

FINANCIAL LIBERALIZATION AND THE EVOLUTION OF BANKING AND  
FINANCIAL RISKS: THE CASE OF SOUTH KOREA<sup>S</sup>

By

Panicos O. Demetriades\*  
University of Leicester

Bassam Fattouh  
CEFS, SOAS

Kalvinder Shields  
University of Leicester

ABSTRACT

The paper provides new insights into the role of financial liberalization in the South Korean financial crisis using a number of novel approaches. Firstly, primary information regarding the relaxation of financial restraints, such as interest rate ceilings, capital controls and reserve requirements, is collected and summarised. Secondly, this information is used to construct summary measures of financial liberalization. Thirdly, qualitative information on the role of financial liberalization in the financial crisis is presented from a new survey of 44 IMF, World Bank and Korean officials who had direct exposure to the events surrounding the financial crisis. Fourthly, the effects of financial liberalization on the evolution of banking and financial risks are estimated utilising a conditional CAPM with time-varying market risk. Finally, qualitative and quantitative findings are juxtaposed, allowing insights into the extent to which financial markets recognized the increased banking and financial risks, which emanated from financial liberalization.

JEL classification: E44, F34, G28, G12

Keywords: Financial liberalization, financial crisis, banking and financial risks

January 2001

---

\* This paper is part of an ESRC-funded project entitled "The South Korean Financial Crisis: Lessons for Financial Liberalization" (Grant R000 22 2773). We would like to thank, without implicating, the following individuals: Dr Jerry Caprio, Director, Financial Strategy and Policy Group, the World Bank for hosting our visit to Washington, D.C. in October 1999. Dr Jea Chun Kim, Deputy Director, Monetary Policy Department, The Bank of Korea, for hosting our visit to Seoul in April 2000. Mr Soon sang Oh, Research Department, Bank of Korea for providing necessary facilities in Seoul. Eun-Ju Jang and Ji Eun Jung, postgraduate students at Ewha Womans University, for assisting with the interviews in Seoul. Finally we are indebted to Giovanni Ferri (University of Bari) and Tae-Soo Kang (World Bank and Bank of Korea), for providing us with their list of contacts in Seoul.

We would also like to thank participants at MFM2000 conference (South Bank University, London, 6-8 September 2000) and the French-British Macroeconomics Workshop (University of Paris 1, 24-25 November 2000) for helpful comments on an earlier version of the paper; we are specifically indebted to Mark P. Taylor and Abhay Abhyankar for constructive suggestions. Naturally all remaining errors are our own.

\* Corresponding author. Address for correspondence: Prof. P. Demetriades, Department of Economics, University of Leicester, University Road, Leicester, LE1 7RH. Tel: ++44 (0) 116 2522835. Fax: ++44 (0) 116 2522908. Email: [pd28@le.ac.uk](mailto:pd28@le.ac.uk).

## 1. Introduction

Financial liberalization has recently become almost synonymous to financial instability, especially but not exclusively so in the case of emerging market economies (Stiglitz, 2000; Demirgüç-Kunt and Detragiache, 1999; Demetriades, 1999; Arrestis and Demetriades, 1999). The most popular explanation for this infamous association is that financial liberalization usually fuels a lending boom, which funds the creation of an asset price bubble (e.g. Allen and Gale 2000). When the bubble bursts, collapsing collateral values result in bank insolvencies and a credit crunch, resulting in severe recessions. In the recent financial crisis in East Asia<sup>1</sup>, the lending-boom explanation accords reasonably well with the experience of Thailand (Demetriades, 1999). However, it does not appear to fit comfortably the case of South Korea, where there was hardly a detectable lending boom or an obvious asset price bubble. Instead, the Korean crisis appears to be very much a case of inadequately managed financial risks. Anecdotal evidence suggests that Korean financial intermediaries borrowed short in foreign currencies and acquired low-quality foreign assets with longer maturities. This created maturity and exchange rate mismatches and increased overall credit risk, since even when exchange risk was hedged, it was substituted by increased credit risk (Demetriades and Fattouh, 1999).

While a lot more is now known about the Korean crisis than at the time it erupted, there is very little evidence documenting the evolution of financial risks before the crisis. Perhaps more importantly, the role of financial liberalization in this process remains largely unknown or even unrecognised. At best, existing discussions of the role of financial liberalization are based on anecdotal evidence. At worst, the role of financial liberalization is neglected or misunderstood. Yet, if there are any policy lessons to be learned from virtually any financial crisis they are almost inevitably related to the timing and implementation of financial reforms.

The paper provides new insights into the role of financial liberalization in the South Korean financial crisis using the following novel approaches.

- (i) Episodes of financial liberalization are documented by collecting primary information from official publications on the relaxation of a variety of financial

restraints, including capital controls, interest rate ceilings and reserve requirements on bank deposits. This information is used to construct summary measures of financial liberalization, which are used in estimations.

- (ii) New qualitative information on the mechanisms by which financial liberalization led to increased banking and financial risks is presented. This information is obtained from a new survey of 44 IMF, World Bank and Korean officials who had direct exposure to the events surrounding the Korean financial crisis. The survey was carried out in Washington, D.C. during October 1999 and in Seoul during April 2000. The findings from the survey are tabulated and analysed, providing a useful background to the formulation of an empirical model.
- (iii) New econometric evidence on the evolution of financial risks for the period 1987–1997 is presented which is aimed at quantifying the effects of financial liberalization. This evidence is obtained by estimating a conditional CAPM in which the conditional variance-covariance matrix of portfolio innovations follows a multivariate GARCH process. The model specification allows testing for the effects of financial liberalization on the conditional variance and riskiness of the banking and financial sector portfolios.
- (iv) Qualitative and quantitative findings are juxtaposed. This allows insights into the extent to which financial markets recognized the increased banking and financial risks, which emanated from financial liberalization.

The rest of the paper is structured as follows. Section 2 provides a conceptual discussion of financial liberalization and its association with increased risks. Section 3 documents the Korean experience. Section 4 summarizes the findings from the IMF/World Bank survey. Section 5 presents the econometric evidence on the evolution of banking and financial risks. Finally, section 6 concludes.

## 2. Financial Liberalization and Banking Risks: Conceptual Issues

The traditional approach towards financial liberalization, which dates back to the work of McKinnon (1973) and Shaw (1973), emphasizes the benefits that would accrue from market determined interest rates and credit allocation decisions (see also Fry, 1997).

---

<sup>1</sup> For a recent comprehensive overview of the Asian crisis see Hunter, Kaufman and Krueger (1999).

The potential benefits of financial liberalization include greater levels of financial savings and investment, as well as improvements in resource allocation, which emanate from more productive investments. It is important to note that even though this literature predated the economics of information revolution, which after all explained the *raison d'être* for banks and financial institutions, it nevertheless had an enormous impact on economic policy through the Bretton Woods institutions, since financial liberalization became an important element of the set of policies associated with the 'Washington consensus'. In spite of unsuccessful implementation of financial liberalization in Latin America and other countries in the late seventies and eighties, the core of the financial liberalization thesis has remained intact, even though some peripheral concessions were made, including acknowledging the importance of policies and institutions that are expected to address market failures (see Arestis and Demetriades, 1999). These included the appropriate 'sequencing' of reforms, in the form of attaining macroeconomic stability and adequate prudential regulation of the financial system, prior to financial liberalization, as well as a specific order for financial reforms, with the liberalization of short-term capital flows being placed at the end of the reform sequence (see for example McKinnon, 1981).

We posit in this section that the impact of financial liberalization on banking and financial risks is ambiguous. While financial liberalization typically offers greater opportunities for diversification, by offering banks and other financial institutions a wider range of asset choices, which in principle should lead to more efficient portfolio choices, it may well expose them to greater risks, due to lack of expertise in operating in new markets, weaknesses in prudential regulation and/or moral hazard emanating from information problems. The modern literature on financial liberalization reflects these two opposing forces. The rest of this section draws on this literature to argue the case.

Capital account liberalization may in principle be expected to: (i) offer investors greater opportunities for risk diversification, achieving more effective insurance than purely domestic arrangements would allow, (ii) raise consumer welfare by allowing a smoother consumption path, (iii) result in a more efficient allocation of resources by channelling the world's savings towards the world's most productive investment opportunities, (iv) complement domestic savings, thereby increasing investment and promoting economic

growth without sharp increases in savings rates, and (iv) lower the cost of capital to creditworthy firms and small and medium enterprises (see Obstfeld and Rogoff, 1996 and Edwards, 1999).

In reality capital account liberalization has presented important challenges and risks for policymakers (see, for example, Stiglitz, 2000). Specifically, the recent East Asian financial crisis has shown that capital account liberalization can magnify the risks and weaknesses of the banking system, especially when capital inflows are intermediated through poorly managed and ill-supervised banking systems. The intermediation of capital inflows through such banking systems usually leads to an expansion in banks' lending activity as banks have more resources available for lending. This generates what is known as a 'lending boom'. Furthermore, domestic banks can exploit market imperfections to generate over-optimistic expectations knowing that in case of default the government will be forced to bail out distressed banks and firms (McKinnon and Pill, 1997). Since entrepreneurs and firms do not have enough information to assess banks' signals adequately, they consider these signals as correct and hence base their investment decisions on such over-optimistic expectations. Consequently, they bid eagerly for funds to finance their investments, further fuelling the lending boom (McKinnon and Pill, op.cit).<sup>2</sup>

One undesirable consequence of a lending boom fuelled by capital inflows is that it can exacerbate the maturity and risk mismatch between banks' assets and liabilities. This is especially true if capital inflows are short-term and in foreign currency while banks' loans are long-term and in domestic currency. Furthermore, unregulated capital flows may be misallocated towards risky projects, speculative activities, the equity market, and cyclical sectors such as real estate. In the short run, the expansion of lending activity bids up (inflates) the price of assets in these markets generating an asset price bubble. Such bubbles inevitably lead to deterioration in banks' portfolios as banks increase their holdings of 'inflated' assets and become heavily exposed to cyclical sectors.

---

<sup>2</sup> What is interesting in McKinnon and Pill's framework is that banks finance the lending boom by attracting capital from abroad. The authors refer to this process as the "over-borrowing" syndrome.

Domestic financial liberalization, which comprises mainly of relaxation of controls on interest rates, lifting of restrictions on the asset choices of banks and lowering or abolishing reserve requirements, can also significantly increase the risks in the financial sector (Fischer and Chenard, 1997; Demingüç-Kunt and Detragiache, 1998; Stiglitz, 1994). Intense competition that usually follows financial liberalization lowers profits for banks, which in turn erodes banks' franchise values and lowers their incentive for making good loans. This exacerbates the problems of moral hazard and looting behavior in the banking system (see Hellman, Murdoch, and Stiglitz, 2000; Akerlof and Romer, 1993). These have the effect of increasing the riskiness of banks' portfolios. A closely related argument is that financial liberalization erodes the protection provided by a regulated term structure and stable intermediation margin (Goldstein and Turner, 1996). This may intensify the moral hazard problem, encouraging banks to engage in lending to more risky borrowers in order to increase the returns on their funds. Indeed, Hellman et al (2000) show that certain types of financial restraints, such as ceilings on deposit rates, by keeping profit margins within certain limits can reduce the riskiness of banks' portfolios by limiting banks' incentives to invest in assets that facilitate gambling. Financial liberalization can also change the banks' customer base with larger and better-known firms raising a larger share of funding through the securities markets or international markets. The resulting effect is generally deterioration in the risk composition of the bank and financial sector's loan portfolios (Fischer and Chenard, 1997).

In principle, however, domestic financial liberalization can generate efficiency gains by removing various constraints on banks' feasible risk-return frontier, which may result in lower overall banking risks (Hogan and Sharpe, 1984). Furthermore, financial liberalization may open new profitable opportunities, which bankers could exploit and thereby avoid the erosion of their franchise value.<sup>3</sup> Hence, while a case could be made that the impact of financial liberalization on the financial sector's overall level of risk is ambiguous at the theoretical level, most studies usually associate financial liberalization with higher risks (Fischer and Chenard, 1997; Hellman et al, 2000).

---

<sup>3</sup> However, Hellman et al (2000) argue that greater investment opportunities, wide ranges of new activities such as derivative trades and foreign currency transactions and greater freedom to allocate assets also increase the potential scope for gambling by banks.

An important element of domestic financial liberalization that has a direct impact on banks' riskiness is reserve requirements on bank deposits. Reserve requirements are usually considered as tax on financial intermediation, which lower the profitability of the banking sector and hence may affect its attitude towards risk. Furthermore, required reserve ratios affect the level of liquidity available for banks and hence affect their lending decisions. Mitchell (1986) finds that the impact of reserve requirements on bank riskiness depends on the way bank risk is measured and on the assumptions made about risk aversion. Specifically, if bank risk is measured by the ratio of banks' risky assets to total assets, then an increase in the required reserve ratio will drive down the level of bank risk. On the other hand, if bank risk is measured by the probability that the banks' profit will fall below zero, a rise in required reserves will also drive down bank risk if and only if there is increasing relative risk aversion. The reverse holds, however, if there is decreasing relative risk aversion. Hence, at the theoretical level, the impact of reserve requirements on bank riskiness is also ambiguous.<sup>4</sup>

To sum-up, the traditional financial liberalization thesis, as well as its modern version, tends to emphasize its potential benefits, in the form of efficiency gains and opportunities for diversification, which in principle should lead to more efficient portfolio choices; these may be reflected in both greater investment returns and lower risks, in both the real and financial sectors. However, skeptics argue that because of the endemic nature of imperfect information and institutional weaknesses, associated market failures, such as moral hazard, could well mean that financial liberalization instead leads to substantially increased financial risks and lower ex-post investment returns. The Korean experience, to which we now turn, reflects both the traditionalist beliefs, which resulted in under-estimation of banking and financial risks, as well as the realities of increased risks through market failures and institutional weaknesses.

### 3. Financial Liberalization in South Korea

In the last two decades or so, the South Korean financial system witnessed major liberalization efforts, especially on the capital account front. According to the discussion of Section 2, these regulatory changes are likely to be associated with a

---

<sup>4</sup> Gelles (1991) shows that all the above conclusions hold for any bank with reserves and a risk-averse utility function with a mean-standard deviation framework that is consistent with expected utility.

change in the level of the riskiness of Korean financial institutions. Before we present qualitative and quantitative evidence on the impact of such liberalization efforts on the riskiness of the Korean financial system, it is useful first to discuss briefly the Korean experience with capital account and domestic financial liberalization.<sup>5</sup>

#### Capital account liberalization

In the late 1980s, the Korean government accelerated the liberalization process of its capital account. The liberalization of the capital account took place mainly by relaxing controls on banks and corporations' fund-raising activity in international markets and by allowing foreigners to invest in the Korean stock, bond and money markets. In December 1989, foreign exchange banks were allowed to raise offshore funds by issuing foreign currency denominated bonds or borrowing from the offshore accounts of other domestic foreign exchange banks. The main liberalization step, however, occurred in January 1992, when non-residents were allowed for the first time to invest in any domestic stock unless specified in some particular act, even though some limits were set on the level of total foreign investment.<sup>6</sup> During September 1992 regulations on the overseas issue of foreign currency denominated securities were greatly eased. The type of securities that could be issued abroad by Korean residents, restricted previously only to bonds, convertible bonds, bonds with warrants and stock depository receipts, were expanded to include negotiable CDs and commercial papers. Furthermore, the authorization procedures necessary for the issue of securities were greatly simplified.

During 1993-1998, the Korean government resumed the opening of its financial markets to foreign investors. For instance, in July 1994, the government partially opened the domestic bond market allowing non-residents to purchase non-guaranteed convertible bonds issues by small and medium enterprises (SMEs) subject to certain limitations. In May 1996, non-residents were allowed to purchase and trade bonds with warrants and to trade the stock index futures on the Korean Stock Exchange. In June 1997, foreign investors were granted access to non-guaranteed bonds of SMEs and of conglomerates

---

<sup>5</sup> A more detailed discussion can be found in the appendix. The information in this section and the appendix was obtained from the Bank of Korea Annual Reports.

<sup>6</sup> For instance, a 3% limit on investment by an individual foreign and 10% limit on total foreign investment were applied respectively and in the case of public utilities and those companies in infant industry, the total foreign investment limit is set at 8%.



and by 1998, all kinds of securities stipulated in the Securities and Exchange Act were made available to foreign investors.<sup>7</sup> Another important development has been the abolition of ceilings on the purchase of domestic stocks by foreigners. In parallel with these developments, controls on foreign borrowing were largely dismantled during 1993–1995. In February 1993, overseas branches of domestic banks were permitted to supply loans to Korean residents engaged in the trading of the commodity futures or financial futures. Later in the same year, security issuers in foreign markets were no longer required to obtain permission before issuing foreign currency denominated securities. Furthermore, the list of corporations and banks that could issue foreign securities was considerably widened. By October 1996, the government dismantled most of the restrictions on direct foreign borrowings, enabling even non-manufacturing SMEs to receive loans from abroad.

#### Interest Rate Liberalization

Unlike the capital account liberalization process, domestic financial liberalization occurred gradually over a long period of time. At the heart of domestic financial liberalization in Korea was the liberalization of interest rates. Since the early 1960s, one of the most important characteristics of the South Korean credit market has been the direct intervention of the state in the pricing of credit, which was mainly achieved through controls on lending, and deposit interest rates. In September 1979, the Monetary Board abolished the maximum interest rate on bank loans. However, given Korean banks' inexperience in setting interest rates, the Korean Bankers Association decided to link the interest rate on loans to the Bank of Korea's rediscount rate which seriously limited the ability of Korean banks to alter lending rates. In July 1984, banks were allowed to charge different rates according to the creditworthiness of borrowers but within a narrow band. It is only in December 1988 that banks began to enjoy complete freedom over interest rate determination when controls on lending rates from banks and non-bank financial intermediaries were relaxed despite the fact that some controls on policy loans remained in place. In a move towards further liberalization, the interest rate on policy based loans were liberalized in July 1995 and, in January 1996,

---

<sup>7</sup> For example, short-term financial products such as commercial papers, commercial bills, and trade bills and CDs issued by financial institutions; and unlisted stocks and bonds.

the Bank of Korea lifted the restriction on the size of premium a bank could charge over its prime lending rate.

The relaxation of controls on deposit rates in Korea was very gradual. Although in 1979 the Monetary Board abolished the maximum interest rate on personal checking deposits, it is not until December 1988, when the Monetary Board liberalized interest rates on certain time and saving deposits, that banks started enjoying some freedom in determining deposit rates.<sup>8</sup> In November 1991, the scope of initial liberalization was extended to cover rates on long-term deposits with a maturity of 3 years offered by banks, mutual credit facilities, and credit unions. It is only as recently as November 1995 that the Bank of Korea freed up the remaining regulated interest rates on bank and non-bank time deposits with maturity of less than six months.

The Bank of Korea concentrated its efforts in developing money markets by relaxing controls on the issue and sale of existing instruments and introducing new ones. In June 1982, the call rate, which had been subject to an upper limit of 16% was deregulated. In March 1986, the rates on negotiable CDs, introduced only in June 1984, were also liberalized. Further liberalization measures took place in December 1988 when interest rate on repurchase agreements (RPs), commercial papers of certain maturities (CPs), financial debentures and corporate bonds were fully liberalized. The major change however came in October 1989, when the government merged the call markets, previously segmented into an inter-bank market mainly for banks and over the counter market between non-bank financial intermediaries and liberalized the interbank rate. Further liberalization was carried in the 1990s where the Monetary Board liberalized the rates on government and public bonds, shortened the maturity of RPs, CDs and other financial instruments, and significantly deregulated the bond market in November 1991. During the 1992-1995 period, the bank lowered gradually the minimum denominations of CDs and shortened the maturities of the RPs. In fact, by 1995 the Korean money markets had become highly liberalized.

It emerges from this brief overview that in the last decade or so, Korean financial institutions witnessed major regulatory changes that may have increased the riskiness of

---

<sup>8</sup> Specifically, only interest rate on time deposits of maturity greater than 2 years at banks, postal savings and credit unions and on time and savings deposits of maturity greater than 1 year at mutual savings and finance companies were liberalised.

these financial institutions. In what follows, we examine this issue both qualitatively and quantitatively.

#### 4. The evolution of banking and financial risks: qualitative evidence

This section presents the results of two sets of interviews carried out in (i) Washington, D.C. during the autumn of 1999 and (ii) Seoul during April 2000. The interviews followed a semi-structured questionnaire, which contained 21 questions relating to the factors that caused the crisis. The respondents in Washington were 15 officials of the International Monetary Fund and the World Bank who had direct exposure to the events surrounding the Korean financial crisis. The respondents in South Korea were 29 private and public sector economists with direct experience of the financial crisis. They included senior officials of the Bank of Korea, the Ministry of Finance and Economics, the Korean Development Institute, the Korean Institute of Finance, private research institutes (funded by Korean chaebols), commercial banks (both Korean and international) and other financial institutions. Tables 1 and 2 present the summary responses to seven questions that focus on the evolution of banking and financial risks and the effects of financial liberalization, as perceived by the respondents after the crisis.

The answers to these questions from both sets of interviews seem to support the view that financial liberalization increased the riskiness of the Korean financial sector. All the respondents in Washington and 72% of the respondents in Seoul thought that financial liberalization (defined as the removal of interest rate restraints and capital controls) on balance – taking into account the responses of financial institutions and regulators, – increased the risks faced by Korean financial institutions. The survey also reveals another interesting observation: it shows that 73% of the respondents in Washington and 97% of the respondents in Seoul thought that the institutional framework of prudential regulation and supervision was not well developed to deal with the risks associated with substantial volumes of capital flows. All but one respondent (i.e. 93%) in Washington and 86% of the respondents in Seoul thought that Korean financial institutions did not have in place adequate risk management systems. 87% of respondents in Washington and 79% of respondents in Seoul thought that Korean financial institutions did not have the human capital or the expertise to manage the risks

associated with the intermediation of large amounts of foreign capital. These results suggest that financial liberalization may have resulted in increased banking and financial risks due to inadequate risk management by financial institutions and expertise and due to weaknesses in prudential regulation.

Table 1: Interview responses of IMF and World Bank officials

Question	Answer			
	Yes	No	Maybe	Don't know
Many economists believe that financial liberalization (i.e. removal of interest rate restraints and capital controls) leads to higher investment returns. Do you agree?	10	2	2	1
Given that many economists do believe that financial liberalization increases investment returns, do you think that it may have played some role in creating over-optimistic expectations about investment payoffs?	8	4	3	0
Some economists believe that financial liberalization leads to increased risks in the financial system, in the form of exchange risk, credit risk and interest rate risk. Do you agree?	14	0	1	0
Did Korean financial institutions have in place the risk management systems required to manage the new risks that financial liberalization may bring about?	0	14	1	0
Do you think that Korean financial institutions were equipped with the human capital and expertise to adequately manage the risks associated with the intermediation of large amounts of foreign capital?	1	13	1	0
Do you think that the institutional framework of prudential regulation and supervision was sufficiently well developed to deal with the risks associated with substantial volumes of foreign capital?	0	11	2	2
Taking into account the new types of risks as well as the responses of financial institutions and regulators to these risks, would you say that on balance financial liberalization increased the risks faced by Korean financial institutions?	15	0	0	0

Table 2: Interview responses of South Korean officials

Question	Answer			
	Yes	No	Maybe	Don't know
Many economists believe that financial liberalization (i.e. removal of interest rate restraints and capital controls) leads to higher investment returns. Do you agree?	18	1	10	0
Given that many economists do believe that financial liberalization increases investment returns, do you think that it may have played some role in creating over-optimistic expectations about investment payoffs?	15	6	8	0
Some economists believe that financial liberalization leads to increased risks in the financial system, in the form of exchange risk, credit risk and interest rate risk. Do you agree?	20	3	5	1
Did Korean financial institutions have in place the risk management systems required to manage the new risks that financial liberalization may bring about?	2	25	2	0
Do you think that Korean financial institutions were equipped with the human capital and expertise to adequately manage the risks associated with the intermediation of large amounts of foreign capital?	1	23	5	0
Do you think that the institutional framework of prudential regulation and supervision was sufficiently well developed to deal with the risks associated with substantial volumes of foreign capital?	0	28	1	0
Taking into account the new types of risks as well as the responses of financial institutions and regulators to these risks, would you say that on balance financial liberalization increased the risks faced by Korean financial institutions?	21	4	4	0

Finally, the survey results show that roughly two thirds of the respondents in both Washington and Seoul believed that financial liberalization normally leads to higher investment returns. Just over half the respondents in both Washington and Seoul thought that financial liberalization played a role in creating over-optimistic expectations about investment payoffs in Korea. These findings suggest that the traditional beliefs concerning financial liberalization were at least partly responsible for the financial crisis for at least two reasons. Firstly, by emphasising efficiency gains through enhancing the quality of investment, they seemed to have contributed to

creating over-optimistic expectations concerning investment payoffs.<sup>9</sup> In fact, many have argued that the creation of over-optimistic expectations is the main impetus behind the lending boom and the asset price bubble (McKinnon and Pill, 1997). Secondly, by failing to emphasize the greater risk-taking opportunities that accompany financial liberalization they generated complacency in relation to the recognition of risks and risk management both by the financial institutions themselves and the supervisory authorities.<sup>10</sup>

##### 5. The Evolution of Banking and Financial Risks: Econometric Evidence

In this section, we investigate the extent to which the survey results, which indicate an increase in risks emanating from financial liberalization, were reflected in financial markets. To this end, we use an approach which exploits the information contained in the price index of securities issued by banks and other financial firms such as investment banks, merchant banks and securities companies. Specifically, we examine the changes in the prices of the banking and financial sector portfolios in order to obtain information on the market's assessment of the evolution of risks of the Korean financial system. In order to measure the riskiness of the banking and financial sector, we use the conditional Capital Asset Pricing Model (CAPM) in which the conditional variance-covariance matrix of portfolio innovations is assumed to follow a multivariate Generalized Autoregressive Conditional Heteroskedastic (GARCH) process. GARCH models provide a flexible method for modeling time-varying conditional variances and co-variances and more importantly capture the empirical regularities found in stock returns (Ng, 1991). We investigate the impact of financial liberalization on the volatility

---

<sup>9</sup> Edwards (1997) reaches a similar conclusion in the context of the Mexican crisis where he argues that the "financial media, academic analysts, Wall Street experts, and multilateral institutions invented the Mexican miracle" which created a wave of over-optimism not based on real economic performance.

<sup>10</sup> There is little doubt that another important factor responsible for inadequate risk management was the moral hazard emanating from the history of the socialization of risks in South Korea. However, the implicit provision of safety nets by the government was not new. It was present in South Korea since the early 1960s, yet no major financial crisis was observed before 1997. Government provided safety nets go some way in explaining disincentives in managing risk, but they do not explain the increase in risk taking opportunities that accompanies financial liberalization. Indeed, up to the early 1990s the socialization of risks was an important factor in ensuring the large investments undertaken by chaebols, most of which were responsible for transforming Korea into a highly industrialized country. It is conceivable that with a different set of beliefs, namely one which acknowledged the substantially increased risk taking opportunities associated with financial liberalization, necessary improvements in prudential regulation, risk recognition and management would have taken place, even in the presence of implicit safety nets. Indeed, many such improvements have now taken place in Korea itself, where the risks emanating from financial liberalization, are now widely acknowledged.

of bank and financial sector stock returns by focusing on two areas of reforms, namely, domestic financial liberalization and capital account liberalization. Consequently, we examine the effects of (i) interest rate liberalization and relaxations of reserve requirements on domestic deposits, which form the centerpiece of various attempts of domestic financial liberalization (ii) the relaxation of controls on capital flows, on banking and financial risks. To this end, we augment the conditional covariance equations of the GARCH model with indices of interest rate liberalization, reserve requirements and capital account liberalization.

The rest of this section describes our modeling framework, presents the data and data sources, including the construction of the relevant liberalization indices, and presents the main empirical findings.

#### The Modelling Framework

The CAPM due to Sharpe (1964), Linter (1965) and Black (1972) explains the risk of a particular asset or portfolio using the excess return on the market portfolio. Specifically, the conditional CAPM model for an asset or portfolio  $i$  can be stated as follows:

$$E(r_{it}/W_{t-1}) = b_{it}E(r_{mt}/W_{t-1}) + d_t H_t W_{t-1} \quad (1)$$

Where  $r_{it}$  is the return on portfolio  $i$  in excess of the return on the risk-free asset,  $r_{mt}$  is the return on the market portfolio in excess of the return on the risk-free asset,  $d_t$  is the aggregate measure of relative risk,  $H_t$  is the conditional covariance matrix with elements  $\{h_{ijt}\}$ ,  $w_{t-1}$  is the vector of assets weights in the market portfolio  $m$ , and  $b_{it}$  is the conditional beta of portfolio  $i$  with the market portfolio and represents the dependence

on market portfolio risk.  $b_{it}$  can be defined as follows:

$$b_{it} = h_{imt}/h_{mmt} \quad (2)$$

where  $h_{imt}$  is the conditional covariance between the return on portfolio  $i$  and the market portfolio and  $h_{mmt}$  is the conditional variance of the market portfolio. In this version of the CAPM, all moments are made conditional on the information available at time  $t-1$  as given by the information set  $W_{t-1}$ .

For estimation purposes, it is useful to decompose the actual return on the different portfolios into forecastable and unforecastable parts:

$$r_{it} = E(r_{it}/W_{t-1}) + u_{it} \quad (3)$$

$$r_{mt} = E(r_{mt}/W_{t-1}) + u_{mt} \quad (4)$$

where  $r_{it}$  and  $r_{mt}$  are actual or realized returns and  $u_{it}$  and  $u_{mt}$  denote the column vectors of the differences between realized excess returns and expected excess returns. Substituting (1) into (3) and using the definition of  $b_{it}$ , we obtain the following:

$$r_{it} = (h_{mt}/h_{mt})\pi_{mt} + u_{it} \quad i=1,2 \quad (5)$$

where  $\pi_{mt} = E(r_{mt}/W_{t-1})$ . For the purposes of this study, we include, in addition to the market portfolio, the banking sector and financial sector portfolios, hence  $i=1,2$ , respectively.<sup>11</sup>

We stack the innovations from the banking sector, the financial sector and the market portfolio into the vector  $e_t$  where

$$e_t/W_{t-1} = \begin{pmatrix} u_{it} \\ u_{mt} \end{pmatrix} \sim N(0, H_t) \quad (6)$$

and the conditional variance-covariance matrix of asset innovations in (6) is assumed to follow a multivariate GARCH process (Bollerslev, 1990). Following Bollerslev, Engle and Wooldridge (1988), we assume that the innovation vector follows a simple GARCH(1,1) process. The simplest generalization of the GARCH(1,1) model can be stated as:

$$\begin{aligned} (e_t/W_{t-1}) &\sim N(0, H_t) \\ \text{Vech}(H_t) &= w + \gamma \text{Vech}(H_{t-1}) + \Lambda \text{Vech}(e_{t-1}e'_{t-1}) \end{aligned} \quad (7)$$

where  $\text{Vech}(\cdot)$  denotes the column-stacking operator of the lower portion of a symmetric matrix,  $e_t$  is an  $(N \cdot 1)$  vector of innovations,  $w$  is a  $(\frac{1}{2} N(N+1) \cdot 1)$  parameter vector, and  $\gamma$  and  $\Lambda$  are  $(\frac{1}{2} N(N+1) \cdot \frac{1}{2} N(N+1))$  matrices of constant parameters. The specification in (8) has  $(\frac{1}{2} N^2(N+1)^2 + \frac{1}{2} N(N+1))$  parameters in the conditional variance and covariances, which makes estimation of the system of equations practically unmanageable. In our simple three-portfolio multivariate GARCH(1,1) model, the number of parameters to be estimated would be 78. In order to achieve tractability, we

---

<sup>11</sup> In principle, we could use data on stock prices of individual commercial banks, investment banks, securities companies, etc. However, the inclusion of a wide list of stocks entails the estimation of too many parameters.



need to impose some reasonable restrictions on the variance-covariance matrix. Bollerslev, Engle and Woodbridge (1988) suggest that the covariance matrix is written as a set of univariate GARCH models where the conditional covariance of each portfolio is assumed to depend only on its own lagged covariance and the cross product of past forecast errors.<sup>12</sup> This can be obtained by making the matrices  $\gamma$  and  $\Lambda$  in (8) diagonal. In this restricted model, the number of parameters would be  $3N(N+1)/2$ , hence for our three-portfolio model, the number of parameters to be estimated would be 18. Based on this specification, the element  $(i,j)$  of  $H_t$  is given by:

$$h_{ijt} = w_{ij} + a_{ij}h_{ijt-1} + b_{ij}u_{it-1}u_{jt-1} \quad (8)$$

We augment the conditional variance and covariance equations to incorporate measures of interest rate liberalization, reserve requirements on domestic demand deposits and capital account liberalization. As postulated in section 2, all these indices are likely to have an impact on the volatility of bank stock returns. In addition, the excess market return equation (4) incorporates indices on interest rate and capital account liberalization.<sup>13</sup> It is often argued in the literature that a shift from a 'financially repressed' economy to a 'financially liberalized' economy is likely to result in more efficient allocation of resources, which has the impact of increasing the return on investment.<sup>14</sup> However, it is now widely recognized that in the presence of information asymmetries and contract enforcement problems, it is not necessarily true that the banking system will allocate resources to projects or firms with the highest return. Furthermore, in the presence of inadequate regulation and bank supervision, capital account liberalization may, in fact, have an adverse impact on productivity. For instance, in McKinnon and Pill's (1997) framework, domestic banks can exploit market imperfections and generate 'over-optimistic' expectations. As a result, entrepreneurs and firms will bid eagerly for funds to finance their investments, creating a lending boom and an asset price bubble. Price distortions and resource misallocations of these types have an adverse impact on the productivity of capital. Given these competing explanations, the impact of financial liberalization on market returns is ambiguous.

---

<sup>12</sup> See also Ng (1991) and Engle and Kroner (1993).

<sup>13</sup> There does not seem to be any strong theoretical justification for reserve requirements to have an impact on the market return; hence this variable is not included in the market return equation.

The complete system of equations of our three-portfolio model using the diagonal representation is given by:

$$r_{m t} = a_0 + a_1 \text{INT}_t + a_2 \text{CAP}_t + u_{m t} \quad (9.1)$$

$$h_{m m t} = w_{01} + a_{11} h_{m m t-1} + b_{11} u_{m t-1}^2 + d_{11} \text{INT}_t + g_{11} \text{RD}_t + g_{11} \text{CAP}_t \quad (9.2)$$

$$h_{11 t} = w_{02} + a_{22} h_{11 t-1} + b_{22} u_{1 t-1}^2 + d_{22} \text{INT}_t + g_{22} \text{RD}_t + g_{22} \text{CAP}_t \quad (9.3)$$

$$h_{22 t} = w_{03} + a_{33} h_{22 t-1} + b_{33} u_{2 t-1}^2 + d_{33} \text{INT}_t + g_{33} \text{RD}_t + g_{33} \text{CAP}_t \quad (9.4)$$

$$h_{1 m t} = w_{04} + a_{44} h_{1 m t-1} + b_{44} u_{1 t-1} u_{m t-1} + d_{44} \text{INT}_t + g_{44} \text{RD}_t + g_{44} \text{CAP}_t \quad (9.5)$$

$$h_{2 m t} = w_{05} + a_{55} h_{2 m t-1} + b_{55} u_{2 t-1} u_{m t-1} + d_{55} \text{INT}_t + g_{55} \text{RD}_t + g_{55} \text{CAP}_t \quad (9.6)$$

$$h_{12 t} = w_{06} + a_{66} h_{12 t-1} + b_{66} u_{1 t-1} u_{2 t-1} + d_{66} \text{INT}_t + g_{66} \text{RD}_t + g_{66} \text{CAP}_t \quad (9.7)$$

$$r_{1 t} = (h_{1 m t} / h_{m m t}) \pi_{m t} + u_{1 t} \quad (9.8)$$

$$r_{2 t} = (h_{2 m t} / h_{m m t}) \pi_{m t} + u_{2 t} \quad (9.9)$$

where INT, RD, and CAP are the measures relating to interest rate liberalization, reserve requirements on domestic demand deposits and capital account liberalization, respectively. This system of equations can be estimated using the method of maximum likelihood assuming the conditional normality of the forecast errors,<sup>15</sup> where the log-likelihood function is as follows:

$$\text{Ln } L(f) = \text{const} - \frac{1}{2} \sum_t \ln |H_t| - \frac{1}{2} \sum_t (e'_{t-1} H_t^{-1} e_{t-1}), \quad (10)$$

and  $f$  contains the unknown parameters in  $r_{m t}$ ,  $e_t$  and  $H_t$ .

## Data

The Korean stock price index (KOSPI) is used as a proxy for the market portfolio. Weekly data on KOSPI, the bank and financial sector indices for the period 7/1/1987 to 29/7/1997 were obtained from DataStream.<sup>16</sup> The three indices are expressed in local currency. The rate of return on the portfolio is defined as the first difference of the

<sup>14</sup> See McKinnon (1973) and Shaw (1973) for a seminal contribution.

<sup>15</sup> The quasimaximum likelihood method, which provides consistent estimates provided that the first and second moments of the standardised distribution can be specified, can also be used if there are small departures from normality (see Bollerslev and Wooldridge (1992)). However, in this empirical work, this assumption cannot be rejected and we use the method of maximum likelihood.

<sup>16</sup> Note that during this period, the Korean government removed most controls on interest rates and embarked on a program of capital account liberalization. Hence, this sample allows us to examine whether the relaxation of various controls had an impact on the riskiness of banks and other financial institutions. Given that the East Asian crisis must have generated powerful shocks to the return on the various portfolios, we exclude the last quarter of 1997 from our estimation sample.

logarithmic stock price index and excess returns are computed in local currency in excess of the overnight call rate (calculated on a weekly basis), which acts as a proxy for the risk-free interest rate.

Figures 1a-1c in the appendix plot the market excess return series and the two-portfolio excess returns series. These figures show that excess returns on the various indices are, on average, zero over the period (in fact the mean return on the three different indices are insignificantly different from zero during the period under study). The graphs also show periods of clusters of high and low volatility, suggesting the presence of autoregressive conditional heteroskedasticity (ARCH) effects. The presence of these effects cannot be rejected (using LM and portmanteau Ljung-Box tests) and the use of the GARCH modeling framework described earlier therefore appears warranted.

The construction of the indices utilises the detailed information about financial reforms summarized in appendix II and obtained from the annual reports of the Bank of Korea. Specifically, the measures of interest rate and capital account liberalization are constructed using information and data obtained from the Bank of Korea, Annual Accounts. They are assumed to take a value of one prior to any relaxations, and decrease in value whenever financial restraints are relaxed or removed; they are therefore increasing with the severity of financial restraints, and decreasing as financial liberalization progresses. Specifically, for the construction of the interest rate liberalization index, we use information on controls on deposit rates, lending rates and money market rates. Strong positive correlation between the lending rate, deposit rate and money market indices allows us to average them out into a single measure, which we call 'the interest rate liberalization index'. For the construction of the capital account liberalization index we use detailed information on the relaxation of controls on banks and corporations' fund-raising activity in international markets and relaxation of restrictions on foreign investment in the Korean stock, bond and money markets.

Figure 2a shows the movement of the interest rate liberalization index. As can be seen, it reflects the changes in the underlying policy variables reasonably well. The relaxation of lending and deposit rate controls in December 1988 is reflected in a sharp drop of the measure for that month. The measure then drops sharply during the second wave of

reform (1992-1995 period). During that period, most of the remaining controls on deposit, lending and money market rates were abolished. Figure 2b plots the movement of the capital account liberalization index. The figure reveals that the index also reflects the underlying measures quite accurately. It shows a sharp decline in the beginning of 1992 when the Korean stock market was open to foreign investors and domestic banks were allowed to raise funds in international financial markets. In subsequent years, most controls on capital inflows were gradually removed and this is reflected in the gradual decline of the capital account index. Figures 2a and 2b also show a high correlation (0.97) between these two indices. Clearly, this poses problems for estimation purposes, and we address this issue using Principal Component Analysis (see Theil, 1971) in order to summarise both liberalization indices in a meaningful way; we retain one principal component with an eigenvalue greater than one.<sup>17</sup>

The measure of reserve requirements on domestic demand deposits is constructed using data on reserve requirement ratios.<sup>18</sup> The index, graphed in Figure 2c shows that reserve requirements on demand deposits increased significantly during the 1987-1989 period and remained relatively high until the mid 1990s, to decline to very low levels in 1996 and 1997.

### Empirical Results

The following system of equations is estimated by maximizing equation (10) using the BHHH algorithm :

$$r_{mt} = a_0 + a_1 LIB_t + u_{mt} \quad (11.1)$$

$$h_{nmt} = w_{01} + a_{11} h_{nmt-1} + b_{11} u_{n,t-1}^2 + d_{11} LIB_t + q_{11} RD_t \quad (11.2)$$

$$h_{11t} = w_{02} + a_{22} h_{11t-1} + b_{22} u_{1,t-1}^2 + d_{22} LIB_t + q_{22} RD_t \quad (11.3)$$

$$h_{22t} = w_{03} + a_{33} h_{22t-1} + b_{33} u_{2,t-1}^2 + d_{33} LIB_t + q_{33} RD_t \quad (11.4)$$

$$h_{1mt} = w_{04} + a_{44} h_{1mt-1} + b_{44} u_{1,t-1} u_{n,t-1} + d_{44} LIB_t + q_{44} RD_t \quad (11.5)$$

<sup>17</sup> See also Demetriades and Luintel (1997) or Arestis and Demetriades (1997), who also advocate using (principal component) summary measures of financial repression/liberalization.

<sup>18</sup> Luarens and Cordoso (1998) argue that indices based only on the reserve requirement ratio and that do not take into account the continued changes in the tax base cannot capture accurately the restrictiveness of reserve requirements. This argument applies to the Chilean case where authorities have continuously changed the tax base to close loopholes and make the controls more restrictive. In the case of Korea, however, there have been no attempts to change the tax base and as such the index we use in this paper remains valid.

$$h_{2mt} = w_{05} + a_{55} h_{2mt-1} + b_{55} u_{2t-1} u_{m t-1} + d_{55} LIB_t + q_{55} RD_t \quad (11.6)$$

$$h_{12t} = w_{06} + a_{66} h_{12t-1} + b_{66} u_{1t-1} u_{2t-1} + d_{66} LIB_t + q_{66} RD_t \quad (11.7)$$

$$r_{1t} = (h_{1mt}/h_{mmt})\pi_{mt} + u_{1t} \quad (11.8)$$

$$r_{2t} = (h_{2mt}/h_{mmt})\pi_{mt} + u_{2t} \quad (11.9)$$

where LIB represents the principal component of the financial liberalization policy variables and RD is the index of reserve requirements on domestic deposits.

The estimated coefficients of this model are reported in Table 3 below, where the figures in parentheses denote the marginal significance levels. Table 3 shows that the model performs quite well in explaining the conditional variances of the bank and financial sector stock returns, as well as of the market returns. All the coefficients on the lagged conditional variances and lagged squared residuals are significantly different from zero at the 1% level and are within a reasonable range. This suggests that the GARCH (1,1) conditional variance-covariance matrix is a good description of the behavior of the bank, financial and market sector stock returns. The table also reports results of the diagnostic tests performed on the residuals to provide an indication of the adequacy of the model. The Ljung-Box Q and Q-squared statistics on the standardized residuals ( $\hat{u}_t/\hat{h}_t$ ) and the squared residuals ( $\hat{u}_t^2/\hat{h}_t^2$ ), respectively, indicate that there is little evidence for residual serial correlation and heteroskedasticity for each of the conditional variance equations. We also carry out diagnostic tests as a simple indication for the presence of model misspecification. In particular, we examine the sign bias test statistic and the negative and positive size bias test statistics proposed in Engle and Ng (1993); the sign bias test investigates the impact of positive and negative excess return shocks on volatility which were not predicted, and the positive (negative) size bias test focuses on the effects of large and small positive (negative) excess return shocks not predicted by the model. We find no evidence of misspecification, and although all these diagnostic tests are merely indicative, again, there does seem to be support for the GARCH (1,1) characterization.<sup>19</sup>

Some interesting observations can be made from Table 3. The conditional mean equation for the market portfolio (equation 11.1) provides good evidence that abnormal

profits cannot be made on the market, on average, and therefore provides a reasonable basis for the use of the CAPM model.<sup>20</sup> However, we also find that the financial liberalization index (reflecting domestic i.e. interest rate liberalization, and external account i.e. capital account liberalization) is positive and significantly different from zero (with a p-value equal to 0.03). This suggests that financial liberalization, through these policy instruments, had a negative effect on the (excess) market return, which is consistent with the view that a liberalized banking system may not necessarily allocate investment funds to projects with the highest returns.

Examination of the conditional variance equations gives consistent results. The estimated coefficients on the financial liberalization index in the conditional variance (and covariance) equations are all positive, implying that increasing financial liberalization over this period served to reduce conditional volatility and hence riskiness in the banking and financial sectors, in addition to the market sector. In four of these equations the coefficients are significant at the 10% level, and in the other two equations the p-values take values of 0.187 and 0.221. With regard to the estimated coefficients on the reserve requirement index, the results are again interesting; all the coefficients are negative and significantly different from zero at the 8% level except for the market equation where the corresponding coefficient has a marginal significance level of approximately 16%. Hence, this suggests that, in general, the reductions in reserve requirements were associated with increases in conditional volatility (and hence riskiness) of (especially) the banking and financial sector stock returns. This may suggest that reserve requirements played a prudential role, preventing large shifts towards greater holding of risky assets in bank portfolios, thereby decreasing their riskiness.<sup>21</sup>

Table 3 also shows that the liberalization index and reserve requirements on demand and enter significantly in the conditional co-variances of the banking and financial sector portfolios with the market portfolio i.e. equations (11.5) and (11.6) respectively. These findings suggest that financial liberalization also affected the (non-diversifiable) market

---

<sup>19</sup> A full set of diagnostic results is available from the authors on request.

<sup>20</sup> Furthermore, in a preliminary analysis, coefficients on lags of the excess returns on the market portfolio were found to be insignificant.

<sup>21</sup> This evidence is also consistent with Gelles's (1986) theoretical framework in which an increase in the required reserve ratio decreases the ratio of banks' risky assets to total assets (a measure of bank riskiness).

Table 3: Conditional CAPM with Multivariate GARCH (1,1)  
Conditional Variance Covariance Matrix

Estimated Coefficients of the Market Portfolio					
	$a_0$	$a_1$			
Conditional Mean	-0.0019 [0.1447]	0.0021 [0.0306]			
	$w_{01}$	$a_{11}$	$b_{11}$	$\bar{a}_{11}$	$q_{11}$
Conditional Variance	0.0005 (0.0008)	0.5192 (0.0000)	0.0908 (0.0000)	0.0028 (0.2207)	-0.0019 (0.1576)
Ljung-Box (6) for levels = 7.333 (0.291)					
Ljung-Box (6) for squares = 2.999 (0.809)					
Estimated Coefficients of the Bank Conditional Variance Equation					
	$w_{02}$	$a_{22}$	$b_{22}$	$\bar{a}_{22}$	$q_{22}$
Conditional Variance	0.0018 (0.0000)	0.4839 (0.0000)	0.1467 (0.0000)	0.0071 (0.0321)	-0.0110 (0.0004)
Ljung-Box (6) for levels = 4.594 (0.597)					
Ljung-Box (6) for squares = 0.319 (0.999)					
Estimated Coefficients of the Financial Sector Conditional Variance Equation					
	$w_{03}$	$a_{33}$	$b_{33}$	$\bar{a}_{33}$	$q_{33}$
Conditional Variance	0.0012 (0.0000)	0.5648 (0.0000)	0.1005 (0.0000)	0.0043 (0.1875)	-0.0061 (0.0091)
Ljung-Box (6) for levels = 3.968 (0.681)					
Ljung-Box (6) for squares = 0.747 (0.993)					
Estimated Coefficients of the Conditional Covariance Equations					
	$w_{04}$	$a_{44}$	$b_{44}$	$\bar{a}_{44}$	$q_{44}$
H 1m	0.0006 (0.0001)	0.6185 (0.0000)	0.0744 (0.0000)	0.0058 (0.0035)	-0.0027 (0.0388)
	$w_{05}$	$a_{55}$	$b_{55}$	$\bar{a}_{55}$	$q_{55}$
H 2m	0.0006 (0.0002)	0.5986 (0.0000)	0.0827 (0.0000)	0.0046 (0.0450)	-0.0024 (0.0826)
	$w_{06}$	$a_{66}$	$b_{66}$	$\bar{a}_{66}$	$q_{66}$
H 12	0.0013 (0.0000)	0.5946 (0.0000)	0.1099 (0.0000)	0.0050 (0.1070)	-0.0061 (0.0091)

Notes: The estimated coefficients refer to the system of equations (11.1) - (11.9) and the figures in parentheses denote marginal significance levels.

risk of the Korean banking and financial sector. This is because (i) market risk is defined as the ratio of the conditional co-variance of the banking and financial sector portfolios with the market portfolio (i.e. equations (11.5) and (11.6) respectively) to the conditional variance of the market portfolio (i.e. equation 11.2); (ii) both the

liberalization index and reserve requirements enter significantly in both of these equations. Further evidence on this issue is presented in Figures 3a and 3b, which respectively plot the time-varying betas of the banking and financial sectors against time, during the 1987:1-1997:6 period. These figures reveal that with two exceptions the banking sector and the financial sector did not increase during the sample period. If anything, the figures show a steady decline in the betas after 1988. The only exceptions are March 1994, when beta increased slightly and became highly volatile, and the period from February 1997 onwards when the betas for the banking and financial sector started to increase sharply. It is important to note that during 1997 there was no change in our policy indices and hence the increase in betas in the latter case cannot be attributed to changes in financial policies. Instead the increase in bank and financial riskiness must be attributed to 'bad news', both from the region and Korea itself – the collapse of some of the largest chaebols such as KIA Motors – which increased substantially the volatility of the stock market.

#### 6. Analysis and Concluding Remarks

Our empirical findings suggest that financial liberalization reduced banking and financial risks, as implied by the significance of the coefficients of the policy measures in the conditional variance and co-variance equations. The empirical analysis also suggests that financial liberalization, with two exceptions, reduced the non-diversifiable market risk of the banking and financial sector. In fact, our findings suggest that market risk only began to increase in early 1997, which coincides with 'bad news' in the period prior to the crisis. Thus, the economic findings contrast sharply with the ex-post qualitative survey findings, which demonstrate that financial institutions in fact became exposed to greater risks, through a combination of inadequate risk management systems, lack of expertise and weaknesses in prudential regulation.

The two sets of contrasting findings can be reconciled, in that the survey findings are clearly ex-post, having the benefit of hindsight which included an expert anatomy of the crisis, while the economic findings to a large extent reflect the ex-ante views of market participants, based on available information at that time as well as their beliefs concerning the effects financial liberalization. In this sense, the economic findings indicate that financial market participants had traditional views, which over-emphasize



the benefits of financial liberalization and under-emphasize the pitfalls. Additionally, they indicate that information flows from financial institutions to financial markets were too slow or even inaccurate, as a result of (now) well known weaknesses in corporate governance, bad accounting practices and complex company linkages. Thus, it is likely that traditional beliefs would have been shattered much earlier had 'bad news' concerning poor risk management practices hit the markets sooner.

Importantly our surveys also reveal that expert opinion – at least in Korea, the IMF and the World Bank – has now shifted, acknowledging that, even though financial liberalization may in principle offer potential benefits (such as greater investment returns and opportunities for diversification), its practical implementation results in greatly increased risks because of weaknesses in risk management and prudential regulation. Additional information from our surveys suggests that the safety nets that have historically been provided by successive Korean governments to banks and industry may well have been responsible for holding back necessary improvements in risk management and prudential regulation. Implicit or explicit safety nets clearly act as disincentives in managing risks, representing a certain type of moral hazard, albeit of a milder form than the one postulated by McKinnon and Pill (which posits that banks mislead investors in order to deliberately take advantage of safety nets). This form of moral hazard was critical in creating vulnerabilities in the banking system, including currency and maturity mismatches, which brought the Korean economy to a stage where even small shocks could trigger a full-blown financial crisis.

A conjecture that emerges from our analysis is that traditional beliefs concerning financial liberalization, which over-emphasize efficiency gains and under-emphasize risks, may well have been responsible for the thesis' failure, by holding back necessary improvements in both the management of financial risks by financial institutions and prudential regulation. While this may, for some, be itself a somewhat speculative conjecture, it is certainly one that opens up fruitful avenues for further research.

#### References:

Akerlof, G. and P. Romer (1993), "Looting: The Economics Underworld of Bankruptcy for Profit", *Brooking Papers on Economic Activity*, September, 1-60.

- Allen, F. and D. Gale (2000), "Bubbles and Crises", *The Economic Journal*, Vol. 110, 236-255.
- Arestis, P., and P.O. Demetriades (1997), "Financial Development and Economic Growth: Assessing the Evidence", *Economic Journal*, Vol. 107, No. 442 (May), 783-799, reprinted in H.D. Dixon (ed.) *Controversies in Macroeconomics*, Oxford: Blackwell Publishers, 2000.
- Arestis, P., and P.O. Demetriades (1999), "Financial Liberalization: The Experience of Developing Economies", *Eastern Economic Journal*, Vol. 25, No. 4 (Fall), 441-457.
- Black, F. (1972), "Capital Market Equilibrium with Restricted Borrowing", *Journal of Business*, Vol. 45, 3-18.
- Bollerslev, T., R.F. Engle, and J. Wooldridge (1988), "A Capital Asset Pricing Model with Time Varying Covariances", *Journal of Political Economy*, Vol. 96, 116-131.
- Bollerslev, T. and J. Wooldridge (1992), "Quasimaximum Likelihood Estimation and Inference in Dynamic Models with Time Varying Covariances", *Econometric Reviews*, Vol. 11, 143-172.
- Bonomo, M. and R. Garcia, (1997), "Tests of Conditional Asset Pricing models in the Brazilian Stock Market", *CI-RANO Scientific Series*, Montreal: CI-RANO.
- Caprio, G., and L. Summers (1994) "Financial Liberalization: Beyond Laissez-Faire", *World Bank Policy Research Working Papers*.
- Demetriades, P.O. (1999) "Financial Liberalization and Credit-asset Booms and Busts in East Asia", presented at Conference "The Credit Crunch in East Asia", Washington D.C., World Bank, November (<http://worldbank.org/research/interest/conf/past/papersnov30-d>).
- Demetriades, P.O., and B. Fattouh (1999b), "The South Korean Financial Crisis: Competing Explanations and Policy Lessons for Financial Liberalization", *International Affairs*, Vol. 75, No. 4 (October), 779-792.
- Demetriades, P.O. and K.B. Luintel (1997), "The Direct Costs of Financial Repression: Evidence from India", *Review of Economics and Statistics*, Vol. 79, No. 2 (May), 311-320.
- Demigüç-Kunt, A. and E. Detragiache (1998), "Financial Liberalization and Financial Fragility", *International Monetary Fund Working Paper*, 98/83.
- Edwards, S. (1997), "The Mexican Peso Crisis? How Much Did We Know? When Did We Know It? The World Economy,
- Edwards, S. (1999), "How Effective are Capital Controls?" *Journal of Economic Perspectives*, Fall, Vol. 13, 65-84.
- Engle, R. and K. Kroner (1993), "Multivariate Simultaneous Generalised ARCH", *Discussion Paper No. 89*, Department of Economics: University of California, San Diego.
- Fischer, K.P. and M. Chenard (1997), "Financial Liberalization Causes Banking System Fragility." *Centre de Recherche en Economie et Finance Appliquées*, University Laval (Canada), Working Paper No. 97-12, June.
- Fry, M.J. (1997), "In Favour of Financial Liberalization", *Economic Journal*, Vol. 107, No. 442 (May), 754-770.
- Gelles, G. (1991), "Some Regulatory Determinants of Bank Risk Behavior: Comment", *Journal of Money, Credit and Banking*, Vol. 23, 120-127.
- Hellman, T.F., K.M. Murdoch, and J.E. Stiglitz (2000), "Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?", *The American Economic Review*, Vol. 90, 147-165.
- Hogan, W.P. and I.G. Sharpe (1984), "Regulation, Risk, and the Pricing of Australian Bank Shares", *Economic Record*, Vol. 60, 34-44.

Hunter, W. C., G. G. Kaufman and T. H. Krueger (eds.) *The Asian Financial Crisis: Origins, Implications and Solutions*, Boston: Kluwer Academic Publishers.

Laurens, B. and J. Cardoso, "Capital Flows—Lessons from the Experience of Chile", IMF Working Paper WP/98/168, Washington D.C.: International Monetary Fund.

Linter, J. (1965), "The valuation of Risky Assets and the Selection of Risky Investments in the Portfolios and Capital Budgets", *Review of Economics and Statistics*, Vol. 47, 13–37.

McKinnon, R. I. (1973), *Money and Capital in Economic Development* Washington D.C.: Brookings Institutions.

McKinnon, R. I. (1981), "Financial Repression and the Liberalization Problem in Less Developed Countries", in S. Grassman and E. Lundberg (eds), *The Past and Prospects of the World Economic Order*, Macmillan, 356–386.

McKinnon, R. and H. Pill, (1997) "Credible Economic Liberalization and Overborrowing", *American Economic Review*, Vol. 87, 189–193.

Mitchell, D. (1986), "Some Regulatory Determinants of Bank Risk Behavior: A Note", *Journal of Money, Credit and Banking*, Vol. 18, Issue 3, 374–382

Ng, L. (1991), "Tests of CAPM with Time-Varying Covariances: A Multivariate GARCH Approach", *Journal of Finance*, Vol. 46, 1507–1521.

Obstfeld, M. and K. Rogoff (1996), *Foundations of International Macroeconomics*. Cambridge, Massachusetts: The MIT Press.

Scheicher, M. (1996), "Asset Pricing with Time Varying Covariances: Evidence from the German Stock Market", Paper presented at the 1996 European Meeting of the Econometric Society, Istanbul.

Sharpe, W. (1964), "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk", *Journal of Finance*, Vol. 19, 425–442.

Shaw, E. S., (1973), *Financial Deepening in Economic Development*, New York: Oxford University Press.

Stiglitz, J. E. (1994), "The Role of the State in Financial Markets", *Proceedings of the World Bank Annual Conference on Development Economics 1993*, 19–52.

Stiglitz, J. E. (2000), "Capital Market Liberalization, Economic Growth, and Instability", *World Development*, Vol. 28, No. 6, (2000) pp. 1075–1086.

Figure 1a: Market Excess Return (local currency)

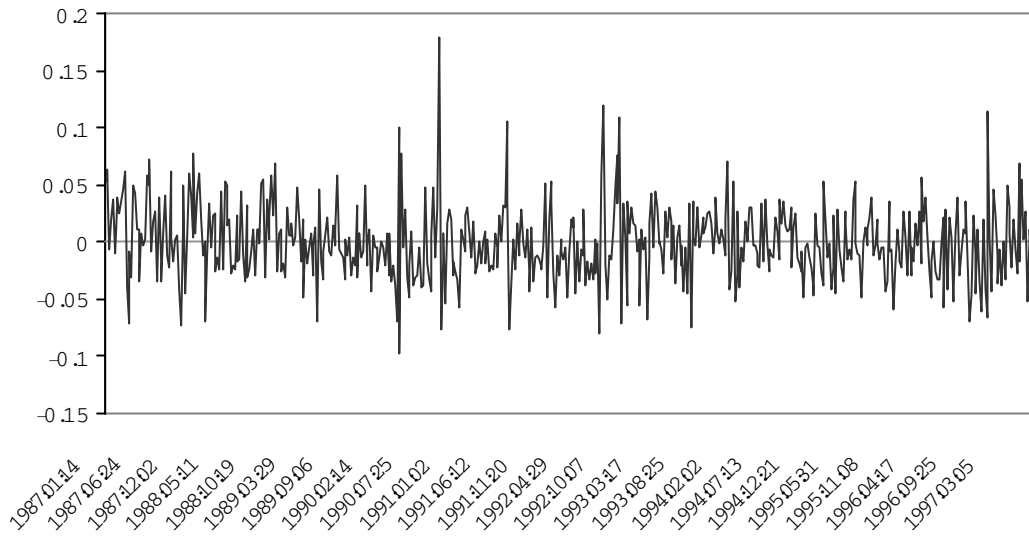


Figure 1b: Banking Index Excess Return (local currency)

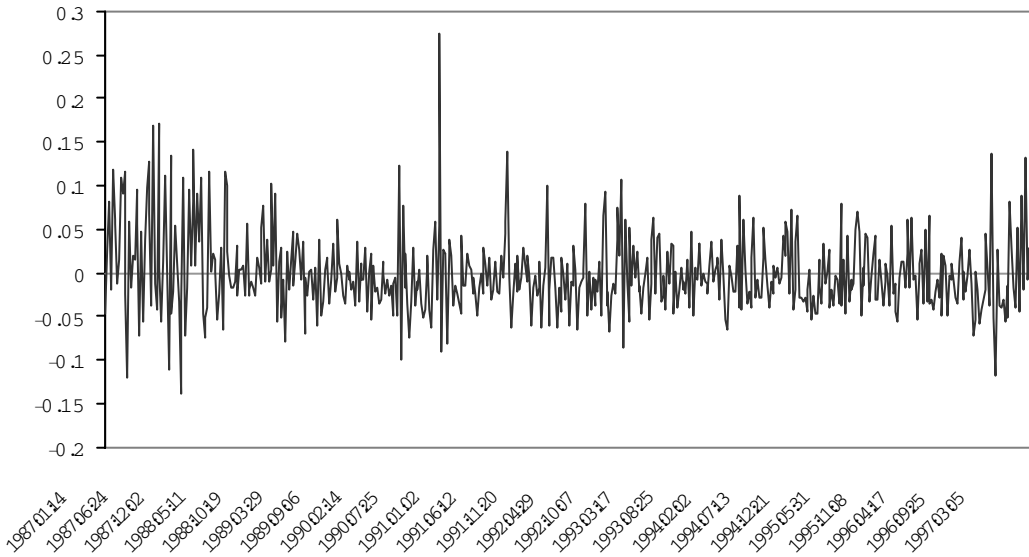


Figure 1c: Financial Sector Index Excess Return (local currency)

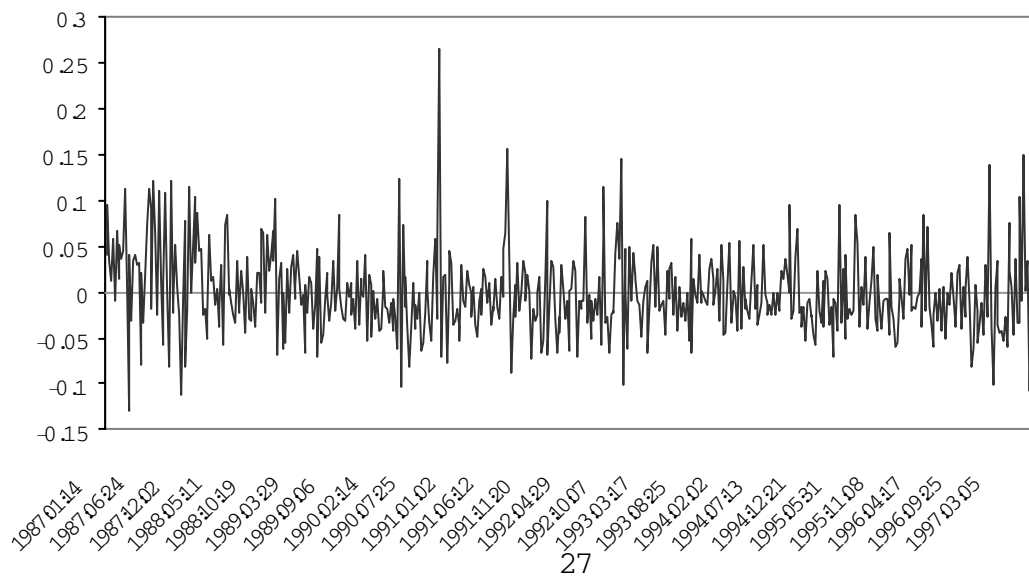


Figure 2a: InterestRate Liberalisation Index

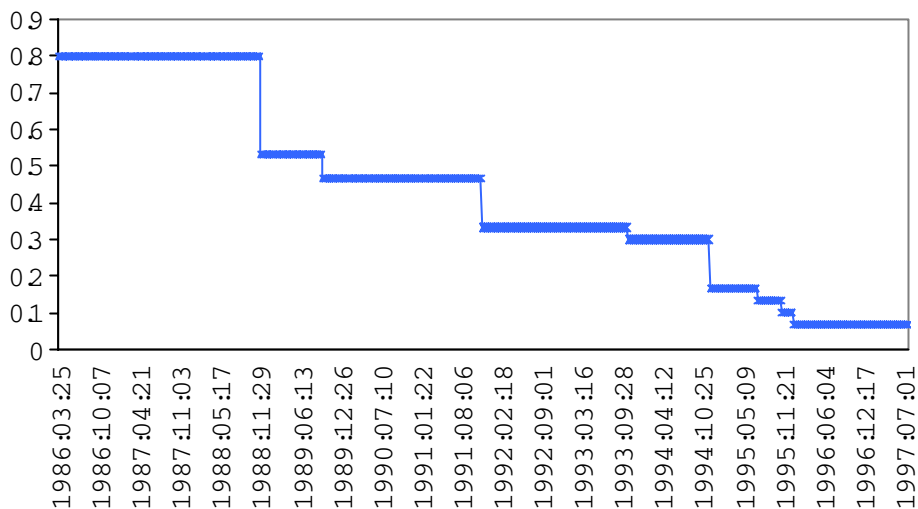


Figure 2b: CapitalAccount Liberalisation Index

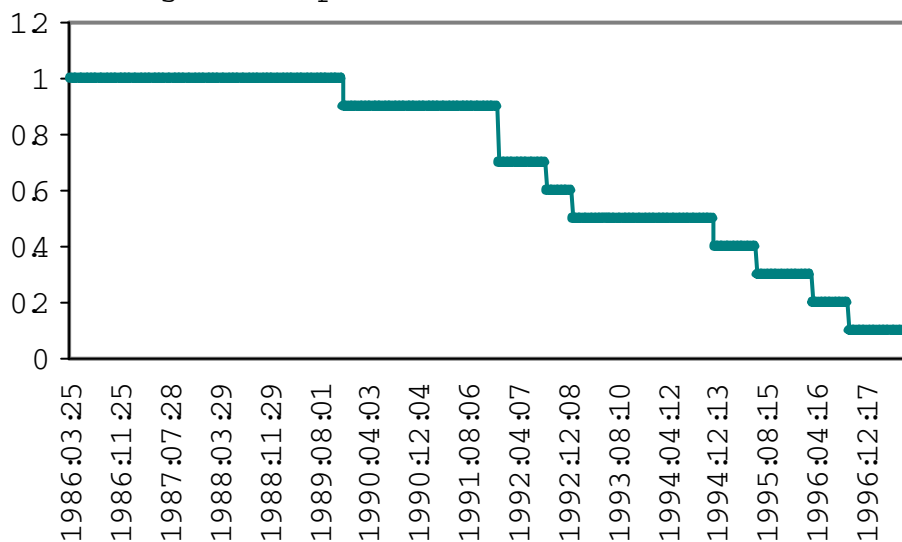


Figure 2c: Reserve Requirements on Dem and Deposits

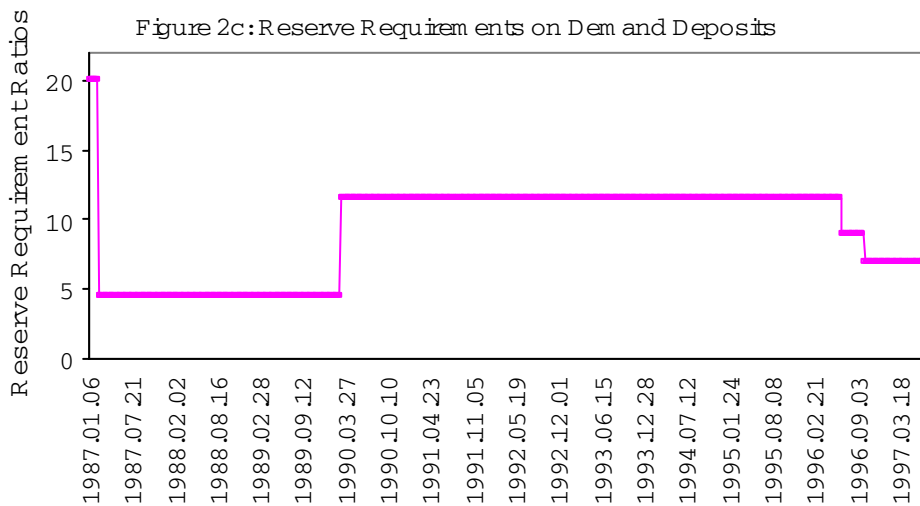


Figure 3a: Beta for the Banking Sector

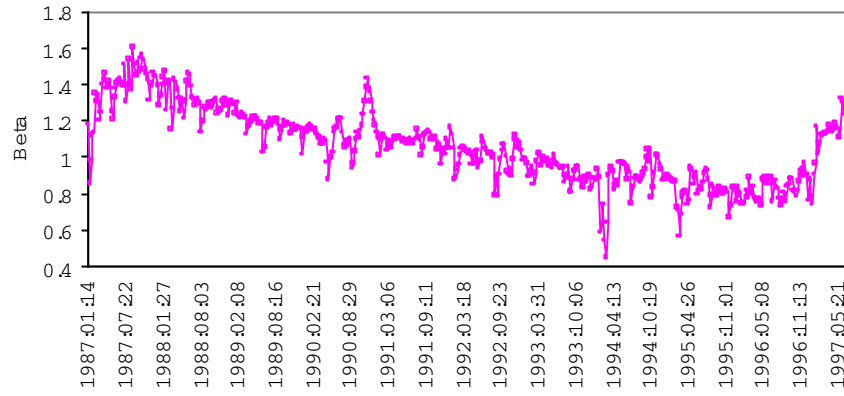
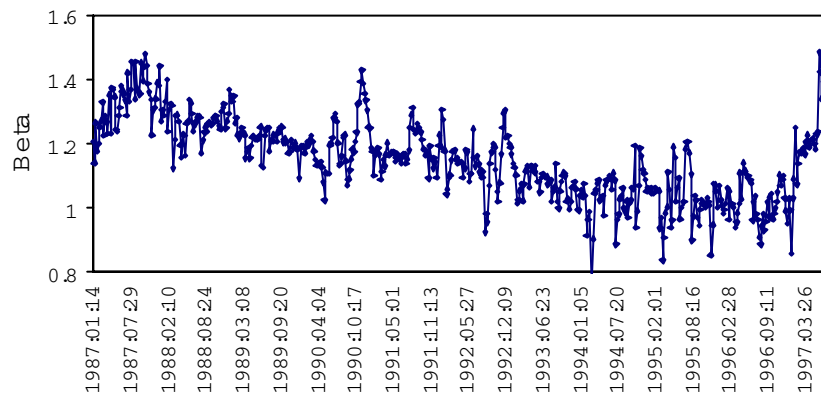


Figure 3b: Beta for the Financial Sector



## Appendix: A Summary of the Main Financial Reforms in Korea

### 1. Interest Rates

September 6, 1979: The Monetary Board abolished the existing maximum interest rate on bank loans to make it possible for banks to alter their interest rate on loans. However, the Bankers Association of Korea, considering that banks themselves are not used to determining interest rates, decided to link interest rates on loans to the central bank's rediscount rate.

September 6, 1979: The monetary board abolished the maximum interest rate on free installment savings deposits and the maximum interest rate on personal checking deposits.

May 17, 1984: The Board allowed seven nationwide commercial banks, local banks and the Korea Exchange Bank to engage in the negotiable certificate of deposit (CDs) from 1 June.

23 July, 1984: A narrow band for loan rates was introduced so that banks could charge different rates according to the creditworthiness of the borrowers.

December 5, 1988: Interest rate on loans from banks and non-bank financial intermediaries were fully liberalized.

December 5, 1988: Interest rate on time deposits of maturity greater than 2 years at banks, postal savings and credit unions were liberalized.

December 5, 1988: Interest rate on time and savings deposits of maturity greater than 1 year at mutual savings and finance companies were liberalized.

November 21, 1991: Lending rates liberalized further. Lending rates liberalized consisted of those on bank overdrafts; on the discount of commercial bills by banks, mutual savings and finance companies; on the discount of commercial and trade bills by investment and finance companies; on the purchase of firms' guaranteed papers by banks' trust accounts; and those on overdue loans by all financial institutions.

November 21, 1991: The liberalization of deposit rates applied to those on short-term, large denomination marketable instruments such as CDs, the sale of large denomination trade bills, commercial papers and RPs.

November 21, 1991: The scope of initial liberalization was extended to cover rates on long-term deposits with a maturity of 3 years offered by banks, mutual credit facilities, and credit unions and mutual time deposits with a maturity of 2 years and more offered by mutual savings and finance companies.

November 21, 1991: The issue rates of corporate bonds with a maturity of 2 years and more were deregulated.

November 1, 1993: All lending rates (apart from those financed by the government and the bank of Korea's rediscounts) were liberalized.

November 1, 1993: Rates on long-term deposits with a maturity of at least two years were completely liberalized.

November 1, 1993: Interest rate on debentures and corporate bonds with a maturity < 2 years were liberalized.

December 1, 1994: Interest rate on bank and non-bank time deposits with a maturity of one year or more but less than 2 years were liberalized.

December 1, 1994: Banks were permitted to set freely the interest rates on policy loans financed through the aggregate credit ceilings system within their respective prime rates.

July 24, 1995: Interest rate on policy-based loans through the aggregate credit ceilings system of BOK were liberalized.

November 20, 1995: The Bank and government freed up the remaining regulated interest rates on bank and non-bank time deposits with a maturity less than six months and on their installment deposits with a maturity less than one year.

January 19, 1996: The Bank of Korea lifted the restriction on the size of the premium a bank could charge over its prime-lending rate, which had been originally imposed in order to prevent a sharp run-up in bank lending rates in the course of interest rate deregulation.

## 2. Developments in Money Markets:

March 7, 1986: The Monetary Board liberalized the rates on negotiable CDs, secured corporate bonds, and bank debentures.

February 13, 1987: The MB reduced the denomination of CDs from 100 million won to 50 million won.

December 5, 1988: Interest rate on repurchase agreements, commercial papers of face value greater than 30 million and maturity more than 91 days, financial debentures and corporate bonds were fully liberalized.

December 5, 1988: New commercial paper and conventional commercial paper were merged into one.

October 4, 1989: The Bank and the government merged the call markets, previously segmented into an inter-bank market mainly for banks and over the counter market between NBFIs, which expanded the size of the money market (call markets, CPs, CDs, RPs, TBs, Bankers' Acceptance). After the merger, the interbank rate was fully liberalized.

October 19, 1989: The BOK adjusted the maturity period of CDs issued by banks to other banking institutions from between 91 days and 180 days to between 30 days and 180 days.

November 21, 1991: The liberalization of deposit rates applied to those on short term, large denomination marketable instruments such as CDs, the sale of large denomination trade bills, commercial papers and RPs.

November 21, 1991: The issue rates of corporate bonds with a maturity of 2 years and more were completely deregulated.

December 19, 1992: The Bank extended the maximum maturities of CDs from 180 days to 270 days.

November 1, 1993: Interest rate on financial debentures and those corporate bonds with a maturity of less than 2 years were liberalized. Government and public bonds and MSB were also to be issued at prevailing market rates.

September 3, 1993: The Bank lowered the minimum denomination of CDs from 50 million to 30 million.

July 18, 1994: The minimum maturities of CDs, high denomination RPs were shortened from 91 days to 60 days.

July 24, 1995: The minimum maturities of short term financial instruments including CDs, high value RPs and high value CPs, were shortened from 60 to 30 days.

## 3. Portfolio Inflows

December 1, 1989: Foreign exchange banks were allowed to raise offshore funds by issuing foreign currency denominated bonds or borrowing from the offshore accounts of other domestic foreign exchange banks.

March 1, 1991: Non-resident Koreans were allowed to sell foreign currencies exceeding US\$ 50 thousand to entrust its proceeds to development trusts with a maturity of 2 years. Effective 15 July, the limit was raised in July 15 to 100 US\$ 100 thousands.

Effective from March 8, 1991: The government permitted the issuance of foreign currency denominated securities to finance the import of production facilities and equipment for which no domestic substitute is available.

January 3, 1992: Non-residents were allowed to invest in any domestic stocks, unless specified in some particular act. A 3% limit on investment by an individual foreign and 10% limit on total foreign investment are applied respectively. In case of public utilities and companies in infant industry, total foreign investment limit is set at 8%.

September 1, 1992: Regulations on overseas issue of foreign currency denominated securities were greatly eased.

Type of securities may be issued abroad by Korean residents were expanded to include negotiable CDs and CPs.

September 1, 1992: Funds raised by the issue of foreign currency denominated securities were permitted to be deposited either in a resident account or an account with overseas branch of a domestic exchange bank.

Feb 1, 1993: Overseas branches of domestic banks were in principle prohibited from supplying loans to residents of Korea. But from the above date, the government permitted them to extend loans to residents of Korea engaged in the trading of the commodity futures or financial futures.



April 1, 1993: The government changed the system whereby permission has to be obtained from foreign currency denominated deposits could be issued to a reporting system. Instead of obtaining permission before issuing foreign currency denominated securities, now it only needed to be reported.

April 1, 1993: Previously restricted to enterprises that had recorded a net profit in each of previous 3 years, issuers were widened to include those that had recorded a net profit on an accumulative basis over the preceding 3 years.

July 1, 1994: The government partially opened the domestic bond market allowing non-residents to purchase non-guaranteed convertible bonds issues by SMEs subject to 30% limit on total foreign investment per issue and a 5% limit per issue on investment by individual firms.

December 1, 1994: The ceiling on overall foreign investment in a listed company's outstanding stocks were raised from 10% to 12%.

May 3, 1995: Firms were permitted to undertake foreign borrowings directly for the redemption of foreign debts on onerous terms for the import facilities where the firms were small and medium sized manufactures.

June 20, 1995: The government permitted the overseas issuance of exchangeable bonds.

July 1, 1995: The general ceiling on total foreign investment in a listed company's outstanding stock was raised from 12% to 15% and that for those of public corporations from 8% to 10%.

April 1, 1996: The aggregate ceiling was raised from 15% to 18% of the outstanding stocks issued by a listed firm and from 10% to 12% for those issued by public corporation. The ceiling on holding of individual investors was raised from 3% to 4% of a firm's outstanding stocks.

May 1, 1996: Non-residents were allowed to purchase and trade bonds with warrants.

May 3, 1996: Non-residents were allowed to trade stock index futures on the KSE.

October 1, 1996: The general ceiling was raised again to 20% for a firm and 15% for a public corporation. The individual ceiling was at the same time increased to 5%.

October 1, 1996: The government dismantled most restrictions on direct foreign borrowings, enabling non-manufacturing SMEs to receive loans from abroad for the import of production facilities.

May 1, 1997: The limit on foreign ownership of Korean equities was raised to 23%.

June 1, 1997: Foreign investors were granted access to non-guaranteed bonds of SMEs and of conglomerates.

#### 4. Reserve Requirements on Demand Deposits

Effective November 23, 1987: The Monetary Board raised the minimum reserve requirement from 4.5% to 7.0%.

April 20, 1989: A marginal reserve requirement ratio of 30% on the average increment of demand deposits and time and saving deposits has been imposed. The marginal reserve requirements were abolished in February 1990.

15 February 1990: The Bank raised reserve requirement ratios on time deposits, installment savings deposits with maturity of 2 years or more and Household installment saving deposit from 7.0% to 8.0%. On all other deposits, reserve requirement ratio increased from 10% to 11.5%.

February 8, 1991: The Bank introduced reserve requirements against mutual installment deposits.

April 23, 1996: The reserve requirement on time and savings deposits of more than 2 years was brought down from 8% to 6%.

April 23, 1996: The reserve requirement on checking deposits, pass book deposits, saving deposits, Time and saving deposits with maturity of less than two years was lowered from 11.5% to 9.0%.

November 8, 1996: The reserve requirement on time and savings deposits of more than 2 years was brought down from 6% to 4%.

November 8, 1996: The reserve requirement on checking deposits, pass book deposits, saving deposits, Time and saving deposits with maturity of less than two years was lowered from 9.0% to 7.0%.