

The Operation of Macro Prudential Policy Measures

The Case of Korea in the 2000s

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Introduction

The 2008 global financial crisis highlighted the need to adopt a macro prudential approach to financial stability, beyond micro prudential regulation and supervision. Macro prudential policy (MaPP) refers to a policy framework for addressing the stability of the financial system as a whole rather than its individual components, such as financial institutions or financial markets. At the international level, consensus has formed in favor of applying MaPP frameworks (FSB (Financial Stability Board), IMF (International Monetary Fund), and and BIS (Bank for International Settlements) 2011).

In reality, however, it is not easy for a country to adopt a full-scale MaPP framework. The reasons vary: that the ultimate target of MaPP cannot be clearly defined, for example, enabling it to be pursued without confusion, or that the instruments and tools necessary for MaPP have yet to be fully developed. Reflecting these difficulties, a few scholars and practitioners have begun to devote attention to MaPP instruments. To date, a variety of MaPP instruments have been suggested, but verification of their effectiveness is needed if they are to be applied in the real world (Caruana 2010; Galetti and Moessner 2011).

Many papers evaluating the usefulness of MaPP measures have appeared. For example, BOE (2011) illustrates various kinds of instruments and discusses their pros and cons. Goodhart and others (2012) analyze the effects of MaPP instruments in a general equilibrium model. Hanson, Kashyap, and Stein (2011) evaluate MaPP tools on a conceptual basis. Lim and others (2011) generalize from 49 countries' experiences on how to improve MaPP tool effectiveness. However,

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none of these papers provides detailed know-how concerning the design and operation of MaPP instruments.

This chapter reports the experiences during the 2000s of the Republic of Korea, which operated several MaPP instruments prior to the stressful events of 2008. The instruments were not based on the concepts currently discussed, but did take similar forms. The Korean MaPP scheme seemed to have been systematic; from as early as 1997 Korea applied several types of liquidity ratio regulations, designed for curing the potential weaknesses in domestic banking and foreign currency (FX) transactions, that is, covering the whole financial sector. Later, with a housing boom becoming apparent, Korean authorities introduced a loan-to-value (LTV) ratio and, even later, a debt-to-income (DTI) ratio, in order to stabilize housing prices.¹

Notwithstanding these measures, another round of crisis-like events hit Korea in 2008. In fact, Korea had accumulated a new type of financial imbalance in domestic banking as well as in FX transactions associated in part with the housing market boom. Banks had raised funds through noncore liabilities and expanded their lending to households in line with strong housing prices. To meet the growing demand for FX derivatives transactions, meanwhile, banks had begun to rely on short-term foreign borrowings.

The Korean case in the 2000s will provide a basis for evaluating several MaPP measures from various viewpoints. For a well-defined MaPP framework, the objective, scope, and other elements for the policy need to be specified (FSB, IMF, and BIS 2011). The choices of operational options—such as single versus multiple measures, broad-based versus targeted risks, or fixed versus time-varying application—can also impact MaPP effectiveness (Lim and others 2011). The Korean case can serve as an example to question what went wrong with the operations of MaPP measures with respect to these factors.

This chapter's approach differs from other analyses of the Korean case. For example, Igan and Kang (2011) analyze the effects of the LTV and DTI regulations, but focus only on the MaPP measures for one sector. Hahm and others (2012) discuss the effects of the MaPP measures introduced in recent years since the 2008 event from a retrospective viewpoint and evaluate their effects on the key factors considered to have triggered that event. This chapter, dealing with the whole set of MaPP measures adopted before the 2008 crisis, is able to analyze the effectiveness of the measures in combination with other measures and from a preemptive perspective. In addition, it discusses various aspects of MaPP operation.

First, this chapter briefly describes the financial history of Korea since the early 1990s and the experiences of MaPP in the 1990s. Then it describes the MaPP measures applied in Korea in the 2000s. The chapter then focuses on the process of accumulation of the financial imbalances that became channels for spillover of the 2008 global liquidity contraction. Combining a consideration of these financial imbalances and of the MaPP measures operation, it then discusses what went wrong with the operations of the measures, and the limitations of these tools. Finally, it concludes with a summary and derives some implications for MaPP in the future.

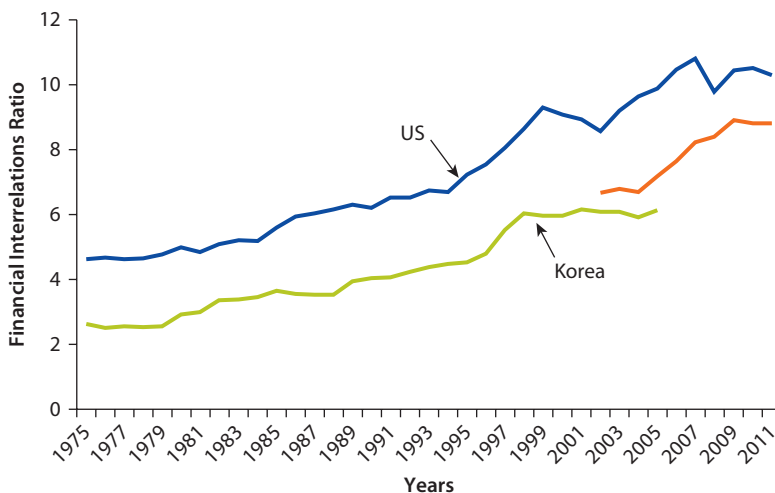
Financial Development since 1990: A Brief History

The Korean financial sector has expanded rapidly since the 1980s. As shown in figure 7.1, the financial interrelations ratio (FIR),² which was less than 3 in 1980, had risen to 9 in 2011. An FIR of 9 is very high, considering that per capita gross domestic product (GDP) in Korea as of 2011 was US\$22,489. The ratio for the United States was only 6 in 1990, when the country's per capita GDP was similar.

Many factors have been in play in the rapid development of the Korean financial sector. Such rapid development was possible thanks to continuous efforts to maintain international competitiveness through structural adjustment, even after successful industrialization, which set the country on a path of persistently high economic growth. Economic growth increased the country's per capita GDP, and thereby created a basis for demand for financial assets.

A variety of development strategies have been pursued in the financial sector in accordance with the stages of economic development. In the early development era, the 1960s, a policy of financial repression was inevitably adopted to ensure the allocation of scarce financial resources toward the industrial sector. In the 1980s, however, the repressed financial sector began to be liberalized. This financial liberalization gave rise to the introduction of financial instruments designed to allow the market to decide interest rates; the establishment of nonbanking financial institutions, resulting in provision of a wide variety of financial instruments; and significant capital market development. The financial markets have been open to the outside world since the 1990s. In the 2000s, the government came up with measures to prevent recurrence of a financial crisis like the 1997 currency crisis, including the introduction of

Figure 7.1 Financial Interrelations Ratio—Comparison of Korea and the United States



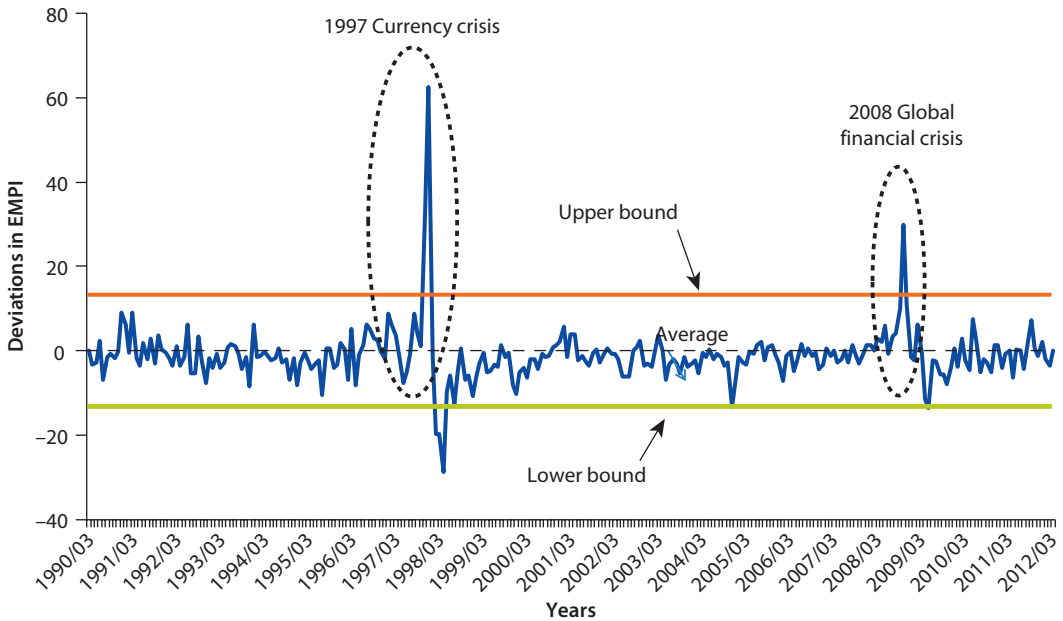
Source: The Bank of Korea Economic Statistics System, FRB, and BEA.

global standards for financial market infrastructures and improvement of the financial supervisory system.

The process of Korean financial development, however, has been a bumpy road, and the financial sector has fallen into crises several times. The FX transaction sector has been particularly vulnerable, and has undergone two rounds of currency crisis. An Exchange Market Pressure Index (EMPI) was calculated to analyze the situation of the Korean foreign exchange market in light of this history, in accordance with the methods of Kaminsky and Reinhart (1999). When the index exceeds more than twice its standard deviation, the case is considered as a currency crisis.³ The exchange rate and foreign reserves are based on monthly average data. As demonstrated in figure 7.2, the EMPI for Korea surpassed the upper bound in November and December of 1997 and in October of 2008, indicating the occurrences of currency crises.

The 1997 currency crisis can be considered a “typical” financial crisis, in that many financial institutions were seriously damaged by toxic assets and came to be restructured under crisis management programs.⁴ The 2008 crisis, however, can be viewed as only financial market instability, in that it was not accompanied by financial institution restructuring. Nonetheless, a systemic event seems to have happened at that time, considering the observance of phenomena similar to those during a financial crisis, such as a serious weakening of function of the financial sector and consequent rapid shrinkage in the real economy.

Figure 7.2 Exchange Market Pressure Index, Korea



Source: The Bank of Korea Economic Statistics System

The 1997 Currency Crisis and MaPP

This chapter attempts to reinterpret the causes and backgrounds of the two financial crises from the perspective of the MaPP, that is, a new policy framework for financial stability. This section describes the accumulation of financial imbalances and the experiences of MaPP operations in the 1990s.

The Financial Sector in the 1990s

Until the 1990s, Korea's financial sector had a dualistic structure, that legacy of former government-led economic development strategies. One financial subsector was under strict government control and another subsector was fully liberalized. This dualistic structure was one of the main reasons Korea was hit so hard by the effects of the 1997 Asian financial crisis that spread across the world.

Some background on the history of financial development in Korea is needed to better understand the situation. In the 1950s, the Korean economy was stuck in a vicious cycle of poverty caused by collapse of its industrial production base following a series of national events, such as liberation from Japanese colonial occupation, territorial division (1945), the Korean War (1950), and political instability during the 1950s. The Korean economy began a leap forward in the early 1960s when the newly established government proceeded with a strong economic development plan. In that early stage of economic development, the government nationalized the major banks and involved itself directly in corporate investment while maintaining interest rates at an artificially low level. This so-called financial repression continued until the 1970s.⁵

In the 1980s, the government began financial liberalization along with a shift in policy attitude from favoring government-led economic development to a market-oriented economic development strategy. Several measures were implemented in the 1980s, including introducing market-oriented financial instruments, relaxing requirements for establishment of financial institutions (lowering the barriers to financial market entry), expanding the capital markets, and strengthening the role of the nonbank financial institutions (NBFIs). With a certain level of financial market development, the authority began to liberalize interest rates in the 1990s, and allowed exchange rates to float freely within a certain range.

Despite such financial policies, financial liberalization had not been completed by the 1990s, because the authority had adopted a phased and gradual approach in its implementation of these policies. Thus, in the 1990s, the financial sector of Korea had a "dualistic structure," with one part under strict control by the government and the other driven by free decision making, profit motivation, and market principles.

More specifically, banks were under relatively strict control, whereas NBFIs, merchant banks in particular, enjoyed freedom in conducting their businesses. The deposit, loan, and credit markets were still under pressure, whereas market principles were applied to the certificates of deposit (CDs), commercial papers (CP) and capital markets. In the banking sector, long-term interest rates were liberalized, but controls remained over short-term interest rates. Capital account

liberalization was carried out in reverse order so that the short-term borrowings of financial institutions and companies were liberalized, while long-term borrowings continued to be regulated.

Changes in Financial Structure: Accumulating Financial Imbalances

In the 1990s, the Korean economy seemed sound, at least in the macroeconomic aspect. Table 7.1 shows some broad macroeconomic indicators during the 1990s. The economic growth rate declined compared with that in the 1980s, but was still at a high rate of 8 percent. Inflation, which had risen during the second half of the 1980s, started to gradually ease, a sign of economic stabilization. The current account turned to a deficit, but a small one at less than 1 percent of nominal GDP, and within a manageable range.

No significant destabilizing events occurred in the financial and fiscal sectors. The monetary aggregates were well managed under the monetary aggregate targeting scheme.⁶ Market interest rates fell slowly along with the lower inflation rate. In terms of fiscal policy, the sizes of the fiscal surpluses and deficits were very small compared with nominal GDP, because the fiscal account maintained a balanced position. On top of this, the amount of foreign reserves was on a continuous rise, and the ratio of foreign reserves to imports of goods and services remained at a stable level.

Notwithstanding its macroeconomic soundness, Korea needed to request an emergency loan from the International Monetary Fund (IMF) in November 1997 because of the depletion of its foreign reserves. The 1997 currency crisis in Korea seems to have been caused by exogenous factors, such as spillovers from the Asian crisis. However, the internal financial imbalances accumulated in the course of gradual financial liberalization had heightened the Korean economy's vulnerability to such spillovers.

Table 7.1 Macroeconomic Indicators in the 1990s

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Economic growth rate (%)	9.3	9.7	5.8	6.3	8.8	8.9	7.2	5.8	-5.7
Inflation rate (%)	8.6	9.3	6.2	4.8	6.3	4.5	4.9	4.4	7.5
Current account (Bil.\$)	-1.4	-7.5	-2.2	3.0	-3.5	-8.0	-23.0	-8.2	42.6
(% in GDP)	-0.5	-2.4	-0.7	0.8	-0.8	-1.5	-4.0	-1.5	11.9
M2 (%. y-o-y)	27.9	23.1	20.4	21.5	20.0	19.7	20.9	18.0	23.6
Bank lending (%. y-o-y)	18.4	20.8	15.0	12.0	18.0	12.2	16.2	13.1	-0.1
NBFI lending (%)	—	—	—	—	25.9	22.4	20.3	18.3	-13.0
Interest rate ^a (%)	16.5	18.9	16.2	12.6	12.9	13.8	11.9	13.4	15.1
Stock price (%. y-o-y)	-23.5	-12.2	11.0	27.7	18.6	-14.1	-26.2	-42.2	49.5
Fiscal balance (% of GDP)	-0.8	-1.7	-0.6	0.3	0.4	0.3	0.2	-1.4	-3.7
Foreign reserves (Bil.\$)	14.8	13.7	17.2	20.3	25.7	32.7	33.2	20.4	52.0
(% of imports)	21.2	16.8	21.0	24.2	25.1	24.2	22.1	14.1	55.8

Source: The Bank of Korea Economic Statistics System.

Note: ^a Yields on corporate bonds of AA- grade with 3-year maturities — = not available.

In the 1990s, notable financial imbalances existed in both the real and financial sectors driven by expansions in borrowings by the corporate sector and financial institutions' short-term foreign borrowings.

Since the early developmental era, the demand for financial resources had always exceeded the supply because of the government's direct control over the financial sector. Against this backdrop, financial liberalization, even though it was pursued gradually, led companies to borrow money relatively freely from the sectors that had been liberalized. As a result, the amount of company financing through NBFIs or the capital market increased sharply, as the banking sector remained tightly regulated under the monetary targeting regime.

Examining changes in the sources of corporate financing during the 1990s (table 7.2), we see significant increases in the issuance of securities and bonds. NBFIs also became major lending partners of business firms, with their shares rising to equal those of commercial banks. In addition, business firms increased their reliance on overseas borrowings (foreign debt).

Thus, with financing through banks remaining restricted, companies expanded their borrowings from the liberalized financial markets where access was easier. As shown in figure 7.3a, the ratio of total corporate debt to nominal GDP rose sharply until just before the outbreak of the currency crisis; figure 7.3b tells a similar story about the debt-to-equity ratio, which also began to rise again, exceeding 400 percent in 1997.

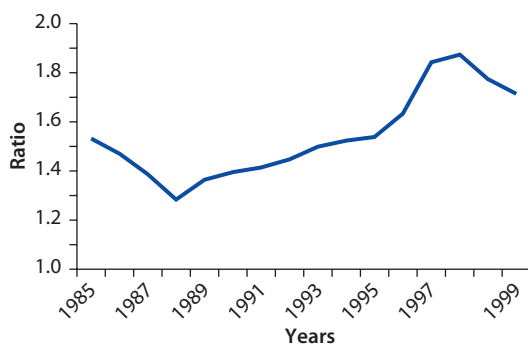
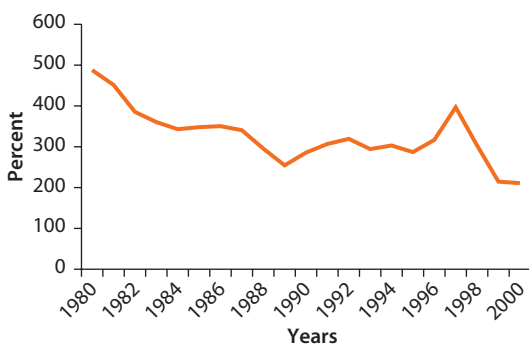
The short-term overseas borrowings were owed mainly by domestic banks. As shown in table 7.3, foreign debt more than doubled from US\$83.6 billion to US\$170.6 billion during the period from 1994 until the end of the third quarter of 1997, just before the outbreak of the currency crisis. Categorizing this foreign debt by maturity, short- and long-term debts showed similar increases of US\$42 billion and US\$45 billion, respectively. Banks increased their short-term debt

Table 7.2 Sources of Corporate Financing

	<i>(share in total borrowings, %)</i>								
	1990 (A)	1991	1992	1993	1994	1995	1996 (B)	B-A	1997
Short-term Notes	6.2	4.6	5.2	6.7	6.4	7.8	9.2	3.1	7.9
(CP)	4.8	3.2	3.8	5.3	5.3	7.0	8.6	3.8	7.4
Long-term Bonds	12.4	14.9	15.2	15.9	16.0	16.3	17.3	4.9	18.6
(Corporate Bonds)	11.0	13.3	13.1	13.3	13.5	13.9	14.8	3.8	14.9
Stocks & Equity	18.3	17.3	16.9	16.6	16.4	16.2	14.8	-3.5	13.1
Loans & Discounts	36.6	37.9	37.6	36.7	38.2	37.4	36.0	-0.6	36.0
(from commercial banks)	18.8	19.0	18.4	17.6	18.2	17.8	17.4	-1.4	17.3
(from NBFIs)	14.6	15.4	15.7	15.6	16.7	16.4	15.5	0.9	15.9
Government Loans	1.1	1.0	1.0	0.9	0.8	0.7	0.5	-0.6	0.8
Trade Credit	10.1	9.8	9.7	9.6	9.2	8.6	8.2	-1.9	8.0
Overseas Borrowings	3.0	2.9	3.2	2.6	2.9	3.3	4.1	1.1	5.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0

Source: The Bank of Korea Economic Statistics System.

Note: Includes public enterprises.

Figure 7.3a Corporate Debt-to-GDP Ratio**Figure 7.3b Debt-to-Equity Ratio**

Source: The Bank of Korea Economic Statistics System.

Table 7.3 Foreign Debt

US\$, billions

	1994.IV (A)	1997.III (B)	Changes (B-A)
Foreign debt	83.6	170.6	87.0
1. Short-term	38.5	80.5	42.0
2. Long-term	45.2	90.1	45.0
A. General government	7.2	6.2	-1.0
B. Monetary authority	0.8	0.5	-0.3
C. Commercial banks	48.4	110.2	61.8
C-a. Domestic banks	34.3	83.5	49.2
C-a.1. Short-term	17.9	41.7	23.7
C-a.2. Long-term	16.4	41.8	25.4
C-b. Foreign banks	14.1	26.7	12.6
C-b.1. Short-term	11.9	23.0	11.1
C-b.2. Long-term	2.2	3.7	1.5
D. Other sector	27.2	53.7	26.5
D-a. NBFIs	0.1	1.7	1.6
D-b. Public enterprises	3.4	6.4	3.0
D-c. Private enterprises	23.8	45.7	21.9
D-c.1. Short-term	8.4	14.8	6.4
D-c.2. Long-term	15.4	30.9	15.5

Source: The Bank of Korea Economic Statistics System.

much more significantly than other borrowers. During this period, banks' debts increased by US\$61.8 billion overall, out of which short-term debts accounted for more than half, at US\$34.9 billion.

The expansion in banks' foreign borrowing was attributable to a domestic and overseas financial gap. The corporate sector's demand for capital was high at the time, and could not be met in the domestic financial markets with their limited

size. Banks consequently intermediated the funds needed by relying on foreign borrowings with relatively low interest rates. Most Korean companies at that time had difficulties raising foreign capital because of their low reputations in the global market; thus, they had to borrow from domestic financial institutions.

The problem, of course, was that the financial institutions were borrowing foreign capital mainly on a short-term basis, since, in the process of gradual capital-account liberalization, short-term borrowing was liberalized while long-term borrowing was still regulated. As a result, short-term foreign debts increased rapidly, and domestic financial institutions became exposed to risks of sudden stops.

In fact, the excessive corporate borrowings and rapid increase in banks' short-term foreign debts were the immediate causes of the 1997 currency crisis. Some companies became insolvent in early 1997 because of their high interest costs due to their overborrowing and squeezed earnings with the economic contraction, leading to a series of bankruptcies of conglomerations. These bankruptcies brought about doubts as to the quality of banks' balance sheets since the banks had intermediated huge amounts of money to these companies.

In parallel with this development in the domestic financial market, the international financial markets faced a liquidity crunch with the Asian crisis spreading worldwide. In July 1997, Thailand gave up defending the value of the baht after speculative attacks on it, giving rise to the currency crisis. As the crisis spread to other parts of Southeast Asia, foreign currency liquidity began to dry up. As a result, foreign lenders became reluctant to roll over their loans to Korean banks whose abilities to repay their foreign borrowings were strongly suspicious. The short-term foreign debts of these banks were supported in part by the central bank's foreign reserves, but only for a short time, after which the currency crisis broke out in Korea.

MaPP in the 1990s

Financial supervision in Korea in the 1990s was much different from modern financial supervision. At that time, the supervisory authorities did not set a supervision target, and could not, therefore, persistently pursue such a target. There are many objectives of financial supervision: enhancing the efficiency of the financial markets, maintaining competition, protecting financial consumers, securing the soundness of financial institutions, and others.⁷ However, none of these objectives were elucidated as objectives of financial supervision in the 1990s.

At that time, as in the era prior to financial liberalization, financial supervision was focused on the efficiency of credit allocation. The financial sector was supposed to carry out its traditional role of supporting economic activities in the real sector, an idea regarded as reasonable ever since the launch of the government-led economic development plans. From this point of view, it was widely accepted that companies endeavor to expand their businesses by expanding their debt.

Note that the sectors that had been liberalized were not supervised. Merchant banks, for instance, were not regulated or supervised in respect of their corporate lending, foreign borrowing, and so on (Kim and Lee 2010).⁸ Accordingly, the financial supervisory system at the time was unable to detect the accumulation

of financial imbalances caused by excessive corporate borrowing and financial institutions' short-term debt extension. In this respect, the financial supervision system was both lax and insufficient, and therefore to blame for facilitating the 1997 currency crisis (Chopra et al. 2001, Kim and Lee 2010, and others). With the lack of adequate and suitable financial supervisory function, macro prudential supervision could not exist.

However, a variety of prudential measures did exist. To name a few, the Bank for International Settlements capital adequacy ratio (BIS CAR) had been implemented in 1993.⁹ Financial institutions had also been obliged, since 1991, to maintain a certain ratio of long-term borrowings to long-term lending: 70 percent of outstanding long-term (three-year maturity and more) foreign currency lending had to be matched by long-term foreign currency debt. This ratio was intended to prevent maturity mismatches in foreign currency in the wake of capital liberalization. However, such ratios were merely used as guidelines. There was neither strict inspection of compliance with these ratios, nor ex post imposition of sanctions in cases of violation.

In conclusion, there were no specific macro prudential policies in the 1990s. Financial supervision itself was not sufficient and not well organized. Financial-sector efficiency was given priority in the process of financial liberalization to escape the financial repression that had caused a deep-rooted problem of financial underdevelopment. Neither the financial institutions nor the policy authorities were aware of the necessity of strengthening the financial stability function in parallel with financial liberalization. Some measures that could be considered related to present-day macro prudential policy had been introduced, but their importance had not been recognized.

MaPP Measures in the 2000s

The 1997 currency crisis paved the way for stronger financial regulation, which it was believed would help prevent a recurrence of the crisis. Among the regulations, several can be regarded as the MaPP instruments suggested in recent years. Of course, it should also be recognized that they were not introduced or operated under the current conceptual framework for MaPP, which might be expected to have led to some shortcomings and limitations. Paradoxically, however, even MaPP measures not based on the modern conceptual framework may provide lessons that can facilitate proper MaPP measure operation in the future.

This section will describe the liquidity ratio regulations operated in connection with FX transactions and domestic banking, as well as the LTV and DTI regulations targeting the real estate market.¹⁰

Prudential Measures Related to FX Transactions

After the 1997 currency crisis, Korea was keen to strengthen its banks' abilities to absorb the impacts of unexpected events or shocks in the foreign sector. Thus, the authority introduced or strengthened regulations on banks' FX transactions, which can be seen as the MaPP measures considered here.

Foreign Currency Liquidity Ratio Regulation

Foreign currency liquidity ratio regulation was intended to strengthen banks' abilities to pay off their short-term foreign debts. It was based on the notion that a certain amount of liquid assets maintained by a bank can be immediately used for covering short-term debts, and, with liquid assets above a certain level, the bank may ensure its liquidity. According to the formula initially employed, banks' FX assets with outstanding maturities less than three months should be maintained at above 70 percent of their foreign debts with outstanding maturities less than three months:

$$FX \text{ Liquidity Ratio} = \frac{\text{Liquid assets with maturity of 3 months or less}}{\text{Liquid liabilities with maturity of 3 months or less}} \cdot 100 \geq 70\%$$

This formula was similar to the foreign currency liquidity coverage ratio (LCR) under Basel III (BCBS 2010b, 2010c), but without risk-factor adjustment.¹¹ In addition, it differed from the BCBS's LCR in that the standard maturity was set at three months, while the BCBS's LCR has a one-month maturity.

This ratio was used as the basic regulation to ensure Korean banks' FX liquidity. Introduced in July 1997, just before outbreak of the 1997 currency crisis, it was applied initially only to general banks, but extended in July 1998, right after the currency crisis broke out, to cover special banks. In June 2000, the guideline for the ratio was adjusted upward from 70 to 80 percent in response to signs of a resurgence of banks' short-term borrowings as their FX transaction activities returned to normal with the improved creditworthiness of the Korean banking sector in the international financial markets. The guideline was raised to 85 percent in 2004, when banks' short-term foreign borrowing began to accelerate.

Maturity Mismatch Ratio

To effectively tackle a variety of risks accompanying FX transactions, the maturities were broken down into seven ranges¹² and different liquidity ratios applied. The regulation tried to limit the gap between the amount of FX assets and debts at each maturity range above a certain ratio. For example, the ratio for the maturity range of less than seven days was required to be more than 0 percent (meaning that the amount of assets with maturities less than seven days should match or exceed that of debts with the same maturity), while that for maturities of less than one month had to be larger than -10 percent (meaning that the amount of assets with maturities less than one month should exceed 90 percent of the liabilities with the same maturity).

This requirement was introduced in January 1999 in line with the recommendation of the IMF. Since then, the regulation has been partly amended, for instance, to include forward FX transactions in the coverage, and the amendments have tended to strengthen it.

Ratio of Long-Term Foreign Borrowings

This measure was introduced in 1991 to restrain the practice of setting the maturities for FX lending as long as possible in the early period of capital liberalization.

In the early 1990s, just after the capital account had begun to be liberalized, companies favored long-term FX debt as a stable source of funding. As the banks began to extend the maturities of their FX loans, their maturity mismatches were consequently aggravated. To deal with this problem, the authorities introduced this measure. According to the initial regulation, more than 70 percent of FX loans with maturities above three years had to be funded with foreign debts with maturities greater than three years.

This ratio was eased in April 1993 (from 70 to 50 percent) because it was difficult to comply with and was considered somewhat superfluous. It was difficult to comply with because, in practice, it was impossible for Korean banks to borrow long-term loans in the international financial markets because of their low credibility. It was also considered as a regulation subject to financial liberalization, and its elimination recommended by the Ministry of Finance and Economy's task force for financial deregulation at that time.

The problem with regulation compliance persisted into the 2000s. Korean banks with low external credibility had to pay additional premiums for longer-term borrowings. Thus, they tried to evade the regulation by adding clauses to their loan contracts specifying early redemption.¹³ In consideration of these problems, the criterion for the ratio was lowered from maturities of more than three years to those of more than one year in September 2001, in view of the reality that most of Korean banks' foreign debts had one-year maturities.

This regulation is similar to the net stable funding ratio (NSFR) under Basel III (BCBS 2010b). The differences are as follows: it was applied to FX transactions while the NSFR is for domestic banking, and it was based on maturity only while the NSFR is based on numerical risk factors in addition to maturity.

Foreign Exchange Position Regulation

Broadly speaking, FX position regulations can be regarded as prudential regulations. They may ensure the soundness of financial institutions by reducing losses owing to changes in exchange rates. Position management can narrow the level of currency mismatches, thus reducing the possibility of currency crises.¹⁴

However, this regulation could be used as a means to control exchange rates. Limiting the foreign exchange positions of financial institutions, among the major market participants, to within a certain range may help stabilize foreign exchange rates. From another perspective, therefore, this measure can be criticized as regulation hindering free-market determination of foreign exchange rates.¹⁵

As early as 1964, Korea introduced FX position regulations. The position limit was initially set based on the absolute amount of foreign currency holding,¹⁶ but with the foreign exchange liberalization in 1993 it was revised to be a certain ratio to capital. During the 1997 currency crisis, the overbought position limit was expanded to induce banks' holding of FX liquidity, while the oversold position limit was reduced. In July 1998, operation of the regulation was again changed to comprehensive position management, which is still applied. The position limit has also been continuously expanded, from 15 percent of total capital

at the end of the previous month to 50 percent, in consideration of the view that regulating banks' FX positions was an obstacle to their autonomous management of assets (Ministry of Strategy and Finance 2007).

Recently the government has expressed an intention to abolish the FX position regulation (Ministry of Strategy and Finance 2007), based on the judgment that not much benefit has come from it since financial institutions have managed risks by themselves even after the position limit was expanded. In 2007, the ratio of position use by foreign exchange banks was 10.3 percent on average, far lower than the 50 percent maximum allowed. In addition, it was thought that prudential measures could absorb the position regulation. In fact, at the time the government expressed this intention, prudential regulation was being strengthened with the introduction of Basel II in January 2008.

These MaPP measures for FX transactions are summarized in table 7.4.

Measures for Domestic Banking

As with new regulations for FX transactions, a liquidity ratio-type regulation was applied to domestic banking. It was the major regulation for domestic banking activities, and thus much simpler than the regulation on FX transactions.

Domestic Currency Liquidity Ratio Regulation

Starting in January 1999, right after the currency crisis, the authorities began to specify a domestic currency (DC) liquidity ratio as one of the major guidelines for banks' risk management. Similar to the FX liquidity ratio, this ratio is denoted by dividing liquid assets by liquid debts of maturities set at three months or less:

$$DC \text{ Liquidity Ratio} = \frac{\text{Liquid assets with maturity of 3 months or less}}{\text{Liquid liabilities with maturity of 3 months or less}} \cdot 100$$

Before the 1997 currency crisis, this formula was operated as the ratio of DC liquid assets to total DC deposits, and the guideline figure was set at more than 30 percent. But the formula was revised to its current form to manage liquidity risks from both the asset and the liability side and to make it consistent with international standard.

Assets and liabilities for computation of the liquidity ratio include all types of credits and debts, except for those in trust accounts. These liquid assets and liabilities should reflect the actual maturity, and the reality that assets and debts are actually payable or receivable at the due date. In this sense marketable securities are recognized as liquid assets, with no consideration given to their outstanding maturities. In contrast, noninvestment grade securities and pledged securities are excluded from liquid assets.

In March 2002, the DC liquidity ratio guideline was strengthened. Because the liquidity ratios of financial institutions had fallen below 100 percent on average from 2001, the rule was revised to send warning signals to banks whose liquidity ratios were below the precautionary level of 105 percent, and to order them to submit plans for improving their financial status.

Table 7.4 MaPP Measures for FX Transactions

Measure	FX Liquidity Ratio	Maturity Mismatch Ratio	Long-term Borrowing Ratio	FX Position Management
Introduction	July 1997	January 1999	January 1991	1964
Objective	Strengthen banks' ability for FX debt payment	Ensure FX liquidity	Curb long-term FX loans	Reduce FX risk
Formula	$\frac{\text{Assets (3m maturity)}}{\text{Liabilities (3m maturity)}} \times 100$	$\frac{\text{FX Assets} - \text{FX Liabilities}}{\text{Total FX Assets}} \times 100$	$\frac{\text{FX borrowing of 3 years} + \text{FX loans of 3 years}}{\text{FX loans of 3 years} + \text{FX assets}} \times 100$	O/B position/capital O/S position/capital
Standard	≥ 70%	7-day GAP: ≥ 0% 1-month GAP: ≥ -10%	≥ 70%	≤ 15%
Scope	General Banks	Domestic Banks	Domestic Banks	Domestic Banks
History				
April 1993	Extended to Special Banks			
July 1998	Reporting: every 3 months → every month		Lower ratio: 70% → 50%	Turn to comprehensive position management
April 1999				
June 2000	Ratio raised: 70% → 80%			
Dec. 2000				Ratio raised: 15% → 20%
March 2001	Forward FX included	Forward FX included	FX loan provisions excluded from FX assets	
Sept. 2001			Maturity shortened: 3-year or more → 1-year or more	
Jan. 2002	Narrower core FX liabilities	Narrower core FX liabilities	Core FX deposits recognized as stable liabilities	
April 2004	Ratio raised: 80% → 85%		Ratio raised: 50% → 80%	Extended to forward FX
July 2005				O/B position: 20% → 50%
Aug. 2006				O/S position: 20% → 50%
Dec. 2007				

However, in August 2006 the scheme was eased significantly: The precautionary ratio level was abolished and authorities allowed the banks to include reserve requirements at the central bank and CDs owned by banks in the class of liquid assets. Further, credit card receivables and other type of receivables were included in the liquid assets. This revision of the scheme meant a lower guideline in practice (down from 105 percent to 100 percent) for the liquidity ratio allowed, and much more capacity to lend domestic currency funds.

The reasons behind this easing of the liquidity ratio are unclear. The authorities said they did it to keep pace with developed countries, as the ratios of Korean banks had improved significantly (FSC and FSS 2006a). According to media reports at the time, however, financial institutions strongly requested easing of the regulation, arguing that it led to short-term lending to business firms (The Edaily 2006). At the time, long-term mortgage loans were on the increase, and the banks had been managing their corporate lending on a short-term basis to meet the liquidity ratio requirement. The bottom line, however, was that banks had to expand their loans to maximize profits, and the liquidity ratio seemed an obstacle to profit maximization.

In any case, the 2006 revision toward deregulation, or easing, was clearly a factor behind the rapid expansion in bank lending. In this regard, it should be considered a mistake in MaPP measure operation, since banks' overlending caused liquidity problems in the wake of the 2008 financial turmoil. This issue will be discussed in detail later.

Loan-to-Deposit Ratio Regulation

In the 1990s, the loan-to-deposit (LTD) ratio was a major management guideline. At that time the ratio of core disposable funds (disposable deposits + domestic currency financial debentures + capital) to loans had to be less than 100 percent, to preclude any shortage of liquidity. This requirement was abolished in January 1999, however, after introduction of the DC liquidity ratio regulation, as part of the regulatory easing efforts (FSC and FSS 1998).

Measures for the Real Estate Market

In September 2002, the authority introduced a LTV regulation to stabilize real estate prices after housing prices had soared suddenly from around 2001. The LTV ratio was first set at 60 percent, and has since then been strengthened to as low as 40 percent in some regions:

$$LTV = \frac{\text{Mortgage loans} + \text{Senior lending on houses} + \text{Rent security received}}{\text{House price}}$$

In August 2005, a DTI regulation was implemented because real estate prices continued to rise despite the variety of measures taken including the LTV ratio requirement. The DTI ratio has been strengthened since its introduction, and the target group for its application expanded:

$$DTI = \frac{\text{Annual mortgage and other loan payments}}{\text{Annual income}}$$

The LTV and DTI regulations were implemented in combination with a variety of other policies. In calculating the BIS capital adequacy ratio, the risk-weighting for mortgage loans was increased. From a short-term perspective, the authorities adopted various measures to deter real estate demand; the rates of taxation for real estate ownership and transactions were raised; the administrative procedures were strengthened; and a new tax was levied on real estate development profits. Longer-term policies to expand housing supply, such as new town development plans, have also been pursued.¹⁷

The LTV and DTI regulations are characterized by the fact that they can target very specific areas or groups. In the early 2000s, real estate prices had begun to rise, mainly in certain parts of Seoul, and the regulations were applied first to these areas. Even after the housing price boom had spread to other regions, the regulations were applied only to some regions designated as “speculative zones,¹⁸” rather than on a nationwide basis. The regulations could also be differentiated in accordance with the types of financial institution they concerned, and be customized to the characteristics of individual financial institutions and users. Their flexibility was another advantage of these regulations. Whereas real estate market conditions have changed continuously, authorities have been able to change the targets of regulation flexibly, as demonstrated in table 7.5. Comparing the DTI with the LTV, the advantage of the DTI has been that it could be used to curb speculative demand among those in certain income brackets, and has been effective in curbing real estate speculation or demand for owning homes by asset holders whose incomes were unclear.¹⁹

Table 7.5 History of LTV and DTI Regulation

<i>LTV Ceilings</i>				
<i>Date</i>	<i>Ceiling (%)</i>	<i>Target</i>		
		<i>Loan Type</i>	<i>Region</i>	<i>FIs</i>
Sept. 2002	60	all	ESZ	B & I
Oct. 2002	60	all	all	B & I
May 2003	60 → 50	loans with 3-year maturity or less	SZ & ESZ	B & I
Oct. 2003	50 → 40	loans for apartment purchase with 10-year maturity or less	SZ	B & I
March 2004	60 → 50	loans for housing purchase with 3-year maturity or less	SZ & ESZ	B & I
	60 → 70	loans with 10-year maturity or more	all	all
June 2005	60 → 40	loans for apartment purchase of 600+ mW, with 10-year maturity or more	SZ	B & I
Nov. 2006	60 → 50	loans for housing purchase of 600+ mW, with 10-year maturity or less	SZ	all
Nov. 2008	(exempt)		Except 3 Dist. in Seoul	all FIs
July 2009	(reapply) 60 → 50	loans for purchase of housing of 600+ mW	Seoul Metropolitan	Banks
Oct. 2009	(extend)			all

table continues next page

Table 7.5 History of LTV and DTI Regulation (continued)

<i>DTI Ceilings</i>					
<i>Date</i>	<i>Change</i>	<i>Ceiling (%)</i>	<i>Application to</i>	<i>Region</i>	<i>FIs</i>
Aug. 2005	Introduction	40	single under 30, married with debt	SZ	all FIs
March 2006	Extension	40	loans for housing purchase of 600+ mW	SZ	all FIs
Nov. 2006	Extension	40	all housing loans	ESZ	B & I
Feb. 2007	Extension	40-60	loans for housing purchase of 600+ mW		Banks
Aug. 2007	Extension	40-70			NBFIs
Nov. 2008	Removal		Except for 3 districts in Seoul		all FIs
Sept. 2009	Reapplication	40	3 districts in Seoul	SZ	Banks
		50	other metropolitan	Metropolitan	Banks
Aug. 2010	Exemption		debtors with less than 2 houses	non-SZ Metropolitan	all FIs

Source: Various press releases by the FSS and other authorities.

Note: SZ: Speculative Zone

ESZ: Excessively Speculative Zone

B: Banks

I: Insurance Companies

The LTV and DTI regulations have drawbacks. The LTV and DTI implemented in Korea were ex-post-facto measures, rather than ex-ante ones. In other words, they were applied after real estate prices had already gone up, and were not effective in stabilizing prices due to these ex-post-facto characteristics.

Financial Imbalances in the 2000s, and Effects of the U.S. Financial Crisis

Notwithstanding the MaPP measures described in the previous section, a new type of financial imbalance accumulated as the economy and financial markets evolved. This section focuses on these financial imbalances which have amplified the impacts of the 2008 U.S. financial crisis on the Korean economy.

The Macroeconomic Situation

In the 2000s, the Korean economy showed signs of escaping the 1997 currency crisis and moving onto a stable path of growth (see table 7.6). Although the economic growth rate was slower than before, it maintained a sound momentum of 5 percent. Inflation, measured by the consumer price index, fell to about 2 percent, far more stable than the annual average of 6 percent seen in the 1990s. In addition, the current account ran continued surpluses with the help of the strong competitiveness of the manufacturing sector. To summarize the overall economic situation in the 2000s, the economy maintained sound and stable economic growth momentum following the successful structural adjustment efforts following the currency crisis.

Table 7.6 Macroeconomic Indicators in the 2000s

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Economic growth rate (%)	0.0	4.0	7.2	2.0	4.6	4.0	5.2	5.1	2.3
Inflation rate (%)	2.3	4.1	2.8	3.5	3.6	2.8	2.2	2.5	4.7
Current account (Bil.\$)	14.0	8.4	7.5	15.6	32.3	18.6	14.1	21.8	3.2
(% in GDP)	2.8	1.7	1.3	2.4	4.5	2.2	1.5	2.1	0.3
M2 (%. y-o-y)	2.2	6.9	11.5	7.9	4.6	6.9	8.3	11.2	14.3
Bank lending (%. y-o-y)	24.2	15.0	32.0	14.1	5.1	8.5	13.9	14.9	14.1
NBFI lending (%)	-12.8	-1.4	-8.2	2.7	4.4	9.6	14.6	19.2	17.6
Interest rate ^a (%)	9.4	7.1	6.6	5.4	4.7	4.7	5.2	5.7	7.0
Stock price (%. y-o-y)	-50.9	37.5	-9.5	29.2	10.5	54.0	4.0	32.3	-40.7
Fiscal balance (% in GDP)	1.1	1.1	3.1	1.0	0.7	0.6	0.7	3.8	1.5
Foreign reserves (Bil.\$)	96.2	102.8	121.4	155.4	199.1	210.4	239.0	262.2	201.2
(% of imports)	59.9	72.9	79.8	86.9	88.7	80.5	77.2	73.5	46.2

Source: The Bank of Korea Economic Statistics System.

Note: ^a Yields on corporate bonds of AA- grade with 3-year maturities.

Financial Imbalances

Although the Korean economy enjoyed stable growth in the 2000s, big structural changes were occurring in the financial sector. Structural changes took place in domestic banking as well as in capital transactions. In parallel with these changes, prices in the asset markets surged. Financial imbalances accumulated and Korea was unable to resolve them before the outbreak of the U.S. financial crisis; thus it was hit hard by its impacts.

The process of financial imbalance accumulation in the 2000s will be reviewed for three sectors: domestic banking, the real estate market, and external capital transactions.

Domestic Banking

One of the most remarkable aspects appearing in the domestic financial sector in the 2000s was the gap in growth between the deposits and loans of commercial banks. Previously, deposits and loans had moved in parallel.²⁰ Beginning around 2002, however, this pattern broke down; the rate of increase in loans greatly exceeded that of deposits, and the trend continued until right before outbreak of the U.S. financial crisis (see figure 7.4a).

As a result of this phenomenon, LTD ratios increased rapidly. The ratio, which was about 80 percent during the 1997 currency crisis, soared to 142 percent in August 2008 just before the Lehman Brothers bankruptcy filing.

The rapid rise in the LTD ratio was made possible through the increase in issuance of noncore liabilities, such as debentures and CDs (see figure 7.5). From 2002, when the gap between deposit and loan growth began, the issuance of bank debentures expanded and the LTD ratio began to rise (see figure 7.4b).

Figure 7.4a Banking Sector Activities

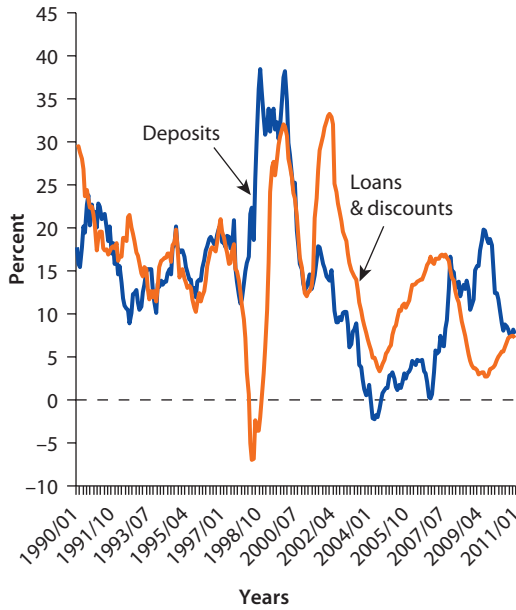
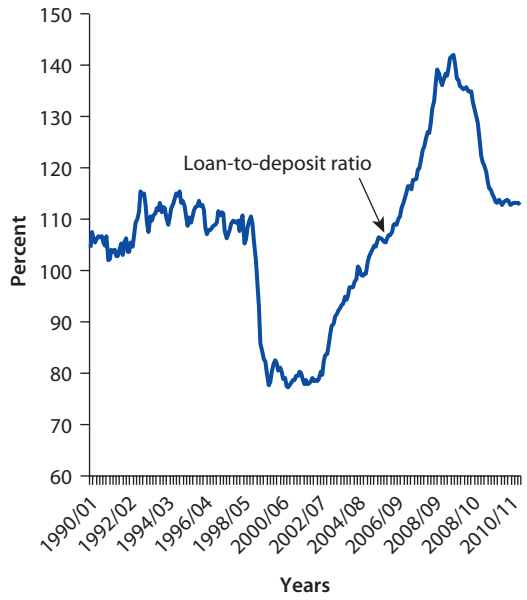
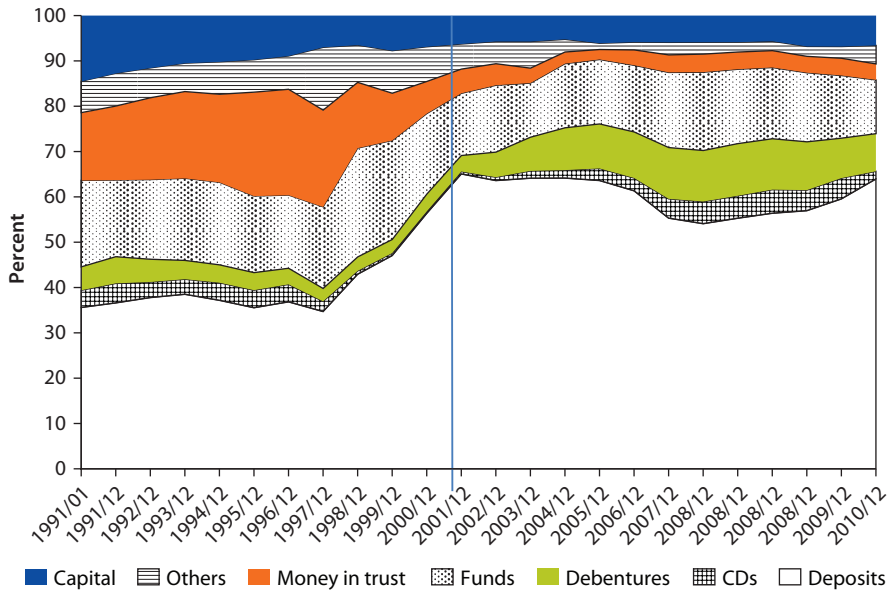


Figure 7.4b LTD Ratio



Source: The Bank of Korea Economic Statistics System.

Figure 7.5 Sources of Loanable Funds in Deposit-Taking Institutions



Source: The Bank of Korea Economic Statistics System.

Note: Funds include CMAs, MMFs, Beneficiary Certificates and others.

Of course, the structural changes observed in domestic banking (as displayed in figure 7.5) might have been due to the changes in individuals' asset management practices (Khatri 2008). Individual depositors at that time preferred investment in marketable financial instruments over deposits, because of the lower interest rates paid on deposits. This meant limitations for banks in expanding their funding through deposits to meet the growing loan demand. As a result, banks could not help but rely on noncore liability issuance to raise funds to lend.

The Korean banks that had issued debentures were faced with numerous difficulties as market liquidity conditions worsened; the effects of the 2008 financial crisis become more evident as these debentures approached their maturity dates. The heavy reliance of Korean banks on noncore liabilities was pointed to as an issue by Shin (2010), from the perspective that their funding possibilities suddenly shrank with the global liquidity contraction. Banks' activities at that time may also be criticized from another point of view, that a bank's fundraising needs to be matched with its lending in respect of maturity (Berger and Bouwman 2009). Korean banks raised funds through liquid liabilities and then lent them out in the form of illiquid loans such as mortgage loans, which consequently increased the extent of their maturity mismatches. From the Berger and Bouwman perspective, we can interpret Korean banks to have been actively involved in excessive liquidity creation.

Real Estate Market

Following the 1997 currency crisis, the major users of bank loans changed from corporations to households. Business firms, which had experienced great difficulties during the currency crisis because of their high reliance on outside borrowings, began to optimize their borrowings to improve their financial soundness after the crisis. Household debt in contrast began to increase significantly right after the crisis. The rate of increase in household borrowings substantially surpassed that in corporate loans, and this trend continued until right before the outbreak of the global financial crisis (figure 7.6a). As a result, the share in total bank loans of loans to households soared from a mere 28 percent in 1998 to 50 percent when the global crisis hit, as shown in figure 7.6b.

The expansion in the 2000s in bank loans, especially mortgage loans to households, was directly related to the asset market boom accompanying the increase in real estate prices. Several other factors might have been related to the expansion in bank lending to households: the liberalization of the housing loan markets,²¹ the profit maximization behaviors of banks, the severe competition among banks, the preferred treatment of household loans in BIS capital adequacy ratio calculation,²² and others. But it should be stressed that the continuous and substantial increases in housing prices had to be the fundamental factor leading to the expansion in banks' household loans.

As shown in figure 7.7a, real estate prices began to soar about 2002, coincident with the beginning of banks' expansions in their mortgage loans. Housing prices had been stable since the early 1990s, and had in fact fallen during the currency crisis. They gained momentum after the crisis, and during 2002 posted

Figure 7.6a Loans by Borrower Type

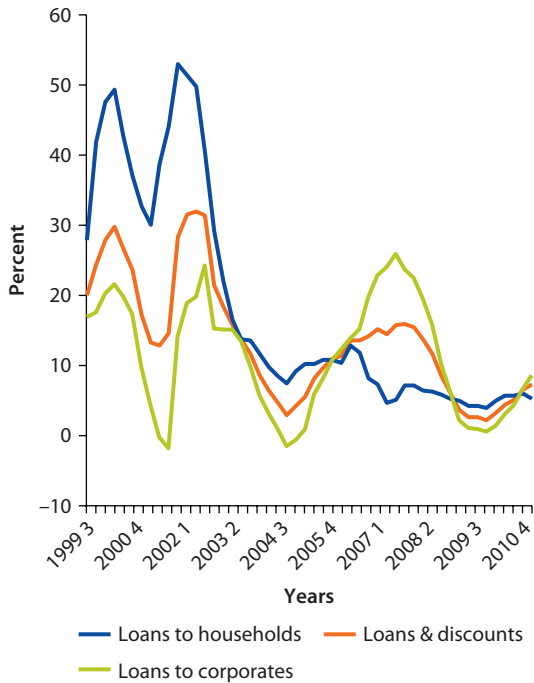
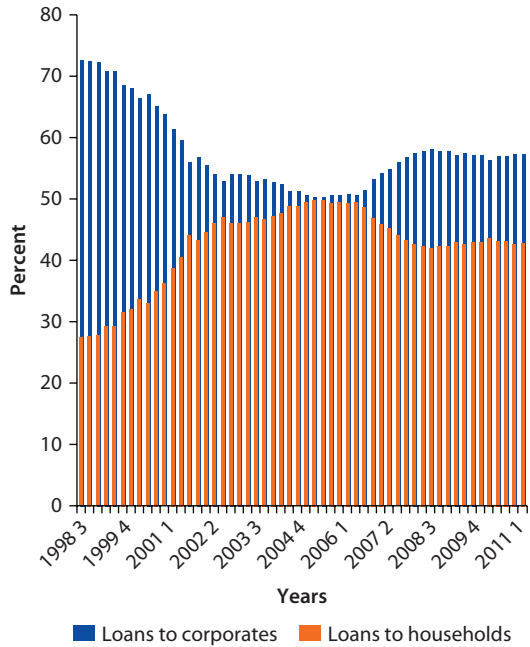


Figure 7.6b Composition of Bank Loans

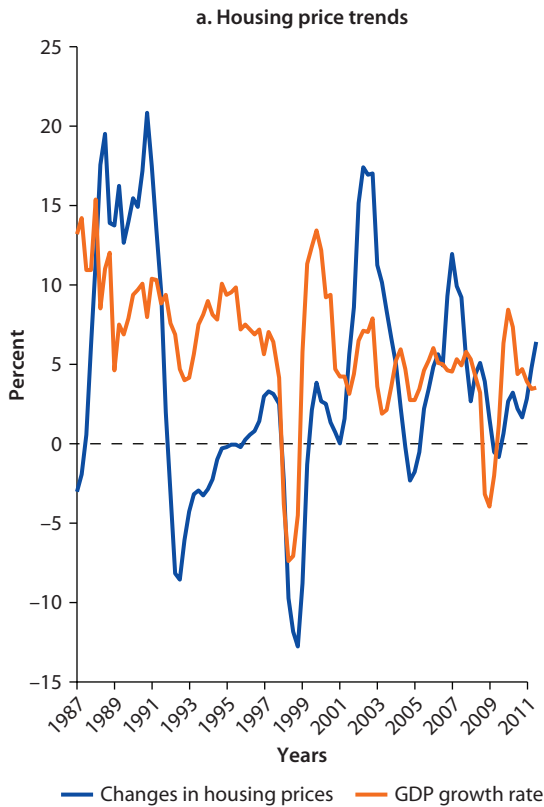
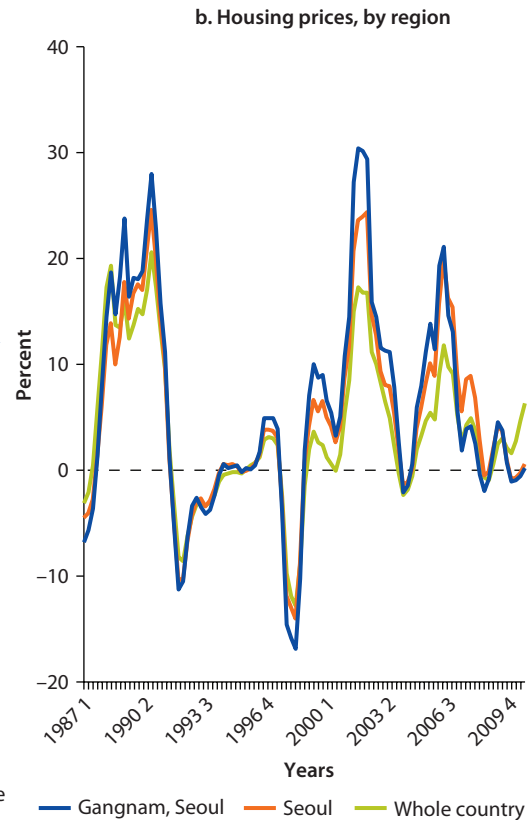


Source: The Bank of Korea Economic Statistics System.
 Note: Loans to corporates include those to public entities

a greater than 17 percent increase. From that time housing prices remained continuously on the rise, despite some fluctuations, until right before outbreak of the global financial crisis. The real estate market was driven by housing prices in certain regions, specifically the three “Gangnam” districts in the southeastern part of Seoul, whose residential infrastructures were relatively well developed because of smooth traffic, high-quality schools, and numerous cultural facilities, as well as their geographic proximity to newly developed downtown areas. The rise in housing prices in these regions led to subsequent real estate price increases in neighboring areas, as demonstrated in figure 7.7b.

Foreign Exchange and Capital Transactions

The 1997 currency crisis was a critical opportunity giving Koreans an awareness of the importance of proper foreign debt management. Following the lessons of the crisis, Korea began paying careful attention to this matter. In particular, focused efforts were devoted to reducing short-term debt while maintaining the country’s net creditor position. In fact, external assets began to exceed external debts in 2000, as Korea moved to a net creditor position, and the net external credit amount grew every year thereafter until 2004 (figure 7.8a). Foreign assets were held mainly in short-term assets, with the aim of ensuring FX liquidity. At least in the early years of the 2000s, Korea managed its external debt without a hitch.

Figure 7.7a Housing Price Trends**Figure 7.7b Housing Prices, by Region**

Source: Kookmin Bank.

In the mid-2000s, however, changes appeared in the net external credit composition. Beginning in 2005, short-term net foreign assets (NFAs) of the private sector turned negative, and the scale of their negative balance grew until right before the global financial crisis, as shown in figure 7.8b. Although the central bank's foreign reserve holdings rose continuously, the short-term NFAs of the private sector declined rapidly enough to offset this.

The decline in the private sector's short-term NFAs was a result of the lending and borrowing activities of financial institutions. Net lending (lending minus borrowing) began a rapid decline in 2005 (see figure 7.9a). This decline was caused mainly by an increase in short-term borrowing by financial institutions.

Both domestic banks and the branches of foreign banks (FBBs) played roles in the decline of short-term NFAs. Comparing the amounts of their negative short-term NFAs, however, those of FBBs overwhelmingly exceeded those of domestic banks, as shown in figure 7.9b. Short-term net debts of the former expanded from \$20 billion at the end of 2004 to \$114 billion in Q3 2008, just before the global financial crisis. Those of domestic banks were, in contrast, a mere \$20 billion at that time. It should be noted, however, that the short-term net position of

Figure 7.8a Foreign Assets and Liabilities

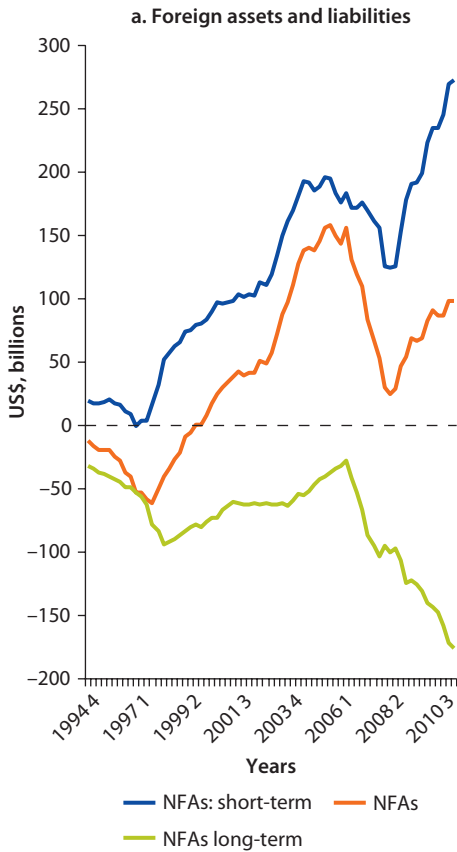
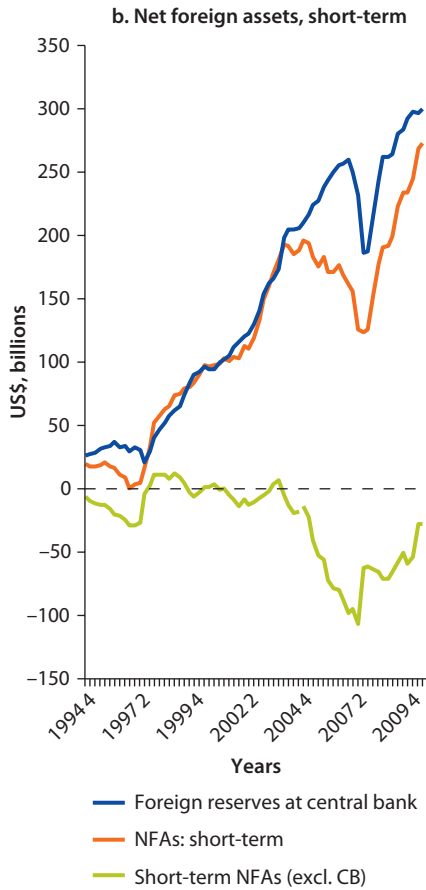


Figure 7.8b Net Foreign Assets, Short-Term



Source: The Bank of Korea Economic Statistics System.

domestic banks had turned negative in 2005, and the negative position size had gradually expanded from that time.

The jump in foreign borrowings by financial institutions was related to a sudden expansion in forward FX contracts (IMF 2008). Major exporters, including shipbuilders,²³ were selling their expected future incomes in foreign currencies in the form of forward contracts with domestic banks and FBBs. The financial institutions buying these forward contracts then needed to borrow dollars abroad to balance their FX positions.

Spillovers from U.S. Crisis: Process and Response

As mentioned earlier, Korea came close to suffering another currency crisis in 2008. This seems unavoidable, since the wide openness of the Korean economy made its exposure to global economic instability, like the U.S. global financial crisis, inevitable. However, the impacts of the U.S. financial crisis were more severe on the Korean economy than on other Asian countries. During the 2008

Figure 7.9a Short-Term Loans and Borrowings

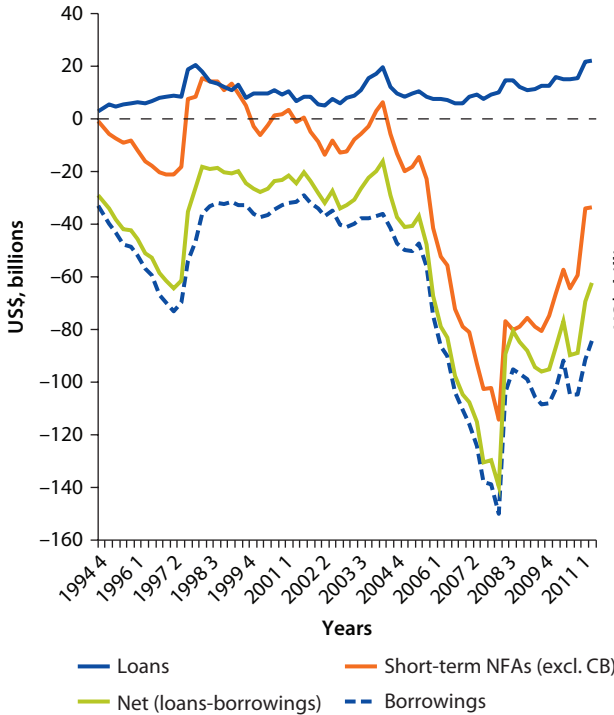
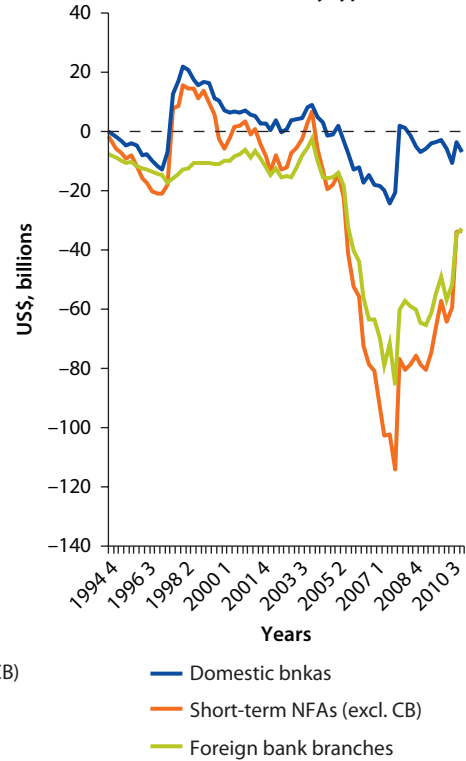


Figure 7.9b Short-Term NFAs by Type of Bank



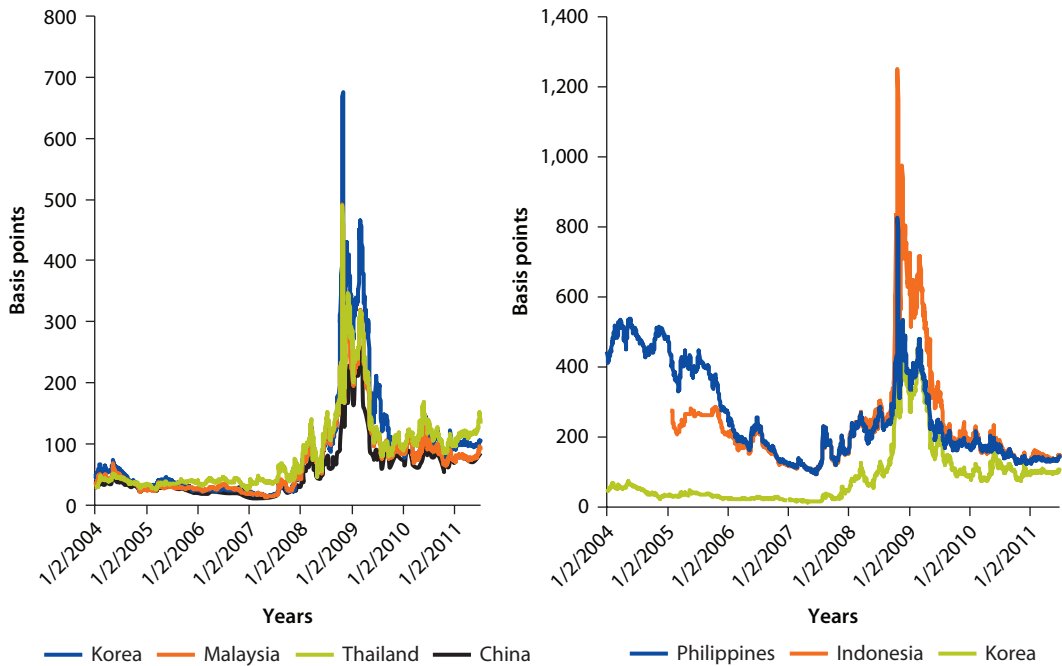
Source: The Bank of Korea Economic Statistics System.

global financial crisis, Korea was hit much harder in terms of exchange rate volatility, the jump in its credit default swap (CDS) premium, and so on. For example, the CDS premium on Korean government bonds, which had been at a level similar to those in China, Malaysia, and Thailand, rose to become much higher (figure 7.10). Korea’s CDS premiums rose to a level similar to those of Indonesia and the Philippines.

This rise was due largely to domestic factors, that is, the accumulated financial imbalances in the 2000s. In the wake of the 2008 global financial turmoil, the domestic financial markets encountered liquidity freezes in several financial instruments such as bank debentures. The aggravated domestic market situation exacerbated the spillover effects on the Korean foreign exchange market from abroad.

The initial cause of the exchange rate surge in 2008 was the direct exposures of financial institutions to FX liquidity risks caused by the increases in their short-term foreign debts. In particular, FBBs had to repay their short-term borrowings from their headquarters offices, in line with the liquidity shortages faced by their parent banks in advanced countries during the global financial crisis. Domestic banks, meanwhile, having also expanded their short-term borrowings,

Figure 7.10 Comparison of Credit Default Swap Premiums



Source: Bloomberg

Table 7.7 Rollover Ratio

2008					2009				
H1	Q3	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
97.6	99.8	39.9	52.9	60.7	92.6	89.1	100.6	111.3	97.3

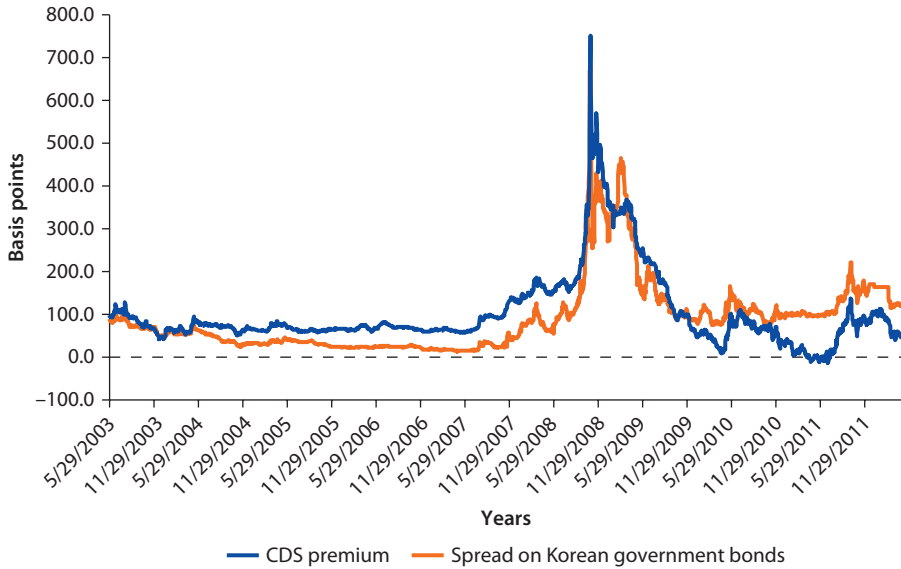
Source: FSS, *Financial Supervision Information*, 2009–26 (No. 529) (2009.6.26.–7.2), and various press releases.
 Note: Of general banks' foreign borrowings with maturities of 1 year or less.

faced similar difficulties repaying them. The ratio of short-term foreign debt rollover fell rapidly during the global financial crisis (table 7.7), and the cost of attracting foreign capital, measured by the spread on Korean government bonds (Foreign Exchange Stabilization Bonds), rose sharply (figure 7.11).

The FX liquidity crunch faced by domestic banks was aggravated further by the potential weaknesses of domestic banking. First, the domestic financial market situation was almost analogous to that in the United States—mortgage loans had been extended to households and housing prices had surged. Many people thus raised suspicions of a housing price bubble, and the risk of declines in housing prices leading to nonperforming loans at banks. In addition, Korean financial institutions had raised their funds for lending through wholesale financial instruments, such as CDs and debentures, a situation similar to the U.S. case.

In the process of the spillover of the U.S. financial crisis into the Korean financial markets, acute debate on the level of Korean banks' LTD ratios occurred.

Figure 7.11 Risk Premium



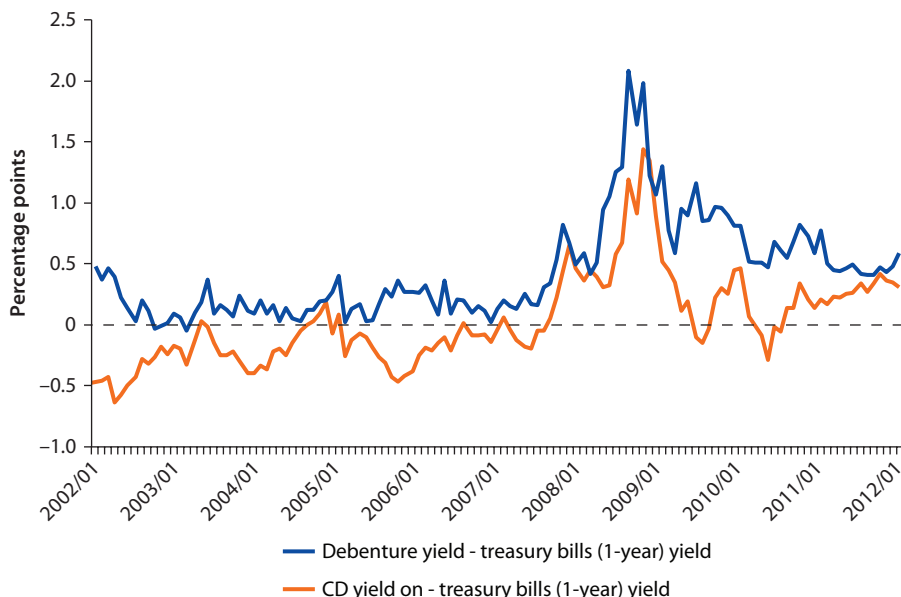
Source: Bloomberg
 Note: 2-year maturity Korean Government Bond spread over US Treasury Bills.

Foreign investors (for example, Merrill Lynch 2008) and foreign media (for example, *The Economist* 2009; Wang 2008, and others) raised questions about the high LTD ratio of Korean banks. Korean banks and the authorities tried to counter by stressing the differences between Korean debentures and CDs and those in foreign countries—in Korea they were issued to individual rather than institutional investors—and by asserting that Korean banks’ LTD ratio was not so high if these debentures and CDs were included in deposits. At any rate, the debate on the LTD ratio level served as momentum sounding alarms that Korean banks might have difficulties securing liquidity.²⁴

Symptoms of a liquidity crunch with respect to securities appeared. The spreads of debenture and CD interest rates over government bond yields jumped to unprecedented levels (figure 7.12). Previously, bank debenture and CD yields had moved in patterns similar to those of one-year treasury bonds, but after the Lehman Brothers incident they rose to levels 2 percentage points higher than Treasury bond yields. The share of debentures in banks’ funding sources declined greatly after October 2008, due to the banks’ difficulties in issuing them (table 7.8).

In addition, given the economy’s growing sluggishness, possibilities arose of a worsening of mortgage loan and small- and medium-sized enterprise (SME) loan performance. If the liquidity crunch in the domestic financial markets had tightened further, and financial institutions refrained from lending, then the domestic financial sector would have experienced a financial contraction through deleveraging, which might have led eventually to the outbreak of a financial crisis.

Figure 7.12 Spreads of Debentures



Source: The Bank of Korea Economic Statistics System.

Table 7.8 Composition of Financial Institution Debt and Capital

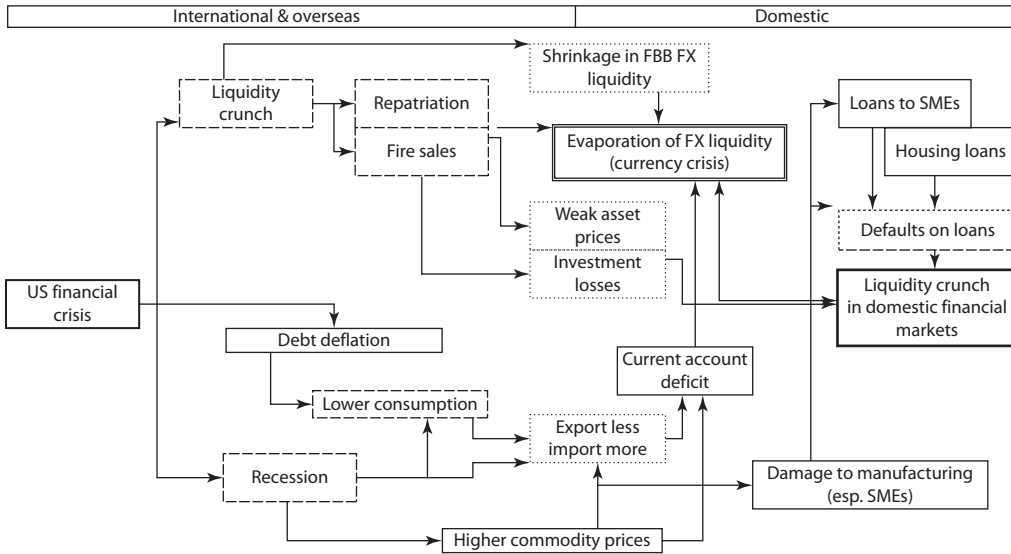
	December 2005	December 2007	August 2008	December 2008	December 2009	December 2010
Deposits	63.6	55.3	54.1	57.0	59.6	64.0
CDs	2.6	4.2	4.8	4.5	4.5	1.7
Debtentures	9.9	11.4	11.3	10.7	8.9	8.4
Funds	14.2	16.6	17.3	15.2	13.8	11.9
Money in Trust	2.2	3.9	4.0	3.6	3.8	3.5
Others	1.4	2.8	2.6	2.2	2.6	4.1
Capital	6.1	5.9	5.9	6.8	6.8	6.6
Total	100	100	100	100	100	100

Source: The Bank of Korea Economic Statistics System.

Figure 7.13 diagrams the process of spillover of the U.S. financial crisis to the Korean economy. It shows how the U.S. financial crisis spread to the domestic Korean financial markets, and how a variety of domestic issues combined to aggravate the impacts from abroad, worsening the domestic liquidity situation and thereby giving rise to another currency crisis. The diagram stresses the fact that liquidity contractions occurred in both the domestic financial and FX markets. In addition, it shows the mutual interaction between foreign exchange market instability and the liquidity strains in the domestic financial market.

Against this backdrop, Korean authorities adopted a series of emergency measures, for example, supplying FX liquidity directly to financial institutions and providing guarantees on banks' foreign liabilities to foreign debtors, but none

Figure 7.13 Currency Turbulence in Korea, 2008



were very effective (Baba and Shim 2011). Korea managed to conclude a bilateral currency swap agreement with the Federal Reserve, however, which helped soothe the market sentiment.

Emergency liquidity was also provided to the domestic financial markets. The authorities sought ways of providing liquidity to SMEs, who were suffering difficulties caused by the sharply increased exchange rate, the economic recession, and huge losses on FX derivatives transactions, as outlined in table 7.9. The Bank of Korea (BOK) opened a rediscount window to securities companies as the interbank markets froze. It also expanded the range of collateral eligible for use in its open market operations to include bonds and debentures issued by public enterprises and banks. Apart from these liquidity provision measures, the BOK cut its policy rate rapidly, from 5.25 to 3 percent in just two months between October and December 2008. The authorities meanwhile created a ₩10 trillion bond market stabilization fund and proposed a bank recapitalization fund with the aim of improving financial institutions’ credibility. The supervisory authority revised the domestic currency liquidity ratio formula by reducing the maturity for calculation of the ratio from three months or less to one month or less.

Effects of MaPP Measures

In evaluating the effectiveness of the MaPP measures, this chapter will look at whether the measures achieved their ultimate purpose, that is, financial stability. Existing studies, for example BCBS (2010a) and Lim et al. (2011), considered the extents to which these measures contributed to reducing the possibility of financial crisis or systemic risk, and tended to evaluate their effectiveness positively if

Table 7.9 Crisis Management in Korea after Lehman Brothers Bankruptcy

<i>Date</i>	<i>Actions and Measures</i>	<i>Note</i>
Oct. 9	BOK cut of Policy Rate	5.25%→5%
Oct. 13	Government and BOK release of plan for provision of FX liquidity for international trade by SMEs	\$16 Bil
Oct. 19	Government provision of guarantees of banks' foreign currency-denominated debts	up to \$100 Bil
Oct. 27	BOK cut of Policy Rate	5% → 4.25%
Oct. 27	BOK inclusion of bank debentures and public entity bonds as OMO collateral	
Oct. 27	BOK introduction of auction scheme to provide FX liquidity to banks	
Oct. 30	BOK signing of currency swap agreement with FRB	\$30 Bil
Oct. 31	FSC change of DC Liquidity Ratio rule	3-month → 1-month
Nov. 7	BOK cut of Policy Rate	4.25%→4.0%
Nov. 24	BOK provision of liquidity to banks participating in Bond Market Stabilization Fund	W5 Tril
Dec. 3	BOK payment of interest on banks' reserves at BOK	2.3% p.a.
Dec. 11	BOK cut of Policy Rate	4.0%→3.0%
Dec. 11	BOK inclusion of securities companies among counterparties for BOK RP transactions	
Dec. 12	BOK signing of currency swap agreement with PBOC ^a	\$30 Bil
	BOK expansion of currency swap agreement with BOJ ^a	\$3Bil →20Bil
Dec. 16	Bond Market Stabilization Fund launched	w 10 Tril
Dec. 18	FSC release of plan for establishment of Bank Recapitalization Fund	W20 Tril

Source: Various press releases by the authorities.

^aThe agreement was made in addition to CMI (Chiangmai Initiatives).

they made even small contributions to this end. In contrast, this chapter will evaluate the MaPP measures' effectiveness on the basis of whether they were effective in preventing the occurrence of "systemic events." This perspective seems more reasonable in the sense that the ultimate purpose of MaPP is to preemptively prevent financial imbalances in the financial sector that might lead to systemic events.

As mentioned earlier, Korea adopted several MaPP measures in the 2000s. However, a financial crisis actually did occur afterward. We can therefore assess the MaPP measures in Korea as not having been fully effective, given that they were unable to achieve the ultimate goal of "preventing system events."

We cannot deny that these policy measures had some effects, compared to doing nothing. The effects of individual policies can be examined from various perspectives and dimensions. As noted earlier, the MaPP measures in Korea were not implemented under the integrated conceptual framework of more recent years, in pursuit of the objectives that have been the basis of the current discussions.

Taking these points into account, this chapter will look into the limitations and problems of the MaPP measures used in Korea in the 2000s, as well as mistakes made in their operation to derive lessons from Korea's experience in hopes of establishing a more efficient MaPP framework. The focus will be on the major instruments, specifically the liquidity ratio regulations and the LTV/DTI regulations.

Limitations and Problems of FX Liquidity Ratio

The biggest problem of the FX liquidity ratio regulation was that the FBBs were not made subject to it. There was a perception that the parent banks in advanced countries could inject FX liquidity into their branches at any time (Khatri 2008). However, when major banks in advanced countries were hit by the global financial crisis, it became impossible for them to inject liquidity into their Korean branches. FBBs, which had increased their short-term borrowings to buy forward exchange, then had to redeem their borrowings at maturity, leading domestic foreign exchange conditions to deteriorate.

Since introduction of the FX liquidity ratio regulation, meanwhile, the domestic banks had been in compliance with it (see figure 7.14, indicating the FX liquidity “guideline”). This compliance indicates that, even if the FX liquidity ratio is met, there are limitations in its ability to prevent the occurrence of systemic events. It is important to examine why an FX liquidity shortage occurred even though the ratio had been met.

Given that the indicative guideline for the ratio was 85 percent, doubts about that level might be raised. In fact, banks actually maintained their FX liquidity ratios above 100 percent, much higher than the guideline. From this perspective,

Figure 7.14a FX Liquidity Ratio, by Banking Group

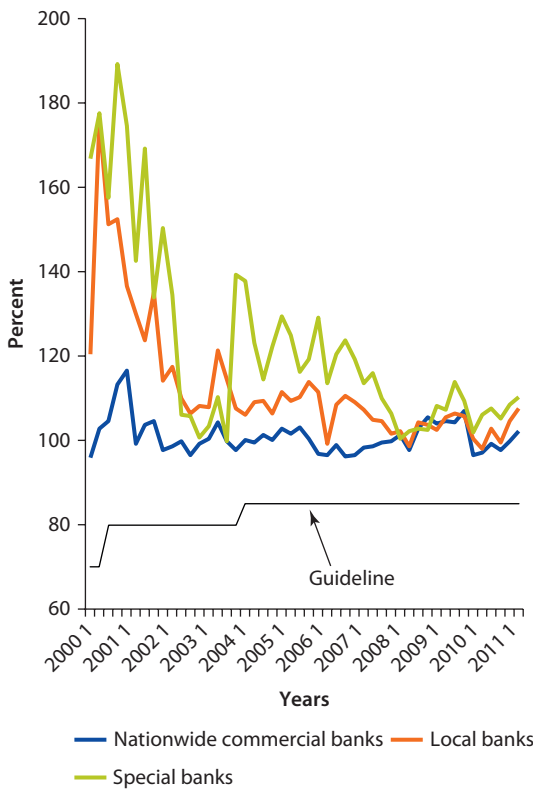
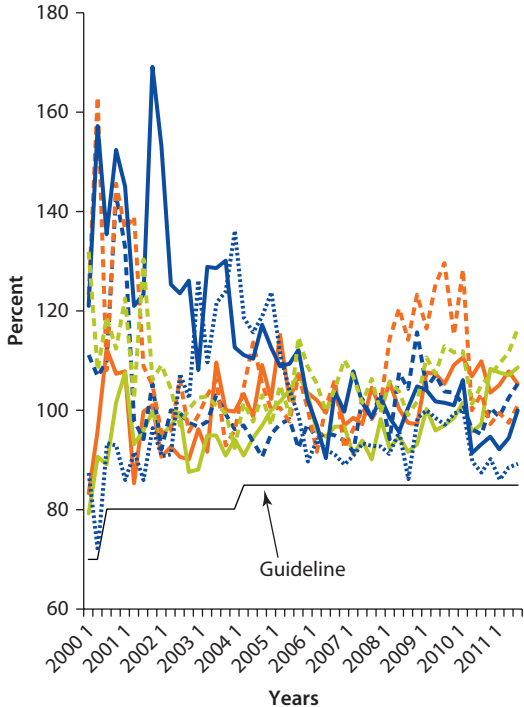


Figure 7.14b FX Liquidity Ratio, Commercial Banks



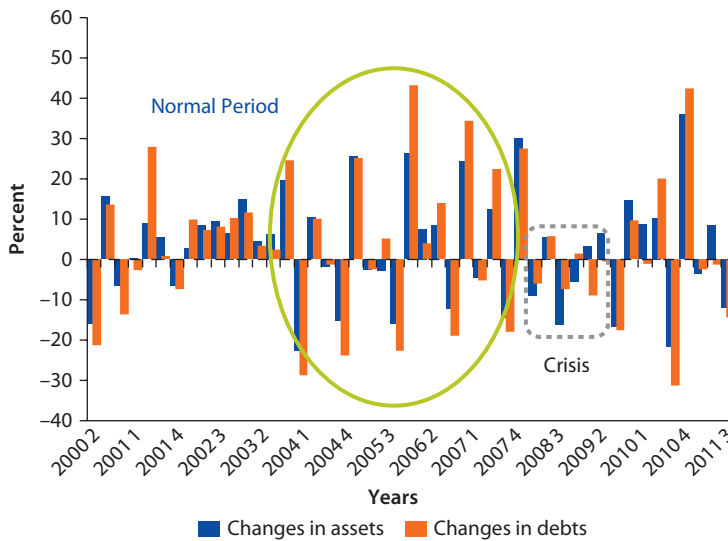
Source: FSS FISIS.

the appropriate level for the FX liquidity ratio guideline can be a major topic of study going forward. However, I would like to emphasize the limitations of the liquidity regulations, as shown in the ratios of assets and debts.

The fact that a liquidity shortage occurred even though the FX liquidity ratio had been met implies that the liquidity secured through foreign currency assets was unable to meet the obligations incurred through foreign currency debts. Since it is not easy to accurately measure the liquidities of assets and liabilities, I examined their volatilities. Figure 7.15 shows the quarter-on-quarter changes in assets and debts with outstanding maturities of less than three months. The volatility of FX debts measured by their standard deviation was much higher than that of FX assets before the crisis.²⁵ In other words, the foreign debts fluctuated with relatively wider margins even during the normal period, suggesting differences in liquidity between foreign assets and liabilities.

There may be a shortcoming in examination of differences in liquidity on the basis of the outstanding assets and liabilities. Outstanding assets and liabilities represent stocks at a certain point in time, after adjustment of excesses or shortages in total liquidity. To measure excesses or shortages in total liquidity, it is necessary to examine the volatility in terms of flows.

Figure 7.15 Volatility: FX Assets versus Debts, Three-Month Maturity Assets and Liabilities



Volatilities in Numerical Terms: FX Assets vs. Debts (%)

	Whole Period 2003IV-2011IV		Before-Crisis 2003IV-2008III		During Crisis 2008IV-2010I		After-Crisis 2010II-2011IV	
	mean	std	mean	std	mean	std	mean	std
Assets	2.5	15.7	3.4	16.0	-2.3	12.6	3.8	20.2
Liabilities	2.4	19.6	4.5	20.7	-3.8	9.5	1.7	25.9

Source: FSS and FISIS.

To examine the fact that assets and debts, two components of the FX liquidity ratio, have different volatilities in terms of their flows, I investigated the relevant statistics from the capital account of the balance of payments. I used the 12-month moving sum of capital flows, based on the methodology of Rothenberg and Warnock (2006), who defined a crisis as when statistical indicators increase beyond a certain range (for example, exceeding more than twice their standard deviations):

$$C_t = \sum_{i=0}^{11} P_{t-i}$$

$$\Delta C_t = C_t - C_{t-12}$$

where,

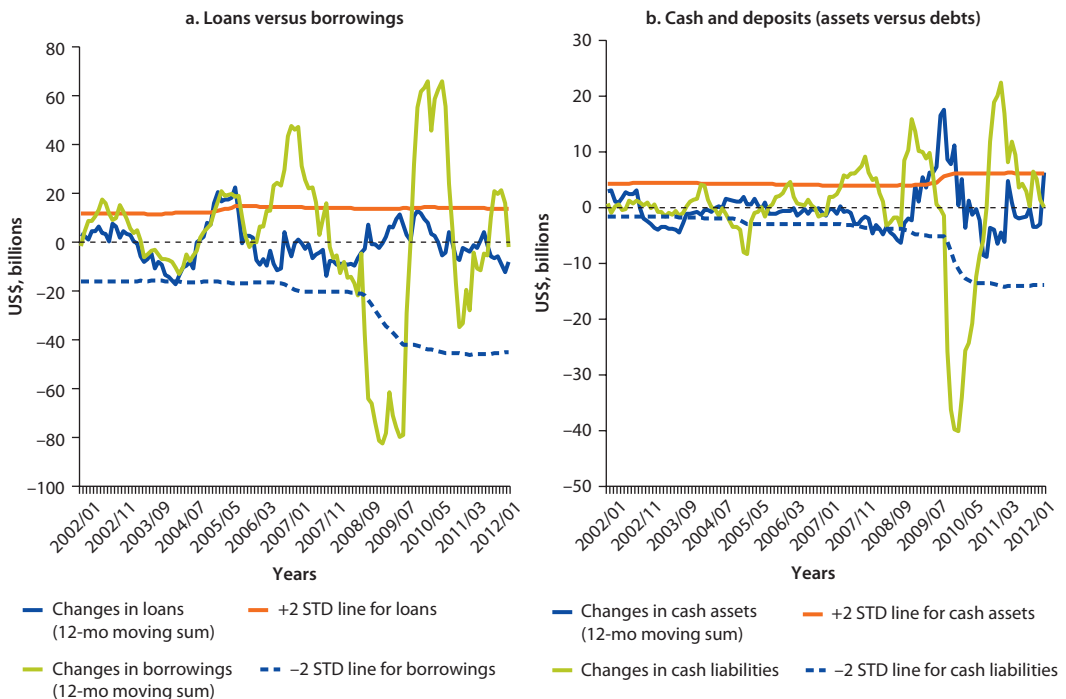
C: 12-month moving sum of capital flows

P: monthly capital flows

ΔC: annual change.

Calculation of financial institution lending and borrowing flows, displayed in figure 7.16a, shows that borrowing went up by more than two standard deviations in 2008, with the accumulated outflows over 12 months so great as to exceed US\$80 billion. Lending meanwhile did not show wide fluctuations, but

Figure 7.16 Volatility



Source: The Bank of Korea Economic Statistics System.

rather remained almost stable within a certain range. In terms of cashable assets and debts including cash and deposits, both assets and liabilities showed wide fluctuations, as displayed in figure 7.16b. In terms of the ranges of their fluctuations, however, cash and deposit liabilities exhibited sharper outflows than the inflows of assets, with the accumulated outflows over 12 months amounting to US\$40 billion. The inflows of cash and deposit assets also grew sharply during the crisis, but by only about US\$15 billion, much less than the increase in debt outflows.²⁶ In sum, examination of the flows of foreign assets and liabilities confirms that the volatilities of foreign debts are larger than those of foreign assets.²⁷

In conclusion, the disparity in liquidity between assets and liabilities is the limitation of the FX liquidity ratio regulation. The possibility of short-term liquid asset liquidation, in other words, market liquidity, could decline drastically during a crisis, and funding liquidity could also drop sharply. In emergencies, therefore, a situation could arise in which banks are forced to redeem their total liquid liabilities without being able to liquidate their liquid assets.²⁸

Another problem of the liquidity ratio regulation is that the gap between liquid assets and liabilities could widen. With the liquidity ratio regulation in place, the actual ratio is not likely to change dramatically, but rather hover at around the regulatory level. Even with an unchanging liquidity ratio, however, the gap between liquid assets and liabilities in terms of their absolute values could widen (as shown in figure 7.17a). This possible widening is because the scale of liquid assets and liabilities with maturities less than three months could increase. In addition, the gap between liquid assets and liabilities could increase compared with nominal GDP, and as shown in figure 7.17b, this trend has been verified in Korea. The widening gap between liquid assets and liabilities may have great impact on the financial market, given the mismatch between market and funding liquidities. The ratio regulation, which expresses the relationship between liquid assets and liabilities in terms of ratios, could therefore lose its effectiveness as time passes, given an expansion in financial transactions.

Limitations and Problems of DC Liquidity Ratio

The DC liquidity ratio regulation is similar to the FX liquidity ratio in terms of its limitations and problems, in that it, too, is based on ratios expressing the relationship between assets and liabilities. Similarly, although no commercial banks' ratios went below the guideline²⁹ (see figure 7.18), a liquidity crunch in the domestic financial market did occur in 2008. Therefore, as in the case of the FX liquidity ratio, it is interesting to inquire as to why liquidity conditions in the domestic financial markets deteriorated in 2008, even despite all commercial banks having met the DC liquidity ratio guideline.

It is doubtful that the DC liquidity ratio represents the liquidity situation of financial institutions in the domestic financial market very well. In other words, the liquidity ratio is not closely related to actual liquidity demand in a crisis situation. As liquidity conditions in the domestic financial market deteriorated in 2008, the Bank of Korea provided liquidity. However, the relationship between the scale of this liquidity provision and the liquidity ratio is not clear. Estimation of the

Figure 7.17a Liquidity Gap

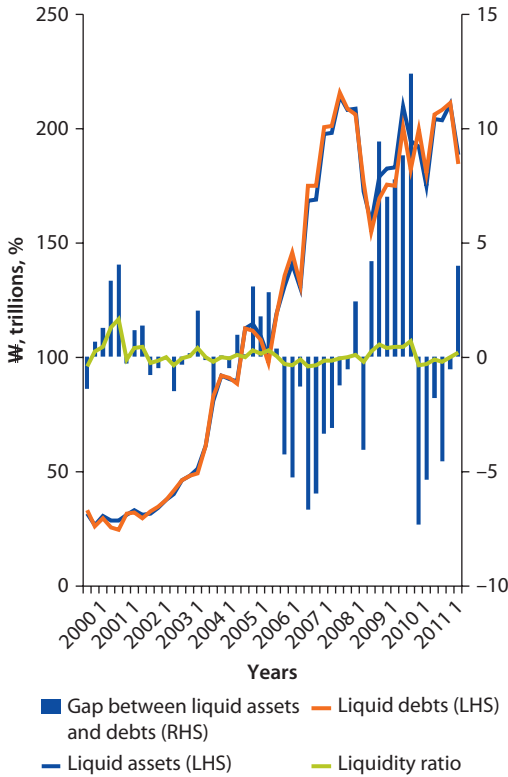
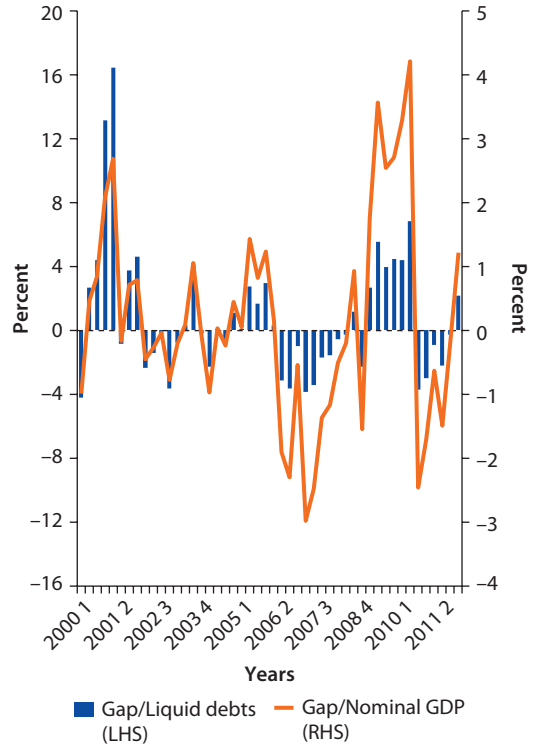


Figure 7.17b Ratios of Gap



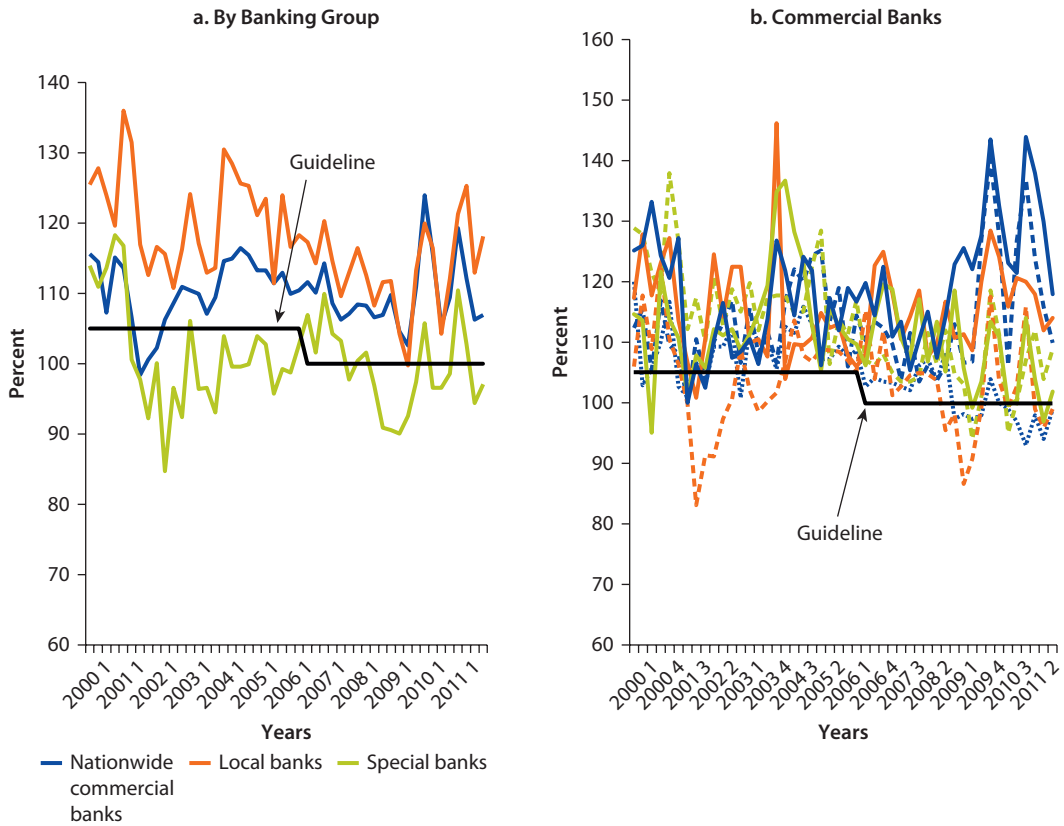
Source: The Bank of Korea Economic Statistics System and FSS FISIS.

correlation from Q4 2008 to Q3 2009 between the ratio and borrowings from the BOK yields a correlation coefficient of near zero (see figure 7.19a). Conversely, the correlation between changes in borrowing from the BOK and in noncore liabilities was relatively distinct, showing a coefficient of -0.32 (see figure 7.19b).

This correlation implies that, amid the unstable financial market conditions at home and abroad from Q4 2008 to Q3 2009, banks that were able to reduce their noncore liabilities borrowed little from the BOK, while those unable to repay them borrowed substantially from the BOK. This analysis implies further that the sizes of liquid liabilities determine financial institutions' liquidity risks. In other words, the volatility of funding liquidity demonstrates financial-institution liquidity risks well.

It should be pointed out that the DC liquidity ratio regulation was eased in 2006, when the financial authorities de facto decided to lower the guideline (figure 7.20). This decision supported the autonomous decision making of banks, whose DC liquidity ratios had risen greatly in their efforts to consolidate their loans after the credit card distress of 2003 (FSC and FSS 2006a). The decision gave priority to bank profitability without taking macroeconomic conditions into account. At the time the decision was made, real estate prices were surging, and

Figure 7.18 Domestic Currency Liquidity Ratio



Source: FSS and FISIS

bank lending was expanding. After that, and up until just before the global financial crisis, the DC liquidity ratio continued to gradually decline, and lending by banks with lending capacities continued to increase.³⁰

Analysis shows that the liquidity ratio regulation affects the total lending amount. To grasp the effect of the liquidity ratio on lending, I estimated the following regression:

$$\log\left(\frac{L_t}{P_t}\right) = \alpha_0 + \alpha_1 \log(y_t) + \alpha_2 (R_t - \pi_t) + \alpha_3 LR_t + \alpha_4 \log\left(\frac{HP_t}{P_t}\right) + \varepsilon_t$$

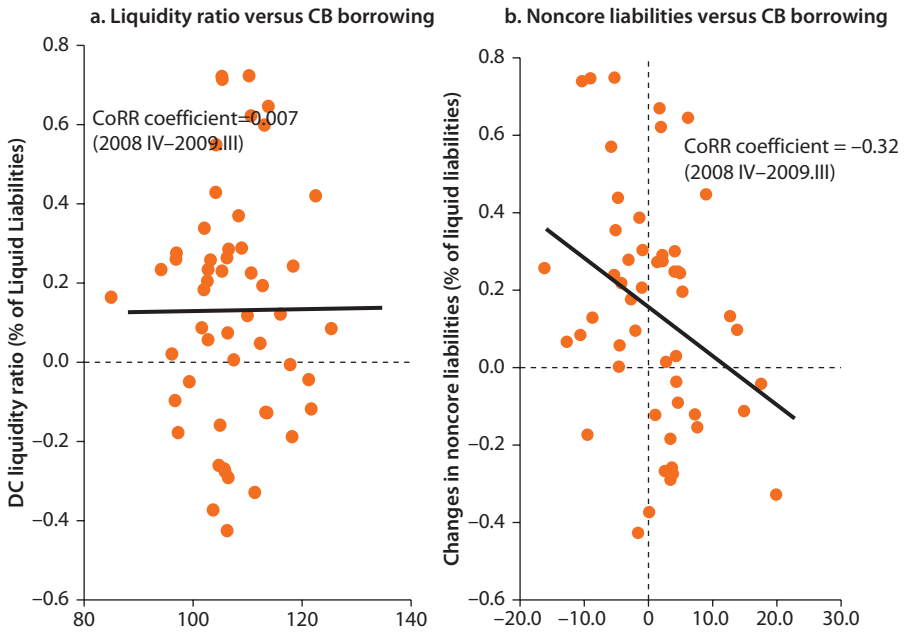
where,

- L_t : bank lending
- P_t : consumer price index
- R_t : lending rate (on newly extended loans)
- π_t : inflation (changes in CPI)
- LR_t : DC liquidity ratio (three-month maturity basis)

HP_t : housing price index (compiled by Kookmin Bank)
 ε_t : errors.

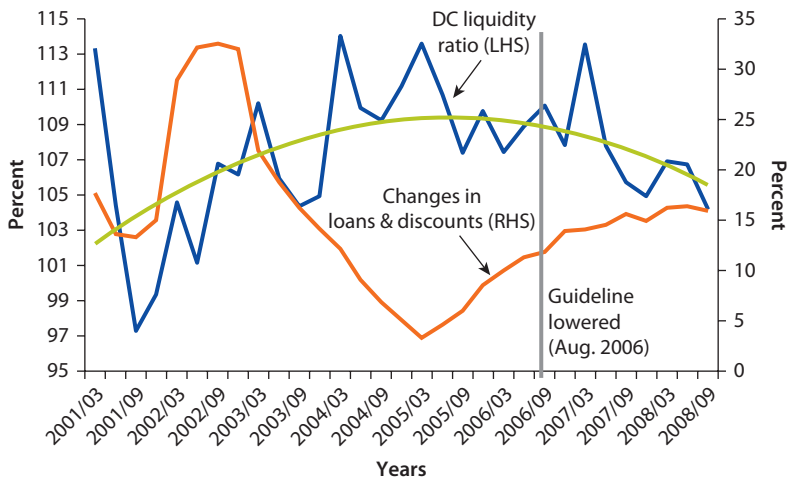
Note: Cointegration regression analysis techniques (FMOLS, CCR) applied³¹ since all level variables have unit roots; first differenced variables represented in stable time series; results of cointegration testing show existence of one cointegration relationship.

Figure 7.19 Correlation with CB Borrowing and Liquidity Ratio and Noncore Liabilities Ratio



Source: The Bank of Korea Economic Statistics System, FSS and FISIS.

Figure 7.20 Domestic Currency Liquidity Ratio and Bank Lending



Source: The Bank of Korea Economic Statistics System and FSS FISIS.

Note: The line along the liquidity ratio presents the trend.

The estimation finds that the liquidity ratio is a significant factor determining the amount of bank lending, and based upon these estimation results (table 7.10) we can infer that the easing of liquidity ratio regulations in 2006 served as a factor causing the expansion in bank lending in the second half of the 2000s. This regulatory easing appears to have been part of the background behind financial institutions' expansion in bank debenture issuance at that time.

Interpreting from a retrospective viewpoint based on this analysis, we can infer that the DC liquidity ratio regulations have been conducted to help ensure the soundness of individual financial institutions, that is, for micro prudential objectives. Macroeconomic financial conditions, including total lending, seem not to have been kept in mind. We can derive the lesson that, in order to use the liquidity ratio as a MaPP measure, it would be more appropriate to set a target variable representing macroeconomic conditions for the liquidity ratio, rather than operating the ratio simply to secure individual financial institution soundness.

Limitations and Problems of LTV and DTI

Many studies exist on the effects of the LTV and DTI regulations on housing finance. Those discussing the issue from a conceptual perspective tend to view the regulations positively. Discussions related to Korea include Chang (2010), Shin (2010), FSB, IMF, and BIS (2011) and Crowe et al. (2011). Although there are not many empirical studies on the Korean case, Igan and Kang (2011) presented results of empirical analysis in a study concluding that the LTV and DTI regulations in Korea have not had great influence on housing prices, but have affected the housing transaction volume.

Table 7.10 Liquidity Ratio and Bank Lending

<i>Independent variable</i>	<i>log(L_t/P_t)</i>	
<i>Estimation method</i>	<i>FMOLS</i>	<i>CCR</i>
Explanatory variables		
Constant	-4.454*** (0.908)	-4.342*** (1.002)
log(y _t)	1.119*** (0.070)	1.114*** (0.076)
R _t - π _t	-0.007 (0.006)	-0.007 (0.002)
LR _t	-0.003** (0.001)	-0.004** (0.002)
log(HP _t /P _t)	0.845*** (0.152)	0.865*** (0.158)
Adjusted R-square	0.987	0.987
Estimation Period	2000.III ~ 2009.III	

Source: The Bank of Korea Economic Statistics System.

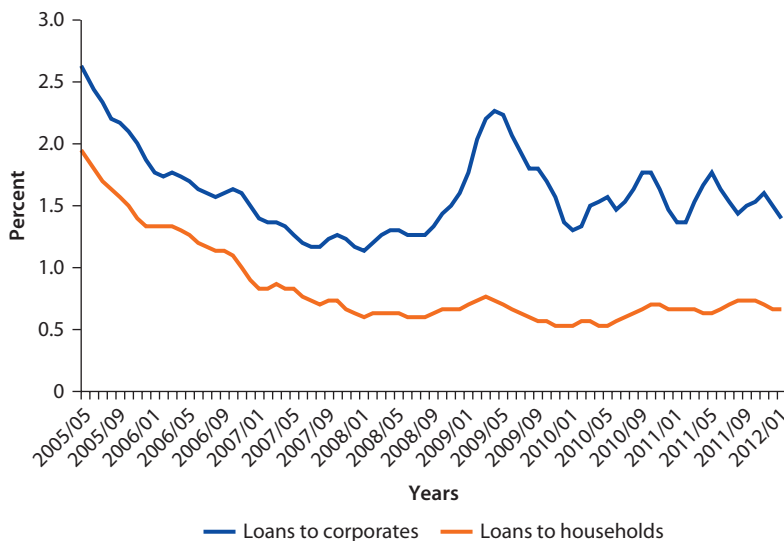
Notes: Figures in () refer to standard deviations, and ***, ** and * to significance levels of 1%, 5% and 10%, respectively.

Assessment of the LTV and DTI regulation effects can differ depending on the perspective and the standard of assessment adopted. I would like to assess the effects from three perspectives: a micro perspective to assess the effects on financial institution soundness; a perspective related to the authority's intention, that is, to stabilize housing prices; and a perspective regarding the household debt volume or level.

In the Korean case, we can assess the LTV and DTV regulations as having at least helped financial institutions maintain their soundness. Housing prices fell from the second half of 2009, after the global financial crisis, but the delinquency ratio on household loans remained extremely low (figure 7.21). This situation implies that strict implementation of the LTV ratio prevented delinquencies on household loans even after housing prices fell,³² thus reducing financial institution credit risks despite the dramatic increase in household loans prior to the global financial crisis.³³ From this standpoint, the LTV and DTI regulations were helpful in securing financial institution soundness.

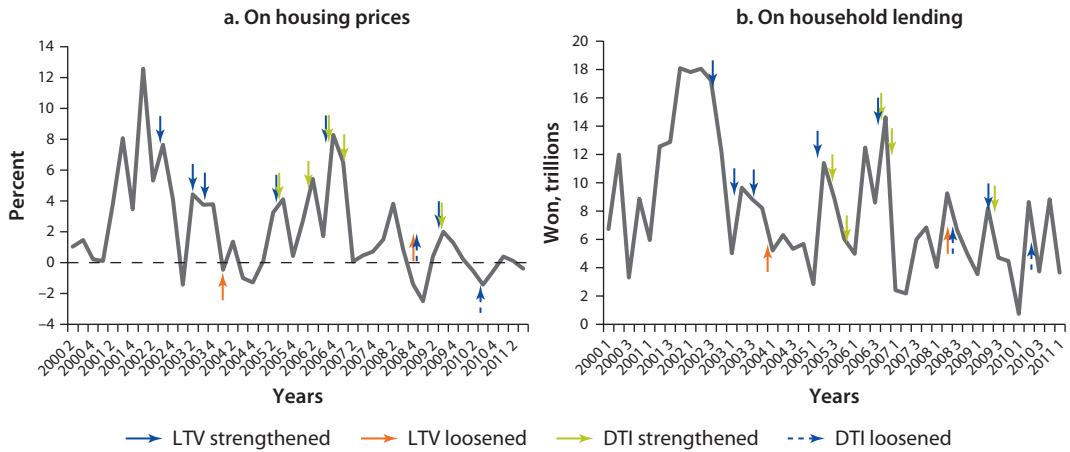
Meanwhile, the effects of the two measures in stabilizing housing prices were limited. When the LTV regulation was introduced, and during the several times it was strengthened through revisions, housing prices declined at first but then rose again one or two quarters later, as shown in figure 7.22a. In fact, the limited effects of the LTV and the difficulties in strengthening it further led to the introduction of a DTI regulation in 2005. After the DTI regulation was adopted, however, results similar to those with the LTV regulation were observed. Strengthening of the DTI regulation worked at first, but housing prices began to rise again one or two quarters later.

Figure 7.21 Delinquency Ratios of Loans to Households and Corporates



Source: The Bank of Korea Economic Statistics System.

Figure 7.22 The Impact of LTV on Housing Prices and Lending



[a] Source: Kookmin Bank

[b] Source: The Bank of Korea Economic Statistics System.

The impacts of the LTV and DTI regulations in limiting household lending, shown in figure 7.22b, seem similar to their impacts on housing prices. When stronger LTV and DTI regulations were implemented, financial institutions at first temporarily extended fewer loans to households. One or two quarters later, however, they increased their household lending again, and this pattern continued until the outbreak of the global financial crisis.

To verify this argument, I estimated a simple regression for the determinants of housing prices and household lending as follows:

$$\log\left(\frac{HP_t}{P_t}\right) = \beta_0 + \beta_1 \log(y_t) + \beta_2 (R_t - \pi_t) + \beta_3 \log\left(\frac{L_t}{P_t}\right) + \beta_4 LTV_t + \beta_5 DTI_t + \mu_t$$

$$\log\left(\frac{HD_t}{P_t}\right) = \gamma_0 + \gamma_1 \log(y_t) + \gamma_2 (R_t - \pi_t) + \gamma_3 \log\left(\frac{HP_t}{P_t}\right) + \gamma_4 LTV_t + \gamma_5 DTI_t + \nu_t$$

where,

HP_t : housing price (Kookmin Bank)

P_t : consumer price index

Y_t : real GDP

R_t : lending rate (new contract basis)

π_t : inflation (changes in CPI)

L_t : bank lending to households

LTV_t : LTV ratio (minimum)

DTI_t : DTI ratio (minimum)

HD_t : household debt

μ_t, ν_t : the respective error terms.

The estimation results represented in table 7.11 show the LTV and DTI ratios to have not affected either housing prices or household debt, as I could not obtain any robust estimation for the coefficient when regressing either on LTV and DTI or on their lag. The regression for the determinants of housing prices revealed a coefficient on LTV_t with a 5 percent level of significance. This estimation result seems unreliable, however, as it shows a negative sign, which is different from expectation; it is naturally expected that if the LTV is lowered (the regulation strengthened), housing prices should be squeezed.³⁴ Regression on the equation of the household debt determinants showed a coefficient on LTV_t and LTV_{t-1} with only a 10 percent significance level, and no significant coefficients on DTI or its lag.³⁵

The reasons for the limited impacts of the measures in stabilizing house prices and limiting household lending can be found in several factors, including the nature of the housing market at that time and the competition among financial institutions. The decrease in housing supply since the time of the 1997 currency crisis had resulted in a structural housing supply shortage, leading to widespread expectations of housing price increases. Changes on the demand side were observed as well; in addition to housing quality, buyers considered the residential environment very important. These structural changes in the housing market seemed to make the LTV and DTI regulations ineffective in curbing the demand for houses, especially high-end houses. In sum, when house prices increase because of fundamental factors such as a supply-demand imbalance, or changes in housing demand patterns, the regulatory effects will be limited, as in the Korean case in the 2000s.

The expansion in mortgage lending in the 2000s was also linked to the changes in lending strategies of financial institutions. In the wake of the 1997 currency crisis, seriously insolvent banks underwent restructuring, for example through mergers and liquidations. After this restructuring process had run its course, banks began to normalize their businesses from 2004. As financial institutions regained autonomy and started to manage their businesses with a focus on making profits, they began to expand their household loans, which are stable with low risk and high interest rates. Based on the lessons from the currency crisis, companies were attempting to avoid taking out loans, making it difficult for financial institutions to expand their corporate lending. To maximize their profits, it was inevitable that financial institutions would extend more loans to households. Financial institutions were able to reap attractive profits from household loans, most of which were secured by real estate collateral such as houses and whose risk-weights in calculating the BIS ratio were low; plus interest rates on household loans were higher than those on corporate loans. Financial institutions competed vigorously with each other in a lending spree in pursuit of market share expansions or higher asset volume growth. Given these lending strategies, household loans emerged as a main focus for banks.

Table 7.11 LTV and DTI Regulations, and Housing Prices and Household Debt

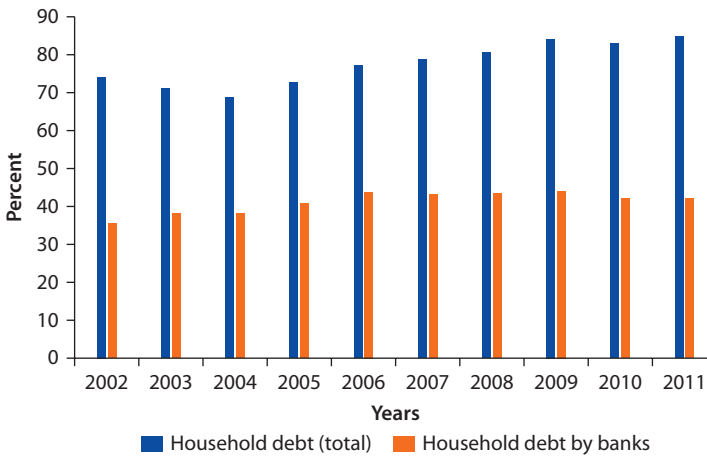
<i>LTV and DTI Regulation and Housing Prices</i>				
Dependent Variable	$\log(HP_t/P_t)$			
Estimation method	FMOLS			
Explanatory Variables				
Constant	2.624 (3.685)	-4.921 (4.536)	0.540 (3.521)	-3.243* (3.895)
$\log(y_t)$	-0.520 (0.387)	0.152 (0.461)	-0.304 (0.370)	-0.008 (0.414)
$R_t - \pi_t$	0.008 (0.008)	0.007 (0.011)	0.004 (0.008)	0.003 (0.011)
$\log(L_t/P_t)$	0.421*** (0.127)	0.318** (0.153)	0.355*** (0.121)	0.353** (0.151)
LTV	-0.002** (0.001)			
DTI		0.002 (0.001)		
LTV(-1)			-0.001 (0.001)	
DTI(-1)				0.002 (0.001)
Adjusted R2	0.859	0.809	0.842	0.823
Sample Periods	2000.III ~ 2009.IV			

Note: Figures in () are standard errors. ***, **, and * imply significant level of 1%, 5%, and 10% respectively.

<i>LTV and DTI Regulation and Household Debt</i>				
Dependent Variable	$\log(HD_t/P_t)$			
Estimation method	FMOLS			
Explanatory Variables				
Constant	-14.562*** (2.241)	-14.243*** (3.846)	-14.074*** (2.352)	-13.016*** (3.174)
$\log(y_t)$	1.910*** (0.180)	1.888*** (0.306)	1.871*** (0.189)	1.791*** (0.253)
$R_t - \pi_t$	-0.026*** (0.007)	-0.020*** (0.010)	-0.024*** (0.009)	-0.020*** (0.009)
$\log(HP_t/P_t)$	0.970*** (0.214)	0.864*** (0.247)	0.997*** (0.216)	0.906*** (0.234)
LTV	0.002* (0.001)			
DTI		0.000 (0.001)		
LTV(-1)			0.001* (0.001)	
DTI(-1)				-0.000 (0.000)
Adjusted R2	0.981	0.978	0.978	0.976
Sample Periods	2000.III ~ 2009.IV			

Source: The Bank of Korea Economic Statistics System, Kookmin Bank.

Note: Figures in () are standard errors. ***, **, and * imply significant level of 1%, 5%, and 10% respectively.

Figure 7.23 Household Debt

Source: The Bank of Korea Economic Statistics System.

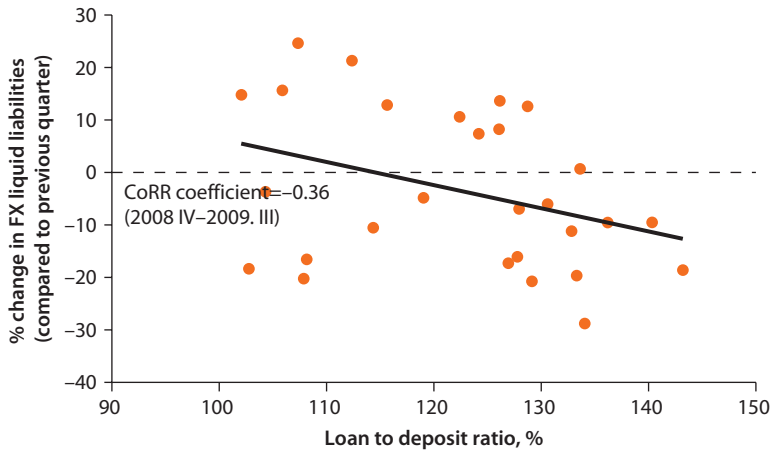
The LTV and DTI regulations could hardly contain this bank lending strategy. Few people considered banks' expansion of household lending to be a problem at the time. There was, instead, a view that it was normal for household lending to increase in the 2000s, since funds had previously been allocated to the corporate sector, with household loan extension limited until the 1990s.

Given the limited effects of the LTV and DTI regulations, the ratio of total household credit to national disposable income has risen, from 69 percent in 2004 to 81 percent in 2008 and 85 percent in 2011, as shown in figure 7.23. Household debt is currently a critically important variable in Korea, for consideration in promoting financial stability and operating macroeconomic policies.

Lack of Linkages among Sectors

While MaPP measures have been explored for individual sectors such as the housing market, domestic banking, and foreign exchange, we should also point out the lack of a comprehensive perspective or tools taking all sectors into account. During the 2008 crisis, foreign financial institutions were reluctant to roll over the short-term foreign debts held by Korean banks, because of doubts about Korean bank creditworthiness. It was the LTD ratio that made foreign financial institutions suspicious; as mentioned earlier, acute debate on the LTD ratio level arose at that time. Although it is not easy to determine how foreign financial institutions reflected the LTD ratios in evaluating Korean banks' financial conditions at that time, the occurrence of this debate did demonstrate the possibility that domestic financial conditions affected the foreign exchange sector.

To find the correlation between the LTD ratio and financial institutions' short-term FX liquidity, a simple calculation was conducted. The coefficient of correlation between the previous quarter's LTD ratio and the quarter-on-quarter changes in short-term FX liquid liabilities was calculated.³⁶ The calculation was conducted for six major commercial banks during the period Q4 2008–Q3 2009,

Figure 7.24 Correlation: LTD Ratio versus FX Funding Liquidity

Source: The Bank of Korea Economic Statistics System, FSS and FISIS.

and the coefficient of correlation was found to be -0.36 , as demonstrated in figure 7.24. Based on this result, we can conclude that the LTD ratio did affect the FX funding liquidity of financial institutions.

This finding indicates that the domestic banking and foreign exchange sectors can affect each other. Likewise, what happens in the housing market is closely linked to the financial sector. It was problematic that Korea sought MaPP measures only for application to individual sectors, rather than tools that could reflect the relationships among sectors. In this regard, it may be necessary to seek ways of reflecting domestic financial conditions in the FX liquidity ratio, and FX funding liquidity conditions in the DC liquidity ratio, as well as simultaneously considering both financial institution activities and real estate market trends when designing MaPP measures.

Summary and Implications

This section summarizes the discussions by describing the characteristic aspects of MaPP operations in Korea in the 2000s. These characteristics will then be used as a basis for deriving implications for more effective operation of MaPP measures in the future.

Characteristics of MaPP Measures in Korea in the 2000s

The limited effects of the MaPP measures in Korea in the 2000s can be attributed to several characteristics of the measures. To pave the way for deriving implications for effective future operation of MaPP measures, this chapter discusses several characteristic aspects of those measures, summarized in table 7.12.

First, the objectives of the measures were micro prudential rather than macro prudential. The liquidity ratio regulation in particular was targeted precisely at strengthening individual banks' abilities to pay their liabilities or secure their

Table 7.12 Characteristic Aspects of the MaPP Measures in Korea in the 2000s

	<i>FX Liquidity Ratio</i>	<i>DC Liquidity Ratio</i>	<i>LTV, DTI</i>
Primary Objective	<ul style="list-style-type: none"> secure banks' capacities to repay short-term FX liabilities 	<ul style="list-style-type: none"> secure banks' capacities to repay debts 	<ul style="list-style-type: none"> stabilize real estate prices
Other objectives			<ul style="list-style-type: none"> strengthen banks' soundness by reducing their credit risks
Regulator	<ul style="list-style-type: none"> supervisory authority 	<ul style="list-style-type: none"> supervisory authority 	<ul style="list-style-type: none"> adopted by policy maker (government) monitored by supervisory authority
The regulated	<ul style="list-style-type: none"> domestic banks FBBs exempted 	<ul style="list-style-type: none"> banks and non-bank FIs 	<ul style="list-style-type: none"> banks and NBFIs adjusted flexibly
Scope	<ul style="list-style-type: none"> FX-denominated assets and liabilities derivatives added 	<ul style="list-style-type: none"> DC-denominated assets and liabilities Moneys in trust excluded 	<ul style="list-style-type: none"> real state market FI lending activities
Character/Attributes	<ul style="list-style-type: none"> quasi-regulation prospective customized rule general and universal 	<ul style="list-style-type: none"> quasi-regulation recommended guideline prospective customized rule general and universal 	<ul style="list-style-type: none"> order retrospective customized rule possibility of modification for specific purposes
Point of Time	<ul style="list-style-type: none"> quarter-end 	<ul style="list-style-type: none"> quarter-end 	<ul style="list-style-type: none"> applied to every loan contract
Time Horizon	<ul style="list-style-type: none"> consistently applied and strengthened 	<ul style="list-style-type: none"> consistently applied, but deregulated 	<ul style="list-style-type: none"> changed frequently
Auxiliary Measures	<ul style="list-style-type: none"> maturity mismatch ratio (GAP ratio) FX position minimum bound of longer-term liabilities 	<ul style="list-style-type: none"> (none) 	<ul style="list-style-type: none"> DTI introduced to supplement LTV applied with various policy measures such as taxation
Degree of Bindingness	<ul style="list-style-type: none"> non-binding 	<ul style="list-style-type: none"> non-binding 	<ul style="list-style-type: none"> strongly binding
Loopholes			<ul style="list-style-type: none"> bridge loans, group lending by construction companies
Side Effects		<ul style="list-style-type: none"> shorter loan maturity 	<ul style="list-style-type: none"> expansion of NBFi and/or other lending methods
Effectiveness	<ul style="list-style-type: none"> limited 	<ul style="list-style-type: none"> limited 	<ul style="list-style-type: none"> limited
Reasons for Ineffectiveness	<ul style="list-style-type: none"> Exemption of FBBs Limitations of ratio regulation volatility of liabilities Inflexibility to new types of imbalances 	<ul style="list-style-type: none"> Limitations of ratio regulation volatility of liabilities Inflexibility to new types of imbalances Time-inconsistency of operations 	<ul style="list-style-type: none"> Limited effects in coping with fundamental changes in real estate and financial markets
	<ul style="list-style-type: none"> Separately operated, while markets are interconnected (lack of comprehensive view) 		

Note: FBBs = Foreign Bank Branches; FIs = Financial Institutions.

soundness. The micro prudential viewpoint of the Korean MaPP measures in the 2000s was of course, inevitable because the concept of MaPP did not exist at the time. Another reason may have been the governance of the measures; the authorities handling these measures were the supervisory authorities, whose responsibility is micro prudential regulation. In short, it should be pointed out as a characteristic feature of the Korean MaPP measures of the 2000s that they did not target macro-level variables or events critical to financial stability.

The Korean MaPP measures of the 2000s had several features that demonstrate the limitations or shortcomings of regulation. Almost without exemption, no regulation can avoid inherent problems such as boundary problems, loopholes, and negative side-effects. Because the MaPP measures took the form of regulations, these problems eroded their effectiveness. An example of a boundary problem of MaPP regulations was the exemption of FBBs from the FX liquidity ratio regulation. Cases of MaPP regulation loopholes were meanwhile relatively apparent with the LTV and DTI regulations. For example, the regulations were ineffective in curbing the demand for houses.³⁷ At the same time, the authorities expanded the scope of LTV regulations to NBFIs including savings banks, mutual savings banks and credit companies, in an attempt to block opportunities for bridge loans by these NBFIs. Negative side effects were not small. Banks endeavored to expand to housing loans, which have longer-term maturities. To meet the liquidity ratio obligation, however, they had to reduce the maturities of their loans to business firms. This reduction was neither ideal nor desirable from the perspective of banks' basic function of maturity transformation, particularly in the Korean situation where viability of the economy depends on smooth business firm activities in exporting and transactions.

The flexibility of MaPP measures is an important factor that can impact their effectiveness or determine the validity of the MaPP scheme. In the history of MaPP measures in Korea, the tools were revised frequently and promptly in accordance with changes in market conditions. However, these frequent revisions did not lead to success in achieving the measures' primary objectives. This failure implies that it might be necessary to adopt a new series of regulations to deal with newly emerging potential risks, rather than adjusting existing regulations. In this regard, Korea was not flexible in adopting new types of MaPP measures in line with the appearance of new potential risks accompanying structural changes in its financial markets.

Another characteristic aspect of the Korean MaPP measures may be examined from the viewpoint of their time dimension, that is, whether they were applied *ex ante* or *ex post*. It is clear that the LTV and DTI rules were applied *ex post*. The introductions and amendments of these rules accompanied changes in housing prices, and their time dimension operational characteristics were thus reactive. This aspect is the opposite of the MaPP perspective, which preempts potential risk factors.

The scope of the MaPP measures is another important characteristic. The Korean MaPP measures were confined to certain areas. Although simultaneous, they were operated separately, without coordination or harmonized adjustments.

In this regard, the operational characteristic aspect of the Korean MaPP measures can be described as an ad hoc approach, which contrasts with the comprehensive viewpoint recommended by the current conceptual framework for MaPP.

A final point about the characteristics of the Korean MaPP measures is that the focus of the regulations was on ratios. The liquidity ratio, for example, a comparison of asset volume with total debt size, has an inherent inability to catch signals of financial imbalances in advance and prevent their accumulation. In addition, the assets and debts of financial institutions have different properties with regard to financial stability: banks' liabilities may become volatile in an emergency situation, moving beyond a range that cannot be covered by the liquidity of the assets that a financial institution holds. In sum, a liquidity ratio is unable to fully and flexibly reflect all aspects of structural changes in the related financial markets, and cannot prevent accumulation of financial imbalances. Reliance on a few ratios, therefore, even though applied from the MaPP perspective, is not sufficient for securing financial stability.

Implications for MaPP Operation

This chapter closes with some implications for the effective operations of MaPP, based on evaluation of Korean experiences of MaPP measure operations in the 2000s.

Objective Setting in a Macro Prudential Dimension

For the successful implementation of MaPP measures, it is important that their objectives be set from a macro prudential dimension. It would be ideal to set as objectives indicators reflecting procyclicality, systemic risks, or interconnectedness. In reality, however, it is necessary to find alternatives for these macro prudential indicators, because their formulation for use in the real world is not easy. Better candidates would be lending or borrowing aggregates of certain sectors, for example, whose developments can be monitored, since most financial imbalances usually accumulate in the forms of excessive lending or borrowing. The Korean case provides evidence, at least, supporting the argument that micro prudential objectives should be avoided in the design of MaPP measures.

Supplementing for Problems of Ratio-Style MaPP Measures

The Korean case illustrates the inherent limitations of liquidity ratio regulation because of the differences between asset liquidity and liability liquidity. Even though the risk factor weighting of liquidity ratios, as considered under Basel III, may lessen this problem to some degree, it cannot resolve it completely. In extreme cases, like during the 2008 global financial crisis, a higher liquidity ratio will not make any difference in preventing a liquidity crunch. In this regard, liquidity ratio regulation may need to be supplemented with, for example, a cap on total borrowing.³⁸

The Korean case also raises the issue of the liquidity ratio level. During the 2000s, the liquidity ratios for DC- as well as FX-denominated transactions did not constrain banks' risky activities; almost every bank maintained its liquidity

ratio above the guideline level. This may indicate that the level for the liquidity ratio guideline has been lax. The appropriate level for the guideline can thus be an important issue related to regulation effectiveness, and could perhaps be raised to far above 100 percent.³⁹

Minimizing Boundary Problems

In Korea, similarly to the U.S. case, the financial imbalances began in areas not subject to regulations. It is clear from the Korean experience that MaPP measures should be devised in a way that reduces the possibility of regulatory arbitrage or minimizes boundary problems of regulations.⁴⁰

Maintaining Time Consistency of MaPP

It is natural to expect a situation in which the MaPP measures need amendment or revision as economic and financial circumstances change. Especially when amending or revising MaPP measures in the direction of deregulation, it will be important to maintain their intended purposes. Authorities should evaluate the impacts of MaPP measure amendment from various perspectives because, as in the Korean case of its 2006 DC liquidity ratio deregulation, a change can be rational from one side but suddenly lead to an imbalance in an unexpected way, which might be very difficult to correct ex post.

Harmonizing MaPP Measures and Combining Subsector MaPP Measures

The financial system consists of many subsectors, for example the domestic banking and FX sectors in Korea. As in Korea, MaPP measures may be designed to target individual subsectors. However, in reality these subsectors are interconnected. Separate MaPP measures targeting specific subsectors will not be able to cope with events occurring across several subsectors. Thus, MaPP measures designed for specific subsectors should also consider activities in related sectors.⁴¹ For example, the Korean case suggests that the FX liquidity ratio scheme needs to also incorporate an indicator for domestic banking activities, such as the LTD ratio.

The operation of MaPP measures would work best if harmonized with those of the whole scheme of measures. This issue may be similar to that of coordination between MaPP and monetary policy. The point is that, when several MaPP measures are applied simultaneously, consideration should be given to coordination and the interrelationships among them.

Overcoming the Limitations of Readymade Rules

MaPP measures, like any regulations, have inherent limitations, such as their tendency to lag behind changes in the financial markets and to have loopholes. For the sake of MaPP-measure effectiveness, they should be supplemented with non-regulatory measures, such as the activities of the authorities concerned with financial market and economic monitoring, analysis of potential risks, recommendation of risk avoidance means, and so on. These measures might be articulated as belonging to the realm of “macro prudential policy,” rather than “macro prudential

regulation.” From this point of view, it would be reasonable to operate the MaPP on two tracks: the MaPP regulatory measures supported by the MaPP policy activities.

Notes

1. These measures can be matched with the MaPP type of Funding Liquidity Standards and Collateral Arrangements considered by Galetti and Moessner (2011), who classify the MaPP measures into 10 categories (see Galetti and Moessner (2011),10).
2. $\frac{\text{Total Financial Assets}}{\text{Nominal GDP}}$, which indicates the size of financial sector relative to the real sector (Goldsmith 1959).
3. The monthly data during the period of April 1990 through March 2012 were used for the calculation, because the government allowed the exchange rate to be freely determined in the market from March 1990 (Rhee and Lee 2004).
4. For more details on the 1997 financial crisis, refer to Chopra and others (2001).
5. The government pursued liberalization of interest rates in 1965, but as a result witnessed only adverse side effects such as expansion of curb markets, and it therefore returned to a policy of suppressive interest rate regulation. Refer to Kim and Lee (2010) for more detail.
6. One extraordinary phenomenon was the expansion in lending by NBFIs, which later became a cause of the 1997 currency crisis but was not recognized as a financial imbalance at that time.
7. Refer to Giordano (2009) for more details on the objectives of financial supervision.
8. At that time, strengthening of regulation was considered unacceptable given the social mood and sentiment valuing pursuit of political and social freedom.
9. Initially 7.25 percent was applied, which was later raised to 8 percent in 1995.
10. Korea has employed several other tools that can be regarded as MaPP measures, such as the BIS capital adequacy ratio, reserve requirements on deposits (in both foreign and domestic currencies), and restrictions on lending (especially FX lending) to certain borrowers. This chapter excludes such measures from discussion.
11. In 2009, Korea revised the formula to incorporate the risk factors for various assets (FSC and FSS 2009).
12. From zero to seven days, from eight days to one month, from one month to three months, from three to six months, from six months to one year, from one to three years, and exceeding three years.
13. The loan contracts set the maturity at more than three years, but contained put option clauses giving the borrowers the right to ask for early redemption, so that the actual maturity would be shortened to one to two years.
14. Goldstein and Turner (2004) expressed the view that currency mismatch is a problem typical to any currency crisis.
15. There has been debate on global introduction of FX position regulations, but objections have been raised from this perspective (see for example Hartman (1994)).
16. Limited to within a certain ratio of past performance.
17. Real estate policy and monetary policy were implemented separately during this time (BOK 2003).

18. An area was designated as a speculative zone in the case where: (1) its monthly nominal house price index (HPI) had risen more than 1.3 times the nationwide inflation rate based on the consumer prices index during the previous month, and (2) either (a) its average HPI appreciation rate in the previous two months had been higher than 1.3 times the average national HPI appreciation rate during that time, or (b) its average month-on-month HPI appreciation rate over the previous year had been higher than the average month-on-month national HPI appreciation rate for the previous three years (Igan and Kang 2011). In the most extreme cases, “excessively speculative zones” were designated, in which certain specified types of transactions were prohibited.
19. The problem, however, was that it was discriminative against members of the younger generations with relatively low incomes, since it could possibly prevent them from owning houses.
20. Except during the period of the currency crisis when deposits at NBFIs were relocated to the banking sector and lending declined significantly due to economic recession.
21. In 1996, Korea Housing Bank was converted to a commercial bank, and from that time other commercial banks were allowed to deal in mortgage loans. Commercial banks had previously focused mainly on corporate finance, and Korea Housing Bank, a specialized bank, had been in exclusive charge of housing finance.
22. Household loans had higher interest rates than corporate loans, and unlike in credit-guarantee funds, securing of deposits was not mandatory. Risk-weights were just 50 percent in estimation of the BIS capital ratio with respect to household loans because the houses were the collateralized. The risk-weight application for corporate loans, in contrast, was 100 percent.
23. In addition, overseas portfolio investment by domestic investors increased rapidly from 2006. Investors sold forward contracts to hedge their investments to avoid foreign exchange risk.
24. The suspicions about Korean banks might also have been aggravated by memories of the 1997 currency crisis.
25. However, the standard deviation of their quarter-on-quarter changes was relatively smaller during the crisis period, presumably because the range of fluctuation in debt narrowed because of unfavorable debt financing conditions.
26. Meanwhile, the time it took for the cash and deposit assets of domestic financial institutions to exceed two standard deviations was significantly less than what it took for debt outflows. We need to devise a plan to use this as a crisis forecasting index.
27. In the case of Korea in 2008, the rapid reduction in foreign borrowings was attributable mainly to foreigners. In this sense, the event could be categorized as a “sudden stop” rather than sudden flight (refer to Rothenberg and Warnock [2006] for detailed discussion of this issue).
28. Recently, a way of numerically reflecting the possibility of liquidation has been considered. However, it is possible that liquidity might not be ensured as much as expected in this case either, if many financial institutions try to liquidate assets at the same time.
29. The ratios of the government-owned specialized banks were lower than the guideline, but they did not cause the liquidity shortage in 2008.
30. In response to this expansion in bank lending, the Bank of Korea raised the reserve requirement ratio in November 2006 to curb the pace of bank lending expansion. This did not pay off, however, because of the inclusion of reserve requirements in liquid assets in DC liquidity ratio calculation.

31. FMOLS: fully modified ordinary least squares method; CCR: canonical cointegrating regression.
32. The lower household loan delinquency ratio in Korea may be due to legal factors. In general, Korean law allows the right of recourse to the creditor, which weakens household incentives for foreclosure. Fitch Ratings (2010) compactly describes the legal aspects of Korean housing loans.
33. The conclusion of Wong and others (2011), who reported relatively positive empirical analytical results for Hong Kong regarding the LTV effects, is based on this logic.
34. This estimation result may reflect the ex post property of the LTV regulation, which was lowered after the jump in housing prices had been observed.
35. To obtain concrete statistical evidence of the effects of the LTV and DTI regulations on housing prices and household debt, it may be necessary to apply more detailed econometric estimation techniques that can determine the interrelations among the variables used in the estimation.
36. Since the liquidity ratio could not reflect the liquidity conditions for banks, as analyzed here, the changes in FX liabilities are selected as the needed proxy for FX liquidity conditions.
37. Up to that time, an LTV ratio of 40 percent had been applied to loans for houses priced above 600 million Won with maturities of 10 years or more. On loans for houses of the same value, but with amortized repayment over 10 years with one-year grace periods, the LTV ratio was meanwhile 60 percent, as the authorities believed these loans were not motivated by speculative purposes. In fact, however, the latter form of loan came to comprise the majority in those days, with most taken out for the purpose of avoiding the regulation (FSC and FSS 2006b).
38. Regarding this issue, Perotti and Suarez (2011) expressed views similar to those in this chapter.
39. The Korean authorities have recently announced a plan urging mandatory minimum holdings of safe FX assets, sufficient to cover FX liquidity needs in times of low roll-over ratios as seen during the recent crisis.
40. Caprio (2010) argues that the ineffectiveness of Spanish dynamic provisioning has been due to the boundary problem. See Goodhart (2008) for a general discussion of the boundary problem.
41. The notion here may be similar to the idea of the “look-through” approach suggested by Caruana (2010).

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