approach can account for multiple influences on prices simultaneously, and thus give a more complete picture of valuation. The drawback of using models is that they can be complex, and sometimes sensitive to the assumptions made in their construction.

12. Several potential drivers of equilibrium prices are considered jointly. Our model is similar to those presented in Holly and others (2010, 2011). We consider for each region: real income per capita; real *jeonse* prices; prices in adjacent regions; and the real long term interest rate.¹⁰ Theoretical reasoning suggests a long-run relationship between real property prices, real incomes, and long-term real interest rates arising from households equating the marginal benefits of housing services obtained from owning a real estate asset with the associated opportunity cost. In the case of Korea, the combination of the real interest rate with jeonse prices is likely to be the relevant opportunity cost for homeowners. The spatial dimension of regional prices may matter in addition, as higher prices in (say) Seoul 'ripple' to nearby areas as people choose to commute or are simply priced out of the market. We therefore include a spatially-weighted apartment price index in the model (see Part D of this Annex).

13. Real apartment prices in the three regions in the capital area are modeled. Monthly data from 2003 to 2019 is used, as 2003 is the earliest date for which data on Gyeonggi-do is available. The chosen model is a vector autoregression (VAR) that allows for a very general set of dynamic relationships between the likely determinants of equilibrium prices. To uncover the long-run relationship between them, we perform system tests for cointegration. When two or more trending variables are cointegrated, a linear combination of them is stationary—that is, shows no tendency to drift over time. Under some circumstances we can interpret the cointegrating relationship as an equilibrium that the system will adjust towards over time. The following section discusses the main findings of the analysis, while full results can be found in Appendix I Table 2.

⁹ There are a number of complications. First, the rental income implicit in the jeonse contract depends on the returns landlords earn on the cash they receive from tenants, and so it broadly linked to market interest rates. These have been low. Second, and partly driven by low rates, the share of jeonse leases has been declining relative to monthly rental payment arrangements in the past few years. There may therefore have been structural changes in the way jeonse prices and sales prices relate.

¹⁰ Additional variables such as the number of dwelling units per household, net migration as a proportion of regional population, and regional unemployment rates were also considered. However, the empirical analysis did not reveal stable or plausible effects from these additional variables.

D. Results

14. Apartment prices in Seoul are driven by real incomes and interest rates. The analysis indicates that there is one long-run relationship in the data for Seoul. Statistical tests show that in the long run, prices have a unit income elasticity, meaning that a 1 percent change in Seoul GDP translates into a 1 percent change in Seoul prices. Interest rates carry an unexpected positive sign, consistent with buyers moving into property assets when the returns that can be earned from tenant cash deposits are high. Adjustment to eliminate disequilibrium is estimated to occur at a rate of 2.6 percent per month. Put differently, if prices are initially 10 percent above equilibrium, then after a year they will on average have adjusted downward to be 3.6 percent above equilibrium, a fairly rapid rate of convergence.

15. For the capital area outside Seoul, spatial effects dominate. After accounting for the effects of regional prices, statistical tests show that regional incomes play no role in the long-run equilibrium for Incheon and Gyeonggi-do (although incomes do matter for short-run price dynamics). In both regions, the data accepts the hypothesis of a long-run unit elasticity on the spatially weighted price index. For Incheon, the bordering regions are Seoul and Gyeonggi-do; for Gyeonggi-do, they are Seoul, Incheon, and three non-Metropolitan markets. The estimated unit elasticity on implies that a 1 percent change in neighboring prices eventually translates into a 1 percent change in home region prices. Note that this estimate does not imply, for example, that median apartment prices in the regions will adjust to the same level as median prices in Seoul—the model's region-specific fixed effects account for such level differences. For Incheon, the speed of adjustment towards equilibrium is similar to that seen in Seoul, at 3 percent per month; for Gyeonggi-do, adjustment is more rapid, at 8 percent per month.

16. Capital region prices are not notably over-valued. Figure 3 in the main text shows the model-based valuation measure for the capital area. Overall, apartment prices are estimated to have been running around 5 percent above their long-run level in the first quarter of 2019. Looking in more detail at the constituent regions of the capital area, we see that real apartment prices in Seoul have been growing a little ahead of incomes. At the same time, Incheon prices have been running behind those in Seoul and Gyeonggi-do, and so in the long run can be expected to rise. For Gyeonggi-do, real prices have been growing at a similar pace to those in bordering regions, and so are estimated to be close to their equilibrium level. For Gyeonggi-do, the 'ripple effect' of Seoul prices is clearly visible in the close co-movement in the valuation measures between the regions. The underlying mechanism may be net internal migration, as Gyeonggi-do has also seen in-migration close to 10 percent of population in 2018-19, while Seoul has seen out-migration of a similar magnitude over the same period.

Appendix I Table 2: Real Apartment Prices, Long-Run Equilibrium

Coefficient	Value		
	Seoul	Incheon	Gyeonggi-do
Real apartment price	1.0 (-)	1.0 (-)	1.0 (-)
Real income per capita	-1.0 (-)	0 (-)	0 (-)
Jeonse price	0 (-)	-	-
Spatially-weighted apartment price	-	-1.0 (-)	-1.0 (-)
Real long-term interest rates	-0.075 (0.0089)	0.010 (0.0032)	-0.024 (0.00371)
Constant	-7.32 (0.045)	0.67 (0.013)	-0.072 (0.018)
Speed of adjustment (per month)	-0.026 (0.0095)	-0.030 (0.026)	-0.076 (0.028)
Test of over-identifying restrictions (<i>p</i> -value)	0.29	0.55	0.04
Number of cointegrating relations (<i>r</i> [*])	1	2	3
Max eigenvalue statistic (<i>r</i> [*] ≤ <i>r</i>), <i>p</i> -value	0.08	0.06	0.05
Trace statistic, <i>p</i> -value	0.01	0.02	0.05
Note: absolute value of standard errors in parentheses.			

E. Data Sources

17. Korea has excellent regional time series data on its regional economies. There are 17 main administrative provinces, of which 8 are metropolitan areas including Seoul, and 9 are non-metropolitan regional areas. (The city of Sejong and the region of Jeju-do have ‘special’ status and will be excluded.) The smallest of the metropolitan cities (Ulsan) has a population of 1.2 million. By contrast, the population of Seoul is close to 10 million. For each regional unit, data is available on house, rent prices, and jeonse prices; GDP per capita and personal income per capita; and housing units per capita; these series are available at differing frequencies. Housing per capita is available in waves: 2017, 2016, 2015, 2010, 2005, 2000, 1995.

18. Apartment price data is from the Korea Appraisal Board and Kookmin bank. The underlying KAB transaction price data on comes in pre- and post-2012 vintages, which we splice together by rebasing as needed. To construct spatially-weighted prices, we rescale our indexes by median house prices available from 2013 from KB. We then apply a spatial weighting matrix which has a unit entry for every region that borders or has a vertex that touches another region. We then row-normalize the weight matrix in standard fashion.

19. To convert nominal house prices into real terms, we deflate using regional CPI data. Regional CPI is available monthly back to 1985. Different studies have followed a variety of

approaches. Cameron and others (2006) deflate UK regional house prices using the national consumer expenditure deflator. Song (2008) studies the regional Korean market, and deflates using the nationwide consumer price index.¹¹ For the US, Del Negro and Otrok (2008) use the national core personal consumption expenditure deflator, while Holly and others (2010) use the state-level ‘general price index’. It seems theirs is the only study that uses a regional deflator for regional data.

20. To obtain monthly regional income we interpolate annual data with higher frequency data. We employ a standard filtering approach, treating GDP as a flow variable to be interpolated with other series (Harvey, 1989; Ch. 6.3). Regional GDP is available at the annual frequency, but monthly indices of production, employment and unemployment rates, and retail sales are available.¹² A complication is that data for Gyeongsangnam-do includes the metropolitan city of Ulsan until 1997. From 1998 Ulsan is separate, necessitating adjustments to GDP for Gyeongnam-do. However, for the purposes of this exercise the break is outside our sample, so will not discuss the issue further.

21. We convert interpolated monthly regional income to a per capita basis. Regional population figures are available at either the annual or (for earlier data vintages) at semi-decadal intervals. We interpolate to a monthly frequency using a cubic spline, then divide income by population to obtain regional monthly real income per capita.

¹¹ Many of the other studies for the Korean market fail to mention which price measure is used.

¹² We avoid using whole-country aggregates to interpolate regional data, as this practice would tend to simply reproduce national patterns.

References

- Adrian, Tobias and Markus K. Brunnermeier (2016): "CoVaR", *American Economic Review* 106(7): 1705–1741.
- Adrian, Tobias, Giovanni Dell’Ariccia, Vikram Haksar, and Tommaso Mancini-Griffoli (2018): "Monetary policy and financial stability", in *Advancing the Frontiers of Monetary Policy*, T. Adrian, D. Laxton, and M. Obstfeld (eds): 69–82. International Monetary Fund, Washington DC.
- Adrian, Tobias and Hyun Song Shin (2008): "Financial intermediaries, financial stability, and monetary policy", *Jackson Hole Economic Symposium Proceedings*: 287–334. Federal Reserve Bank of Kansas City.
- Akinci, Ozge and Jane Olmstead-Rumsey (2018): "How effective are macroprudential policies? An empirical investigation", *Journal of Financial Intermediation* 33: 33–57.
- Alam, Zohair, Adrian Alter, Jesse Eisemann, R. Gaston Gelos, Heedon Kang, Machiko Narita, Erlend Nier, and Naixi Wang (2019): "Digging deeper: Evidence on the effects of macroprudential policies from a new database", *IMF Working Paper* 19/66.
- Baba, Naohiko and Ilhyok Shim (2014): "Dislocation in the Won-Dollar swap markets during the crisis of 2007–2009", in *Volatile Capital Flows in Korea*, Chung et al. (eds.): 143–176. Palgrave.
- Banka Slovenije (2017): *Macroprudential Policy for the Banking Sector: Strategic Framework*. URL: <https://www.bsi.si/en/financial-stability/macroprudential-supervision/macroprudential-policy-strategy>
- Becker, Bo and Victoria Ivashina (2015): "Reaching for yield in the bond market", *Journal of Finance* 70(5): 1863–1902.
- BCBS (2019a): "Towards a sectoral application of the countercyclical capital buffer", Working Paper 36. Bank for International Settlements. Basel.
- BCBS (2019b): "Guiding principles for the operationalisation of a sectoral countercyclical buffer". Bank for International Settlements. Basel.
- Brownlees, Christian and Robert F. Engle (2017): "SRISK: A conditional capital shortfall measure of systemic risk", *Review of Financial Studies* 30(1): 48–79.
- CGFS (2016): "Objective-setting and communication of macroprudential policies", *CGFS Papers* 57. November.

- Cho, Sungbin and Joon-Ho Hahm (2014): "Foreign currency non-core liabilities and macroprudential levy in Korea", *Emerging Markets Finance and Trade* 50(6): 5–18.
- Choi, Chango (2014): "Impact of FX-related macroprudential measures in Korea: An assessment", in *Volatile Capital Flows in Korea*, Chung et al. (eds.): 187–216. Palgrave.
- Chung, Kyuil, Hail Park, and Changho Choi (2014): "Overview of international capital flows", in *Volatile Capital Flows in Korea*, Chung et al. (eds.): 3–24. Palgrave.
- Committee on the Global Financial System (2016): "Objective-setting and communication of macroprudential policies", CGFS Papers No. 57. BIS.
- Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini (1999): "What caused the Asian currency and financial crisis?", *Japan and the World Economy* 11: 305–373.
- Dell’Ariccia, Giovanni, Luc Laeven, and Gustavo A. Suarez (2017): "Bank leverage and monetary policy’s risk-taking channel: Evidence from the United States", *Journal of Finance* LXXII(2): 613–654.
- De Paoli, Bianca and Matthias O. Paustian (2017): "Coordinating monetary and macroprudential policies", *Journal of Money, Credit & Banking* 49(2-3): 319–349.
- Drehmann, Matthias and James Yetman (2018): "Why you *should* use the Hodrick-Prescott filter—at least to generate credit gaps", BIS Working Paper 744.
- ESRB (2014): *Flagship Report on Macro-prudential Policy in the Banking Sector*.
- Financial Stability Board (2019): *Evaluation of the effects of financial regulatory reforms on small and medium-sized enterprise (SME) financing*. November.
- Gadatsch, Niklas, Lukas Mann, and Isabel Schnabel (2018): "A new IV approach for estimating the efficacy of macroprudential measures", *Economics Letters* 168, 107–109.
- Hahm, Joon-Ho, Frederic S. Mishkin, Hyung Song Shin, and Kwanho Shin (2012): "Macroprudential policies in open emerging economies", NBER Working Paper 17780.
- Hamilton, James D. (2018): "Why you should never use the Hodrick-Prescott filter", *Review of Economics and Statistics* 100(5), 831–843.
- Harvey, Andrew C. (1989): *Forecasting, structural time series models and the Kalman filter*. Cambridge.

- Holly, Sean, M. Hashem Pesaran, and Takashi Yamagata (2010): "A spatio-temporal model of house prices in the USA", *Journal of Econometrics* 158: 160-173
- Holly, Sean, M. Hashem Pesaran, and Takashi Yamagata (2011): "The spatial and temporal diffusion of house prices in the UK", *Journal of Urban Economics* 69: 2-23.
- Hwang, Moon-Woo (2017): "FX related macroprudential policies in Korea: A study on the effect of the FX derivatives position ratio policy on the banks' foreign borrowings", in P. Tillmen (ed) *Global Liquidity and the Impact on SEACEN Economies*. SEACEN Research and Training Centre.
- Igan, Deniz and Heedon Kang (2011): "Do loan-to-value and debt-to-income limits work? Evidence from Korea", *IMF Working Paper* WP/11/297.
- International Monetary Fund (2012): "The liberalization and management of capital flows: An institutional view". November. Washington, DC.
- International Monetary Fund (2013): "The interaction of monetary and macroprudential policies", Board Discussion Paper. January. Washington, DC.
- International Monetary Fund (2014a): "Staff guidance note on macroprudential policy", Board Paper. November. Washington, DC.
- International Monetary Fund (2014b): "Staff guidance note on macroprudential policy—Detailed guidance on instruments", Board Paper. November. Washington, DC.
- International Monetary Fund (2017a): "Increasing resilience to large and volatile capital flows: the role of macroprudential policies—case studies", *IMF Policy Paper*. Washington, DC.
- International Monetary Fund (2017b): *Global Financial Stability Report*, April. Washington, DC.
- International Monetary Fund (2018): *Annual Report on Exchange Arrangements and Exchange Restrictions*. Washington, DC.
- International Monetary Fund (2019a): *External Sector Report: The Dynamics of External Adjustment*. July. Washington, DC.
- International Monetary Fund (2019b): *Global Financial Stability Report*. April. Washington, DC.
- Jahn, Nadya and Mara Pirovano (2019): "Understanding the specific features of the CCyB and SCCyB—evidence from the 3D DSGE model", *ECB Macroprudential Bulletin*, September. URL: https://www.ecb.europa.eu/pub/financial-stability/macprudential-bulletin/html/ecb.mpbu201909_01~b0f121ee33.en.html

- Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina (2014): "Hazardous times for monetary policy: What do twenty-three million bank loans say about the effects of monetary policy on credit risk-taking?", *Econometrica* 82(2): 463–505.
- Jorda, Òscar, Moritz Schularick and Alan M. Taylor (2016): "The great mortgaging: housing finance, crises and business cycles", *Economic Policy* 31(85): 107–152.
- Jung, Hosung and Jieun Lee (2017): "The effects of macro-prudential policies on house prices: Evidence from an event study using Korean real transaction data", *Journal of Financial Stability* 31: 167–185.
- Jung, Kyuchul (2019): "Evaluation and implications of the recent disinflation", *KDI Economic Outlook* 36(2), Part 2.II.
- Kaminsky, Graciella, Sual Lizondo, and Carmen M. Reinhart (1998): "Leading indicators of currency crises", *IMF Staff Papers* 45(1): 1–48.
- Kang, Jong Ku (2017): "The relationship between monetary and macroprudential policies", *KDI Journal of Economic Policy* 39(1): 19–40.
- Kang, Taesoo and Guonan Ma (1999): "Credit card lending distress in Korea in 2003", BIS papers 46, *Household debt: implications for monetary policy and financial stability*.
- Kim, Kyung-Hwan (2004): "Housing and the Korean economy", *Journal of Housing Economics* 13: 321–341.
- Kim, Young-II (2019): "Risks of short-termism in macro-prudential policy making: The case of household debt in Korea", *KDI Policy Forum* 272. Korea Development Institute, February.
- Kim, Young-Se (2011): "Housing price convergence in Korea: Do purchase price and jeonse price have in common?", *Korea and the World Economy* 12(1): 211–238.
- Kim, Kyungmin and Joo Yong Lee (2017): "Estimating the effects of FX-related macroprudential policies in Korea", *International Review of Economics and Finance* 50: 23–48.
- Kuttner, Kenneth N. and Ilhyok Shim (2016): "Can non-interest rate policies stabilize housing markets? Evidence from a panel of 57 economies", *Journal of Financial Stability* 26: 31–44.
- Laureys, Lien and Roland Meeks (2018): "Monetary and macroprudential policies under rules and discretion", *Economics Letters* 170: 104–108.

- Lee, Soo Jin and Hyungjoon Ray Lim (2017): "Does credit rationing really exist in Korea? Evidence from the SME loan market", *Korea Journal of Financial Studies* 46(3). Korean Securities Association, Seoul. [In Korean]
- Lee, YongHoi and SeungWha Lee (2018): "A study on the effects of macroprudential policies using panel VAR model—with a focus on the apartment prices of the Seoul metropolitan area", *Financial Supervisory Research* 5(2). October. [In Korean]
- Lindé, Jesper (2018): "DSGE models: Still useful in policy analysis?", *Oxford Review of Economic Policy*, 34(1-2): 269–286.
- Meeks, Roland (2017): "Capital regulation and the macroeconomy: Empirical evidence and macroprudential policy", *European Economic Review* 95: 125–141.
- Mester, Loretta J. (2017): "The nexus of macroprudential supervision, monetary policy, and financial stability", *Journal of Financial Stability* 30: 177–180.
- Ministry of Strategy and Finance (2014): "Economic policy direction of the new economic team", *Press Release*. July 24. Republic of Korea. [In Korean]
- Organisation for Economic Cooperation and Development (2019): *Financing Entrepreneurs and SMEs 2019: An OECD scoreboard*. URL: <https://doi.org/10.1787/23065265>.
- Rey, Hélène (2016): "International channels of transmission of monetary policy and the Mundellian trilemma", *IMF Economic Review* 64(1): 6–35.
- Shin, Hyun Song (2015): "Macroprudential tools, their limits and their connection with monetary policy", remarks at the IMF Spring Meetings. URL: <https://www.bis.org/speeches/sp150415.htm>.
- Shleifer, Andrei and Robert Vishny (2011): "Fire sales in finance and macroeconomics", *Journal of Economic Perspectives* 25(1): 29–48.
- Song, Joonhyuk (2008): "House prices and monetary policy: A dynamic factor model for Korea", *Journal of the Korean Economy* 9(3): 467–496.
- Stankova, Olga (2019): "Frontiers of economic policy communications", *IMF Communications Department Paper* 19/08. International Monetary Fund.
- Svensson, Lars E. O. (2017): "Cost-benefit analysis of leaning against the wind", *Journal of Monetary Economics* 90: 193–213.

Tierno, Paul (2019): "Can Korea move beyond government-backed small business lending?", Pacific Exchange Blog, Federal Reserve Bank of San Francisco. URL: <https://www.frbsf.org/banking/asia-program/pacific-exchange-blog/beyond-small-business-lending-korea/>