

Potential Effects of Basel II on the Transmission from Currency Crises to Banking Crises – The Case of South Korea

Tobias Knedlik

Halle Institute for Economic Research, Germany
E-mail: Tobias.Knedlik@iwh-halle.de
Tel: +49-345-7753740; Fax: +49-345-775369740

Johannes Ströbel

Department of Economics, Stanford University, California
E-mail: stroebel@stanford.edu

Abstract

In this paper we evaluate potential effects of the Basel II accord on preventing the transmission from currency crises to banking crises by analyzing the South Korean crisis of 1997. We show that regulatory capital reserves under Basel II would have been lower than those under Basel I, and that therefore Basel II would have had adverse effects on the development of the crisis. Furthermore we investigate whether the behavior of rating agencies has changed since the East Asian crisis. We find no evidence that rating agencies have started to take micro-mismatches into account. Thus, we have reservations concerning the effectiveness of Basel II.

Keywords: Asian Financial Crisis, Bank Portfolios, Currency Mismatch, Maturity Mismatch, Basel II, Credit Ratings

1. Introduction

The severe financial market turbulences of the East Asian crisis have highlighted the dangers associated with an unregulated, globalized financial system long before the current international financial crisis. To prevent the future spread of currency crises throughout the domestic financial system, as was the case in South Korea in 1997, numerous alterations to the international financial architecture have been recommended. The revised “Basel Accord on Capital Adequacy” (Basel Committee, 2005) by the Basel Committee on Banking Supervision (from now on the “Basel II” accord) has been introduced as one potential tool to limit financial crises in the future. In this paper we analyze the possible usefulness of the Basel II accord’s regulation of bank portfolios in preventing the transmission from currency crisis to banking crises, by assessing the impact Basel II could have had on inhibiting such a transmission in the case of South Korea.

In section 2 of this essay a short taxonomy of currency crises is provided, with particular focus on the issues of currency mismatch and maturity mismatch that characterize third generation currency crises (Chang and Velasco, 1999). We then outline the events that led up to the Korean currency crisis of 1997. In section 4 the set-up of the Basel II accord is explained. In section 5 we simulate the potential effects of Basel II on preventing the Korean currency crisis, and its transmission to a banking

crisis. Section 6 takes this issue further and consider whether the performance of rating agencies is sufficiently reliable to merit the central role they are allocated in the Basel II accord.

2. Theoretical Background

In November and December 1997, South Korea's currency collapsed, leading to a sharp economic decline with GDP falling by 6.9% in 1998. This came as a surprise to most market participants and official observers, given South Korea's remarkable economic success over the previous decade. However, retrospectively Korea's remarkable economic success disguised a number of structural, micro-economic weaknesses, primarily related to the balance sheet of the financial sector. These weaknesses can be interpreted to have been the primary driver of the transmission from the currency crisis throughout the whole economy, mainly via the banking sector.

The academic literature distinguishes broadly between three different models or "generations" of currency crises. Until the early 1990s the prevailing first-generation model explained currency crises in terms of macroeconomic mismanagement on part of the sovereign (Krugman, 1979; Flood and Garber, 1984). This model served well to account for the currency crises in Latin America in the 1970s and 1980s.

The ERM crisis of 1992 necessitated the development of a new, second-generation model of currency crises. Obstfeld (1994) rationalized the new generation of currency crises as a multiple equilibria game, in which the government views adhering to the peg as a contingent commitment, constantly trading off its costs and benefits.

The Asian Crisis of 1997-8, and in particular the episode of South Korea, showed that also micro-economic weaknesses could be the cause of an exchange rate crisis. While these crises had some self-fulfilling aspects, the central weakness was not of macroeconomic nature, but was related to the balance sheets of the corporate sector, and in particular the banking sector. While there are various approaches to these third-generation crises, Krugman (1999) and Chang and Velasco (1999) stressed the important role of balance-sheet imbalances.

Currency mismatches arise when assets and liabilities on the private and corporate sectors' balance sheets are denominated in different currencies. Once a currency crisis is set in motion, the currency depreciation in the presence of a currency mismatch will lead to a deterioration of banks' balance sheets (Arteta and Hale, 2006).

Maturity mismatches between assets and liabilities on a balance sheet result in financial institutions, and in whole countries being vulnerable to an international version of a Diamond and Dybvig (1983) style bank-run. Most banks finance themselves short-term on the international financial markets, while lending long-term to domestic corporations (Kashyap, et al., 2002). In the case of a currency crisis given currency mismatches, with the associated deterioration of banks' balance sheets, international lenders may become unwilling to roll-over the financing of banks.

3. The Korean Currency Crisis

In the run-up to the Korean Currency crisis, macroeconomic conditions appeared very sound (Radelet and Sachs, 1998). GDP was growing in 1996 at a healthy 7%, inflation was approximately 4.9%, and foreign exchange reserves were at a high, even though the current account deficit had widened significantly. The fiscal balance was in surplus, suggesting that the currency crisis could not be explained by the first-generation model outlined above. Also, second-generation models lack explanatory power: The low rate of unemployment meant that sustaining the peg in Korea, even in the face of high interest rates, was not as damaging, as for example, the sustaining of the peg by the United Kingdom in 1992 would have been.

3.1 Background Causes

The positive macroeconomic indicators disguised the vulnerability of the Korean economy resulting from the balance sheet of the private sector, in particular of banks. Bank credit extended to the private sector had risen from 36.6% of GDP in 1980 to 65.6% of GDP in 1997, severely increasing the leverage of the commercial sector. By the end of 1997, the thirty most important conglomerates were financed with an average debt-to-equity ratio of 519%. This can be contrasted to a gearing of 157% in the US and 193% in Japan. (Bisignano, 1999). There is also evidence of both severe currency mismatches and maturity mismatches that contributed to the vulnerability of the economy. This was particularly problematic in Korea, where the absence of properly developed capital markets increased the reliance of domestic firms on the banking sector for finance (Chino, 2000).

The maturity mismatch that was prevalent in the South Korean economy on the eve of the crisis was to a large extent the result of the process of capital account liberalization pursued by the Korean government. In 1993 the government had increased the scope for short-term foreign borrowing, by liberalizing short-term lending rates, while retaining the restrictions on long-term borrowing as well as direct access to capital markets by Korean firms. Short-term external debt rose from USD 40bn in 1993 to USD 98bn at the beginning of October 1997. Of this amount of short-term debt, commercial banks could only cover 55% with short-term assets (Chopra et al., 2001). Bisignano (1999) provides similar evidence for the reliance of merchant banks (which were even less regulated than generic commercial banks) on short-term financing. By 1997 Merchant Banks had raised almost USD 12bn in short-term funds that could not be covered by short-term assets (Bisignano 1999). This created serious problems of maturity mismatch, which in the case of declining investor confidence could lead to a serious roll-over problem.

In addition, most of the short-term bank financing was in foreign currency, which created a serious currency mismatch. Cho and McCauley (2003) calculate that the proportion of foreign-currency debt to total debt in the South Korean economy rose from 15.6% in 1992 to 28.5% in 1997. Sharma (2004) argues that this was partly due to high domestic interest rates, which were significantly above world interest rates, encouraging banks to heavily rely on cheap foreign credit. The strong macroeconomic performance prior to the crisis, and the success of the currency-peg, led most banks to underestimate the risk of their foreign currency exposure. As a result, only a small part of the outstanding currency mismatch was hedged by market participants (Sharma 2004: 55). Therefore, the large, unhedged foreign borrowing, combined with its short maturities, left South Korea vulnerable to a third-generation currency crisis.

This problem was intensified by a lack of prudential monitoring and supervision of the banking sector. Significant moral hazard was present in the financial system, resulting from the assessment that the Korean government would not allow any of its major banks or corporations to fail (Bank of Korea, 1998). In their interviews with South Korean economists, Amess and Demetriades (2001) showed that similar implicit guarantees were assumed for the financial sector. They found that prior to the crisis 93.1% of economists believed that South Korean financial institutions enjoyed implicit guarantees from the government. However, even if the government had issued explicit guarantees to the banking sector (as partly was the case with the introduction of the 1996 Deposit Insurance Scheme), the currency mismatch on the balance sheets of the banks that were guaranteed severely reduced the usefulness of such a guarantee. In the case of a currency crisis, the central bank's own lack of foreign currency reserves limits its ability to provide banks with the type of liquidity (e.g. foreign currency) that would be necessary to avert a bank-run. Therefore, in the presence of currency mismatches, a small change in the perceived ability of the government to provide foreign currency liquidity to banks could trigger a bank-run and be an additional transmission mechanism from currency crises to banking crises.

3.2. Proximate Causes

In this situation of financial vulnerability, a changing external economic environment posed real dangers for the health of the South Korean economy. Some of these factors were general macroeconomic problems, such as rising oil prices and the depreciation of the yen against the US dollar, which reduced the competitiveness of Korean firms. In 1997, first indicators of an impending crisis emerged. The fall in the world-market prices for South Korean exports such as semiconductors led to the collapse of a number of large *chaebols*, undermining the health of the banking-sector balance sheet and rapidly eroded the capital position of banks in Korea. While non-performing loans stood at approximately 12.2 trillion won at the end of 1996, this figure rose to 21.9 trillion won in the nine months leading up to September 1997 (Bank of Korea, 1998).

As a result, in July 1997, several Korean banks were placed on a negative credit outlook by international rating agencies (Chopra et al., 2001). The devaluation of the Thai bath, and the ensuing contagion, negatively influenced international investor attitude towards Asian emerging market economies. A sharp increase in risk aversion of investors, combined with a re-assessment of the riskiness of investments in Asian emerging market economies, led to a gradual increase in capital outflows from Korea.

3.3. Crisis and Resolution

Problems became serious when on October 24, Standard & Poor's downgraded Korea from AA- to A+, due to the government practice of bailing out failing companies. As a result, many market participants lost faith in the Korean economy, and started to further withdraw credit lines. Between July and October 1997, the rollover rate of the seven largest South Korean banks was generally over 85%. By November, this rate had fallen to 58.8%, declining further to 32.2% in December (Bank of Korea, 1998). Beginning in late October 1997, the South Korean won depreciated heavily against the US dollar, forcing the Bank of Korea to give up its peg, and pushing the country into a currency crisis.

These developments led to a serious credit crunch, amplified as outlined above by the presence of problematic currency and maturity mismatches. Ferri and Kang (1999) analyzed individual bank data and found that banks raised lending rates and rapidly reduced their lending. The refusal of international capital markets to roll-over credit-lines to banks led to a foreign-currency shortage. Between October and November 1997, usable South Korean foreign exchange reserves fell from USD 22.3bn to USD 7.3bn, a level insufficient to cover even one month's imports (Bank of Korea, 1998). On November 21, 1997, South Korea had to turn towards the IMF for support. A multilateral aid package of USD 58.3bn, including the largest IMF support package up to that time, was agreed on December 3, 1997. However, only the election of a new South Korean president on December 18, 1997 could partly restore the trust of international investors in the South Korean economy.

4. The Basel II Accord

In the aftermath of the Asian financial crisis, the academic and professional community has made numerous suggestions on how to deal with some of the weaknesses in the international financial architecture that had been demonstrated by the Asian financial crisis. One proposal has been the introduction of an accord to regulate the capital reserves of banks. Basel II is that accord, and allows more control over the balance sheets and lending behavior of financial institutions. Banks operate under a system of fractional reserve holding, in which the liquid assets that banks hold at any given moment in time represent only a fraction of their liabilities. This system relies on the statistical assumption that it is unlikely for all depositors to withdraw their deposits simultaneously. In the absence of regulatory requirements, banks have a strong incentive to engage in very risky lending projects without holding sufficient buffer capital, relying on the central bank as a domestic lender of last resort to provide the necessary liquidity in case of default or a bank run (Santos, 2001). This moral hazard is further increased by the limited liability status granted to most banks, which reduces the

personal loss of employees in the worst-case scenario. Miller and Zhang (1999) argue that regulatory capital requirements are one way to reduce such moral hazard. The correct amount of such capital reserves should depend, among other factors, on the riskiness of the loan, that is, on the probability of its default.

In addition, properly regulated banks with sufficient regulatory capital also minimize the danger of a lack-of-confidence-induced bank run. If investors know that banks hold sufficient capital to remain solvent even in the face of corporate bankruptcies, they will limit the rate of withdrawal of capital, therefore contributing to the maintenance of solvency. Thus, in theory, regulatory capital requirements could be an effective way of helping to prevent currency crises turning into banking crises.

4.1. Overview of Basel II

In June 1999 the Basel Committee on Banking Supervision issued a proposal for a new capital adequacy framework for banks. This Basel II accord was to replace previous attempts at regulating capital adequacy, in particular the Basel I accord of 1988, which had proved too simplistic.¹ The new approach substantially changes the treatment of credit risk, and compels banks to retain capital reserves to cover operational risks in addition to market and credit risk. By aligning the capital requirements more closely with the perceived default risk of the debtor, Basel II aims to curb imprudent lending practices by providing incentives for banks to discriminate between borrowers on the basis of their repayment risk. Basel II is based on a three-pillar approach, and was timetabled to be implemented by domestic regulators around the globe by January 1, 2008.

Pillar I outlines minimum regulatory capital requirements for banks. It regulates the amount of capital that banks must hold to protect their balance sheet against credit risks, operational risks and market risks. Basel II maintains the minimum capital requirement at 8% of risk-weighted assets, as set by the Basel I accord. However, it introduces a more sophisticated risk-weighting approach to determine the exact amount of regulatory capital. This approach, and the impact of external credit ratings on the amount of regulatory capital, are the primary focus of this essay. Pillar II outlines the process for supervisory control of the financial institution's risk management process and its capital adequacy. Pillar III attempts to enforce a higher degree of market discipline by regulating the disclosure requirements of banks (Basel Committee, 2005). In the following the focus is exclusively on the alterations in the process of determining credit risk that were outlined in Pillar I.

4.2. Determining Credit Risk

The primary improvement of Basel II upon Basel I is in the process of evaluating and determining the credit risk faced by financial institutions. The increased sophistication of Basel II results from its more complex process of allocating different risk weights to different types of claims. Basel II allows banks to choose from a continuum of three approaches to determine these risk weights. This permits each financial institution to select the approach that is most appropriate to its size, complexity and nature of risk. Banks can choose between the so-called standardized approach and two versions of the Internal Ratings Based (IRB) approach, which incorporates banks' own assessment of the riskiness of their exposure. The rest of this paper will model the potential effects of Basel II by focusing on the standardized approach. The standardized approach allocates a certain risk-weight to each claim on the basis of a rating of the issuer of the claim provided by an external rating agency. The method for determining capital requirements for credit risk can be summarized in a very simplistic way. The capital reserves that banks are required to hold are obtained by taking 8% of the product of the risk-weight of a particular claim and the volume of the claim.

$$\text{Minimum Capital Requirement} = \text{Risk Weight} \times \text{Volume of Claim} \times 0.08 \quad (1)$$

¹ For example, Basel I risk-weighting for sovereign lending only distinguished between OECD countries (which were weighed at 0%) and non-OECD countries (which were weighed at 100%).

The risk-weights associated with certain credit ratings also depend on the type of debtor. Table 1 summarizes the various risk-weights associated with different external credit ratings for each borrower class.

Table 1: Basel II Risk Weightings under the Standardized Approach

Credit Assessment	AAA to AA	A+ to A-	BBB+ to BBB-	BB + B-	Below B-	Unrated
Sovereign	0%	20%	50%	100%	150%	100%
Banks – Option 1	20%	50%	100%	100%	150%	100%
Banks Option 2 – Long-Term	20%	50%	50%	100%	150%	50%
Banks Option 2 – Short-Term	20%	20%	20%	50%	150%	20%

Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BB-	Below B-	Unrated
Corporate	20%	50%	100%	150%	100%

Source: Basel Committee, November 2005

For sovereign borrowers, OECD-membership will no longer be the determining criterion for risk-weights. Instead, the assessment of external credit rating agencies will determine the risk-weights of sovereign borrowers. This should improve the ability of the Basel accord to differentiate between very real disparities in sovereign risk between both members and non-members of the OECD.

For the treatment of banks as debtors there are two options: The first option assigns banks a risk-weight category that is one class below that of the sovereign of incorporation. A cap of 100% is imposed, except for banks in countries rated worse than B-, in which case a cap of 150% is introduced. Alternatively, national supervisory bodies can choose a second option, which allocates risk-weights dependent on external assessments of banks. In the case of the second option, claims on some banks (Rated A+ to BB-) with an original maturity of less than three months receive a risk weighting that is one category more favorable than the risk-weighting attached to long-run credit to those banks.

For corporate borrowers, the Basel II accord also moves away from the “one-size-fits-all” approach of Basel I, which assigned a risk-weight of 100% to all corporate credits. Instead, as in the case of sovereign borrowers, an external assessment of credit risk determines the risk-weight attached to a corporate loan.

5. The potential effect of Basel II on the Korean Crisis

It has been suggested that the introduction of Basel II capital requirements could contribute in the future to the prevention of currency crises and their transmission to banking crises (Siebert, 2005). In order to evaluate such a claim, we attempt to deduce whether the Basel II accord could have helped to prevent past currency crises. There are a number of reasons to imagine that the introduction of Basel II could have helped to prevent the South Korean crisis. In particular, under the Basel I accord, South Korea, as an OECD member, was assigned a 0% risk weight, and would have required banks to hold no regulatory capital against claims on the South Korean government. Under the Basel II accord, the quantity of capital requirements depends in part on the external rating of the sovereign. A potentially higher level of regulatory reserves could have allowed banks to cover a larger proportion of the capital outflow without having to terminate domestic lending, softening the credit crunch. In an optimal case, the higher levels of capital reserves could have induced sufficient confidence in the health of the banking system to prevent the capital outflows in the first place.

In this section we simulate regulatory capital requirements of banks had Basel II been in place and compare these with the requirements that Basel I would have imposed on banks. We also discuss potential pro-cyclical effects that Basel II may have had, in addition to potential effects on the maturity structure of bank borrowing. We show that under the assumptions of our simulation, regulatory capital requirements would have been even lower under the new accord than under Basel I – this suggests that Basel II would have had little positive, and potentially even adverse effects on investor confidence.

However, we also show that the capital requirements depend crucially on the sovereign credit rating of Korea. Specifically, we show that Basel II could have had a positive effect on capital reserves had the sovereign credit rating of South Korea been only marginally worse. We also take the arguments about the pro-cyclicality of Basel II (see e.g. Griffith-Jones et al., 2004; ECB, 2001) and the adverse effect on the maturity structure of banks (see e.g. Raffer, 2006; Reisen, 2002) seriously but do not discuss them in this section.

5.1. The importance of the sovereign credit rating

Sovereign credit ratings are of particular importance in determining the impact of Basel II on regulatory capital requirements. This is because even though sovereign debt may only represent a small proportion of the assets in a bank's portfolio, the risk-weights associated with other assets are closely related to the credit risk of sovereign debt.

As described above, banks partly finance themselves via short-term loans from foreign banks. Its assets are comprised of lending to its sovereign entity (in our example to the government of South Korea), lending to other domestic banks and lending to domestic corporates (in the case of South Korea, primarily the powerful chaebols). The minimum regulatory reserves specified by Basel II depend on the risk-weightings of each of these assets. However, it can be shown that the majority of these risk-weightings are closely related to the sovereign credit rating.

In section 4 we showed how the risk-weighting associated with sovereign debt is a direct function of the credit rating allocated to the national government. In addition, the risk-weights associated with lending to other banks are often also related to sovereign credit ratings, via "Option 1" described in section 4. The third major component of the asset-side of banks' balance sheets, lending to the corporate sector, is also partly a function of the credit rating of the country of incorporation. Creditworthiness of large corporations in Korea often depended upon the explicit or implicit government guarantees, and a downgrade of the sovereign could thus affect the risk-weights of corporate lending. State involvement in the South Korean economy was very high, and it is generally accepted that the government provided implicit guarantees to the corporate sector (Amess and Demetriades 2001).

A different but related argument is used by credit rating agencies such as Standard & Poor's to justify what is sometimes termed the "sovereign ceiling". This is the idea that due to the tax-raising powers of the government it is very unlikely that a corporate borrower will be able to have a more favorable credit rating than the country of incorporation.² Thus, a sovereign downgrade will almost necessarily lead to a downgrade in the ratings of significant portions of the corporate sector. Therefore it becomes clear that a correct assessment of sovereign credit risk by credit rating agencies is an important aspect in the successful application of Basel II, because sovereign credit ratings play an integral part in determining the minimum regulatory capital reserves related to the majority of assets in a bank's portfolio.

5.2 Simulating Regulatory Capital Requirements

In this section we proceed to simulate the regulatory capital reserve requirements for Korean banks had Basel II been implemented in 1997, and compare them with the minimum reserves as determined by the Basel I accord.

Monfort and Mulder (2000) have previously attempted to approximate such capital requirements for the aggregate of some emerging market economies. They faced the problem that there

² „In the case of foreign currency debt, the sovereign has first claim on available foreign exchange, and it controls the ability of any resident to obtain funds to repay creditors. To service debt denominated in local currency, the sovereign can exercise its powers to tax, to control the domestic financial system, and even to issue local currency in potentially unlimited amounts. Given these considerations, the credit ratings of nonsovereign borrowers most often are at, or below, the ratings of the relevant sovereign" (Standard & Poor's, September 7, 2001, Rating Methodology: Evaluating the issuer; Standard & Poor's, September 22, 2003, Credit FAQ: Sovereign / Nonsovereign Ratings Differentials).

is insufficiently detailed data available on the actual ratings or “probability of default”- estimations of lending to corporations or banks. They dealt with this problem by assuming that sovereign ratings were binding, i.e. that the ratings of all positions in a bank’s portfolio were identical to the ratings of the sovereign. Given this assumption, they showed that for all emerging market economies combined, the necessary capital adequacy ratio under Basel II would have been lower than that under Basel I. However, they do not conduct this simulation for individual countries.

This result, however, depends crucially on the assumption of binding sovereign ratings. It is unlikely that all loans are as good as those of the sovereign, and given the reasonable assumption that at least some loans to domestic banks or corporations would have been internally or externally rated to be more risky than government bonds, it is likely that the actual capital requirements under Basel II would have been higher than those determined by Monfort and Mulder.

We enrich the analysis by Monfort and Mulder, by analyzing data detailing the share of sovereign and corporate lending in a bank’s portfolio. Information about the composition of domestic banks’ balance sheets at the time of the crisis is notoriously difficult to obtain, particularly given the lack of prudential regulation and insufficient publication requirements. Nevertheless, using data on the destination-sector of bank loans, provided by the Bank for International Settlement (Kim et al., 2006) we proceed to simulate the capital adequacy ratios (see table 2).

Table 2: Trend of Shares in Bank Lending

	1997	1998	1999	2000	2001	2002	2003	2004
Corporate Loans	63.8	63.6	61.9	56.5	48.9	45.5	45.6	43.5
Household Loans	20.0	18.3	34.3	39.0	49.1	52.9	53.0	55.0
Loans to public (and other legal) entities	16.3	18.1	3.8	4.6	2.0	1.5	1.3	1.4

Source: Kim et al. (2006)

We make the assumption that corporate loans, bank-to-bank lending and lending to the household sector were weighted one risk-category lower than those of the sovereign. We feel that given the Basel II – rules for the allocation of reserve capital to bank-lending, and the logic of section 5.1, that this approach is a more realistic approximation of the actual capital requirements of Korean banks under Basel II than the one undertaken by Monfort and Mulder.

Additionally, in contrast to Monfort and Mulder, we do not limit the analysis to calculating the changes in capital requirement on an annual basis, but attempt to predict the required changes as a result of each Standard & Poor’s rating change of the Korean sovereign rating since the beginning of 1997. To calculate the volume of outstanding loans in the exact periods of the rating, we interpolated the annual balance sheet data, assuming a linear trend.

Table 3 shows the results from the simulation exercise. It can be seen that in the run-up to the crisis, the capital requirements under Basel I would have been significantly higher than those required by the proposed accord. This is particularly so, because under the old accord lending to corporate entities (the vast majority of Korean bank lending) was weighted at 100%, while under Basel II, given the favorable rating of the guaranteeing Korean government, less capital would have had to be put aside.

Table 3: Minimum Capital Requirement Simulation (Trillion Won)

	01.01.1997- 24.10.1997	24.10.1997- 25.11.1997	25.11.1997- 11.12.1997	11.12.1997- 22.12.1997	22.12.1997- 18.02.1998	19.02.1998- 25.01.1999
Rating	AA-	A+	A-	BBB-	B+	BB+
Capital Requirement Basel I	41.6	41.6	41.6	41.6	37.5	37.3
Capital Requirement Basel II	8.3	22.4	22.4	24.8	64.4	41.1
Excess Requirement Basel II	-33.3	-19.2	-19.2	-16.8	26.9	3.8

	25.01.1999- 11.11.1999	11.11.1999- 13.11.2001	13.11.2001- 24.07.2002	24.07.2002- 31.12.2002	2003	2004
Rating	BBB-	BBB	BBB+	A-	A-	A-
Capital Requirement Basel I	42.9	45.9	56.3	58.3	64.4	67.0
Capital Requirement Basel II	43.7	46.7	56.8	29.3	32.4	33.7
Excess Requirement Basel II	0.8	0.8	0.5	-29.0	-32.0	-33.3

Source: Kim et al. (2006), Authors' calculations

An opposing effect is seen for lending to sovereign entities. Under Basel I, lending to South Korea as an OECD member required no capital reserves. Under Basel II, even given the rather favorable rating, from October 24, 1997, lending to the South Korean sovereign attracted a minimum weighting of 20%. However, the combined effect of an increase in capital reserves required for sovereign lending and a fall in capital reserves required for corporate lending leads to a clear overall fall in capital reserves in the run-up to the crisis. This allows us to conclude that the introduction of Basel II would not have helped to prevent the transmission of the currency crisis to a banking crisis in South Korea by inducing confidence that banks held sufficient levels of capital reserves.

Another interesting result of the simulation exercise is that this conclusion would have been very different had the sovereign rating of South Korean been only marginally different in the lead-up to the crisis. For example it can be shown that if the Korean rating in the period 25.11.1997 – 11.12.1997 had been one notch worse, pushing Korea into a higher risk-weight category, the required reserves under Basel II would have been at 45.6 trillion won, and thus higher than those required by Basel I. Therefore, had the rating agencies been more successful at predicting the crisis, Basel II could have helped to reduce the size of the credit crunch required. Therefore, in the following section, the behavior of the rating agencies is analyzed closely.

6. The Performance of Rating Agencies

As was shown in section 5, the Basel II accord grants external credit rating agencies an explicit and important role in the determination of risk weights and thus of minimum standards of regulatory capital. Therefore, a good performance of credit rating agencies is a crucial component if Basel II is to be successful in preventing the transmission from currency crises to banking crises in the future. After describing the failure of rating agencies during the Asian currency crisis, we assess whether credit rating agencies have changed and improved their approach to measuring sovereign credit risk.

6.1. The Performance of Sovereign Credit Ratings

As argued by Reisen and von Maltzan (1999), both the Mexican crisis of 1994/5 and the East Asian crisis of 1997/8 showed that the credit rating agencies had failed to predict the currency crises, and the dangers of the impending default. For example, Korea's credit rating had to be reduced by S&P by ten notches in the months during and after the crisis. While some of this "rating crisis" (Jüttner and McCarthy, 1999) can be attributed to genuinely declining economic conditions in the countries following the strong depreciations, it is fair to argue that rating agencies strongly underestimated the dangers associated with potential currency crises. Already in the aftermath of the East Asian crisis, the credit rating process was therefore criticized by academics and multinational institutions such as the IMF (Reisen, 2002). In particular, it was argued that by ignoring liquidity and balance sheet risks,

rating agencies have been guided by outdated crisis models, being able to only adequately warn of first-generation currency crises.

There is no theoretical necessity for sovereign credit ratings to systematically predict or warn of currency and banking crises. Nevertheless, in particular in emerging markets, there is a strong link between currency crises and sovereign debt default. Reinhart (2002) finds that in his representative sample, 84% of emerging market defaults were associated with currency crises. Without the international bail-out organized by the IMF and the international community, it is likely that the currency crises of South Korea, Thailand and others would also have ended in sovereign default. This assessment is shared by most external credit rating agencies, who regularly downgrade sovereign rating significantly in the aftermath of a currency crisis. Therefore it can be argued that sovereign ratings should systematically take into account the risk of currency crises when estimating default risk. Yet, evidence of recent currency crises shows that these were not anticipated in sovereign credit ratings; Reinhart (2002) provides interesting empirical evidence for this statement. It appears that rating agencies are reactive to rather than predictive of actual crises. This may limit the effectiveness of the new Basel Accord, as was seen in section 5. As outlined above, for Basel II to aid in the prevention of the transmission from currency crises to banking crises, sovereign credit ratings must force banks to raise capital reserves in advance of a potential crisis.

There are various indicators for the three generations of currency crisis, and it is important to analyze whether credit rating agencies do take these indicators into account. In the following paragraphs we analyze which macro- and micro-economic indicators are most effective at explaining differences in sovereign credit ratings between countries.

6.2. The Components of Credit Ratings – Literature Review

Credit rating agencies are in general rather vague about which aspects they take into account when allocating sovereign ratings. Standard & Poor's (2004) claims that the "appraisal of each sovereign's overall creditworthiness is both quantitative and qualitative. The quantitative aspects of the analysis incorporate a number of measures of economic and financial performance and contingent liabilities, although judging the integrity of the data is a more qualitative matter. The analysis is also qualitative due to the importance of political and policy developments."

Cantor and Packer (1996) provided one of the first systematic empirical investigation into which indicators factor most strongly in the determination of sovereign ratings. Using cross-sectional data of 49 countries from September 1995, the authors use a regression analysis to establish which quantitative factors are most relevant in the determination of sovereign credit ratings of Moody's and Standard & Poor's. They found that credit ratings can be explained to over 90% by a small number of macroeconomic variables and dummies. In particular, they found that a rating is strongly related to per capita income, GDP growth, CPI inflation, the ratio of foreign debt to exports as well as dummies for economic development and previous default. Additionally, they established that fiscal balance and external balance did not factor significantly in the estimations of sovereign credit ratings.

Cantor and Packer's analysis shows that credit ratings prior to the Asian crisis focused primarily on traditional macroeconomic fundamentals. The taxonomy of currency crises in section 2 shows that such a focus may aid in detecting danger signals of first- and maybe second-generation currency-crises, but fails to predict micro-structure based third-generation currency crises. In other words, as Reisen (2002) concluded, sovereign ratings leading up to the Asian crisis seem to have been driven by an outdated crisis model. Jüttner and McCarthy (1999) conduct a similar analysis, and show that the factors identified by Cantor and Packer deteriorate in significance for subsequent years, especially for 1998.

Monfort and Mulder (2000) use a different approach to measure the importance of various components in the rating behavior. They use a dynamic relation of the error correction type to account for the fact that credit rating agencies claim to attempt to see through cycles. Their finding of relevant indicators is similar to that of Cantor and Packer. In addition, they find that ratings exhibit a high degree of inertia. However, with the exception of the ratio of short-term debt to total debt, Monfort and

Mulder also fail to test for any micro-economic balance-sheet variables that are the prime cause of third-generation currency crises, und subsequent default.

6.3. The Components of Credit Ratings – Post-Crisis

Following their failure to predict the Korean and other Asian currency crises, rating agencies admitted to having missed some important indicators of the crises, and promised to take them into account in their future rating decisions. For example, Standard & Poor's increased the number of categories in which they would assess each sovereign borrower. These categories are outlined in table 4, and now include the crucially important aspects of currency mismatch and maturity mismatch, as well as other liquidity indicators.

Table 4: Sovereign Ratings Methodology Profile – Standard and Poor's

Political Risk	External Liquidity
<ul style="list-style-type: none"> • Stability and Legitimacy of Political Institutions • Orderliness of leadership succession • -Popular participation in the political process • Public Security 	<ul style="list-style-type: none"> • Impact of Fiscal and monetary policy on external accounts • Structure of the current account • -Composition of Capital Flows • Reserve Adequacy
Income and Economic Structure	Private Sector External Debt Burden
<ul style="list-style-type: none"> • Prosperity, diversity, and market-orientation • Income Disparities • Availability of Credit • Competitiveness and profitability of non-financial sector • Efficiency of public sector • Labor flexibility 	<ul style="list-style-type: none"> • Financial sector external debt, including deposits and structured debt, as % of Current Account receipts • Non-financial private sector external debt, as a percentage of Current Account receipts • Maturity profile, Currency Composition + interest-sensitivity • Access to concessional financing
Economic Growth Prospects	Offshore and Contingent Liabilities
<ul style="list-style-type: none"> • Size and composition of Savings and Investment • Rate and pattern of economic growth 	<ul style="list-style-type: none"> • Size and Health of nonfinancial public-sector enterprises • Robustness of financial sector
General Government Debt Burden	Public Sector External Debt Burden
<ul style="list-style-type: none"> • Gross and Net debt as percentage of GDP • Share of revenue devoted to interests • Currency composition and maturity profile • Depth and Breadth of local capital markets 	<ul style="list-style-type: none"> • Public sector external debt as percentage of CA receipts • Maturity profile, Currency Composition + interest-sensitivity • Access to concessional financing • Debt Service Burden
Fiscal Flexibility	Monetary Flexibility
<ul style="list-style-type: none"> • General government surplus/deficit trends • Revenue-Raising flexibility and Efficiency • Expenditure Effectiveness • Pension Obligations 	<ul style="list-style-type: none"> • Price behavior in economic cycles • Money and Credit expansion • Compatibility of exchange rate regime and monetary goals • Institutional factors such as central bank independence

Source: Standard and Poor's (2004)

This table would suggest that Standard & Poor's should have started to put more emphasis on the micro-economic structure of the domestic economy when assigning its currency ratings. To analyze whether this is actually the case, we carry out an econometric analysis.

6.4. Data, Method and Results

We begin by grouping the rating outcome as the dependent variable into three groups (see table 5). The composition of groups is chosen to yield similare group sizes.

Table 5: Mapping of Rating Outcome (S&P) to Group (G)

S&P	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-
G	0	1			2											

Source: own presentation.

We include GDP growth, GDP per capita, CPI inflation, general government balance and current account balance as potential explanatory factors in the analysis. Unlike Cantor and Packer (1996), who often analyzed three-year-averages of these variables, we examine annual data. In addition, we also include dummy variables for the economic development of the countries, their default history.

To determine whether rating agencies today put sufficient emphasis on micro-economic mismatches in the banking sector, we include three new indicators in the analysis of the panel data. Firstly we have included a currency-mismatch indicator, using data from the BIS (2006). The indicator is comprised of the ratio of foreign currency assets to foreign currency liabilities of domestic banks vis-à-vis all sectors. A low ratio hints at potential balance-sheet problems in the case of a devaluation, and should thus adversely affect the sovereign credit rating.

We also include a maturity-mismatch indicator, using data provided by the Joint External Debt Hub coordinated by the World Bank (2006). In particular, we calculate short-term loans as percentage of total cross-boarder loans from foreign banks. A high fraction of short-term loans is an indicator of the danger of a debt roll-over crisis in the face of an economic crisis, and should negatively influence the sovereign rating of the country.

We include an additional indicator measuring the net foreign position of banks. This indicator represents the ratio of total cross-boarder deposits to total cross-boarder loans. A low ratio of foreign currency deposits with foreign banks to foreign currency loans from foreign banks reveals further balance sheet problems which could intensify in the case of a currency crisis.

While previous analyses have focused primarily on cross-sectional data, the data required to calculate the mismatch-indicators is only available for a limited number of countries (39 countries publish the data required to calculate currency-mismatch, 30 countries the data required to calculate maturity-mismatch). Therefore, focusing on the cross-section of countries at one point in time provides an insufficient number of data points for a robust analysis. Thus we decided to analyze the 29 countries with required data sets spanning the years 2002 to 2005. Analysis over a longer time-period was not an option, as the required data for the mismatch-indicators for a number of countries has not been published for a longer period. The countries included in our analysis are: Austria, Belgium, Brazil, Canada, Chile, Denmark, Finland, France, Germany, Greece, Hong Kong, India, Ireland, Italy, Japan, Luxemburg, Mexico, Netherlands, Norway, Panama, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, Turkey, United Kingdom. Data for the currency mismatch indicator is not provided by Greece and Mexico for 2002, therefore the analysis includes a total of 110 observations.

In order to evaluate the composition of factors influencing the rating results we could potentially consider three econometric models. These are in particular two linear regression models, namely a random effects panel data analysis and a pooled panel data regression and a limited dependent variable model, namely a probit maximum likelihood analysis including random effects.

The first would be the random effects model as conducted by Cantor and Packer (1996). They assume the dependent variable to be metric and linear. This assumption proves to be untenable. We would choose a random effects model for panel data analysis since fixed country effects do not seem to be appropriate taking into account the short time-dimension. One problem we would have with the estimation method is the short t, which might suggest to ignore country specific effects and to pool the observations to conduct a more robust pooled panel data analysis. However, we restrain from this analysis because it is intuitively clear and supported by research (Majnoni and Powell, 2005) that, in fact, rating classification are ordinal but not metrically scaled in relation to default probability. It is important to bear in mind that linear regression models depend on the assumption of metrically scaled data. Therefore, it is doubtful whether the linear regression models employed by Cantor and Packer

(1996) and others will be able to pick up effectively the correct influences on the non-metrically scaled dependent rating variable.

To correctly handle the ordinal data of rating results we estimate the influence on these groupings by employing an ordered probit model using maximum likelihood estimation. In order to account for the panel structure of the data we also consider random country effects. The model takes the form of:

$$\begin{aligned}
 \text{rat3}_{it}^* &= x'_{it} \beta + u_i + \varepsilon_{it}, \quad i = 1, 2, \dots, 29 \text{ and } t = 1, 2, 3, 4 \\
 \text{rat3}_{it} &= \begin{cases} 2 & \text{if } \text{rat3}_{it}^* > 1 \\ 1 & \text{if } 1 \geq \text{rat3}_{it}^* > 0 \\ 0 & \text{else} \end{cases} \quad (2)
 \end{aligned}$$

The estimation is carried out in Stata using the “reoprobit extension” developed by Frechette³ (compare also Butler and Moffitt, 1982; Green, 2000). Estimation results of the general model and the significant variables only model are reported in table 6.

Table 6: Ordered probit, random effects model

	General model	Significant only model
Dependent variable	rat3	
gdp_gr	-.0656932	
infl	1.433916**	.3968088*
govbal	-1.056137***	-.5755665***
cabal	.1395552	
curmis	-1.519087	
matmis	1.832538	
netforpos	1.54365	
advecon	-15.88667***	
cut1_cons		
cut2_cons	-9.280664**	5.402373
rho_cons	-.213867	10.63025
No of observations	.9822781***	.9934281***
LR chi^2		
Prob > chi^2	110	110

*: Significant at 10%-level, **: Significant at 5%-level, ***: Significant at 1%-level; rat3 is the rating group of the respective country, gdp_gr is the growth rate of GDP, infl is the CPI inflation rate, govbal is the general government balance, cabal is the current account balance, curmis is the currency mismatch indicator, matmis is the maturity mismatch indicator, netforpost is the net foreign position of banks, and advecon is a dummy for the economic development status of the countries. Source: Own calculations.

When employing the approach that we believe is the most appropriate (i.e. using a random effects ordered probit model) all micro-structure variables turn out to be insignificant. The only significant coefficients are those of inflation and the public deficit, both showing the expected signs.

6.5. Interpretation of results

As a conclusion from the empirical analysis we deduce that while we can show that rating agencies do seem to take certain variables into account on a fairly consistent basis, we fail to obtain robust evidence for the micro-economic mismatch variables being of any relevance for rating agencies. This throws doubt on the insistence of rating agencies that in fact they do take these micro-mismatches into account (see section 6.3). On the other hand, rating agencies do seem to consider inflation, public deficits and the development status of the economies as relevant data for their decisions – similar to the rating behavior prior to the Asian crises, these are all macro-economic indicators. The low significance of the other factors considered in this analysis may be due to the important role that qualitative analysis plays

³ <http://homepages.nyu.edu/~gf35/html/econ.htm>.

in the rating assignments. However, it is important to bear in mind the limitations of our conclusions due to the limited number of observations. Thus we emphasize the importance of carrying out similar estimations when more data about the mismatch-indicators becomes available.

7. Conclusion

In the standardized approach of the Basel II accord, credit ratings are the fundamental determinant of the risk-weight attached to bank exposures. However, the failure of credit rating agencies to predict the Asian crisis casts doubt on the effectiveness of applying credit ratings to determine the regulatory capital requirements of financial institutions. This paper analyzed the potential effects of the Basel II accord on preventing the transmission from a currency crisis to a banking crisis in the case of the South Korean crisis of 1997/1998.

The simulations of capital requirements under Basel I and Basel II in the case of South Korea prior to the crisis show that under Basel II in the run-up to the crisis, there would have been lower rather than higher minimum capital reserves. This suggests that Basel II could not have effectively contributed to mitigating the transmission from the currency crisis to the domestic financial system. Additionally, the pro-cyclical nature of the capital reserves under Basel II and the risk-weight preference of short-term lending further undermine the ability of the new capital adequacy accord to positively influence the development of financial crises.

Empirical investigation into the factors that determine sovereign credit ratings do not generate any robust evidence that credit rating agencies have in fact altered their rating behavior in response to their failure to predict the Asian crisis. In particular, it cannot be shown that rating agencies nowadays pay attention to micro-economic balance sheet factors such as currency mismatch or maturity mismatch. While we acknowledge the limitations these findings have as result of the data restrictions outlined above, we do believe that they are consistent and significant enough to allow a tentative conclusion. This leads to argue that South Korea's significant mismatches in the months leading up to the crisis would even under the current rating system not have triggered an earlier downgrade, and a subsequent increase in capital requirements of banks. Thus, given the current approach of credit rating agencies, we have reservations concerning the effectiveness of Basel II to prevent the transmission from a currency crisis to a banking crisis, both for the case of South Korea and for potential future crises.

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