Sovereign Ratings and Their Impact on Recent Financial Crises

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Abstract

This paper discusses the role of credit rating agencies during the recent …nancial crises. In particular, it examines whether the agencies can add to the dynamics of emerging market crises. Academics and investors often argue that sovereign ratings are responsible for pronounced boom-bust cycles in emerging-markets lending. Using a VAR system this paper examines how US dollar bond yield spreads and international liquidity react to an unexpected sovereign rating change. Contrary to common belief and previous studies, the empirical results suggest that an abrupt downgrade does not necessarily intensify …nancial crises.

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Keywords: Sovereign Ratings, Boom-Bust-Cycles, Financial Crises, VAR System

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1 Introduction

Given the growing relevance of capital markets as a major source of funding for emerging market economies, the importance of credit rating agencies in providing standardized assessments of credit risks associated with emerging market investments has continued to grow. In addition, the recent proposal of the Basle Committee on Banking Supervision of June 1999 has emphasized the role of the agencies. However, not all market participants are con…dent that credit rating agencies are reliable enough to set regulatory capital requirements.

The sharp adjustments of sovereign credit ratings for many emerging markets during the Asian crisis of 1997/98 have raised concerns about the accuracy and stability of the rating process. Although major credit rating agencies accurately identi…ed weaknesses in the …nancial systems of a number of Asian countries before the crisis started in 1997, the maintenance of investment-grade ratings for many countries right up to the brink of the crisis and the subsequent sharp downgrades during the Asian crisis were interpreted by many observers as imparting a procyclical element into global capital ‡ows. The behavior of the agencies was criticized, because it induced large-scale capital in‡ows and excessive compression in interest rate spreads by exacerbating herding behavior before the crisis and contributing to the abrupt reversal of capital ‡ows after the Asian crisis emerged.

Against the background of these pronounced boom-bust cycles, this paper examines empirically whether the agencies can add, i.e. intensify or attenuate, to the dynamics of …nancial crises. In particular, the role of sovereign downgrades is analyzed for Mexico during the Peso crisis of 1994/95 and Korea during the Asian crisis of l997/98, respectively.

By using a vector autoregressive (VAR) model the way US dollar bond yield spreads and international liquidity react to an unexpected sovereign rating change is analyzed. Therefore, impulse response functions are estimated and a historical decomposition of the time-paths of the variables is carried out. Previous studies did not consider the dynamic interaction between these variables. As will be shown, rating changes clearly have simultaneous e¤ects on both bond yield spreads and liquidity. However, bond yield spreads and liquidity also have an contemporaneous e¤ect on sovereign ratings. Therefore, a multivariate modeling approach seems appropriate. The empirical results show that abrupt downgrades do not necessarily contribute to …nancial crises, which is in sharp contrast to the views of the proponents of the boom-bust cycles theory.

The remainder of this paper is organized as follows. Section 2 gives an overview on the topic of sovereign risk and …nancial crisis. In the …rst part,

the criteria of sovereign ratings are discussed. The second part considers the role of the credit rating agencies during the Asian crisis and tries to answer the question whether agencies failed to foresee the Asian crisis. The …rst part of section 3 discusses the recent empirical investigations of Cantor and Packer (1996) and Reisen and Maltzan (1999) on the issue of whether credit rating agencies can add to the dynamics of …nancial crises. In an empirical study the second part of section 3 analyzes whether sovereign ratings are responsible for boom-bust-cycles by using a vector autoregressive model. Section 4 presents a conclusion.

2 Sovereign Risk and Financial Crises

During the 1990s, global securities markets have become an increasingly important source of funding for many emerging market countries. In this respect, credit rating agencies, such as Standard & Poor's (S&P) and Moody's Investors Service (Moody's), have been seen by many market participants as having a strong impact on both the costs of funding and the willingness of major institutional investors to hold certain types of instruments.[1]

2.1 Sovereign Rating Criteria

Like other credit ratings, sovereign ratings are assessments of the likelihood that a borrower will default on his obligations. The rating agencies interpret their ratings as forward-looking indications of the relative risk that debt issuers will not have the ability and willingness to make full and timely payments of principal and interest over the life of particular rated instruments.

It is important to note that, historically, sovereign ratings have been relatively stable. Although ratings are inevitably in‡uenced by cyclical factors, rating agency o¢cials point out that long-term foreign currency debt ratings try to see through economic, political, credit, and commodity cycles. Therefore, a recession or tightening of global liquidity should not, by itself, be the reason for a sovereign downgrade. Rating changes should thus be tied to fundamental factors such as secular trends (see S&P (1999b)).

The two major credit rating agencies, Moody's (1998) and S&P (1999a), argue that they do not regard their ratings as providing either a prediction of

[1] Indeed, obtaining a sovereign credit rating has often been seen as a prerequisite for issuing an Eurobond. Furthermore, some institutional investors are constrained to hold securities that have been classi…ed by the rating agencies as "investment-grade", as a result of either o¢cial regulations or internal risk management practices. Moreover, sovereign ratings often serve as a ceiling for private-sector ratings of any given country, which stretches their in‡uence far beyond government securities (see Moody's (1999)).

the timing of default or an indication of the absolute level of risk associated with a particular …nancial obligation. Moreover, the agencies declare that an issuer credit rating is not a recommendation to purchase, sell, or hold a …nancial obligation issued by an obligor, as it does not comment on market price or suitability for a particular investor.

In assessing the solvency and liquidity of sovereigns, rating agencies have focused on a number of factors. Table 1 illustrates which factors S&P (1998) focus on when rating sovereigns. S&P divides the factors which in‡uence the determination of the overall sovereign rating into eight categories. Each category relates to the two key aspects of credit risk, i.e. economic and political risk. Economic risk addresses the government's ability to repay its obligations on time and is a function of both quantitative and qualitative factors. Political risk addresses the sovereign's willingness to repay debt.

Despite the fact that all major credit rating agencies list the relevant economic and political factors that underlie their sovereign ratings, they supply no information about the weights they assign to each factor and the role of non-quanti…able criteria such as government stability and policy consensus. The rating agencies emphasize that they do not use a speci…c formula to combine their evaluations of the political and economic factors to derive the overall rating. However, there have been a number of empirical studies which attempt to shed light on quantitative factors having historically received the greatest weights in the decision-making process.[2]

For their ratings the agencies use an ordinal scale. S&P's ratings run from AAA, the highest, through AA, A, and BBB, which is still investment-grade, and then all the way down to D, which re‡ects the potential default of an obligation. Similarly, Moody's ratings range from Aaa through Baa down to Caa. Ratings are also subject to re…nements by adding pluses or minuses or additional numbers. Moreover, sovereign ratings are often divided into two broad categories, namely, investment-grade and speculative-grade. Investment-grade issues are usually considered to be acceptable investments for institutional investors. S&P's issues rated BBB- and above are investment-grade, while Moody's split is made at Baa3 and above.

In recent years, both S&P and Moody's have supplemented their ratings with outlooks and watches, respectively, designed to indicate the agencies' perspective on factors that might prompt a rating review over the next six months to three-to-four years. Such reviews are usually denoted as positive, implying that the rating may be raised, stable, or negative, implying that

[2] In particular, Cantor and Packer (1996), Juttner and McCarthy (1998), and recently Kräussl (2000) examined the determinants of the levels of S&P's and Moody's ratings for a range of mature and emerging market economies in the 1990s.

the rating may be lowered. However, as S&P (2000) points out, an outlook is not necessarily a precursor of a rating change.[3]

2.2 Did the Rating Agencies Miss the Asian Crisis?

The rating changes on Asian emerging markets observed during the period between July 1997 and November 1998 were, collectively, the largest and most abrupt downgrades in the modern history of sovereign credit ratings. Across all credit rating agencies, so-called rating crises, as de…ned by Juttner and McCarthy (1998), which denote a downgrade of three rating notches[4] or more in long-term foreign currency debt, were observed. Thailand fell by an average of four rating notches, Indonesia was downgraded by an average of nearly …ve rating notches, and Korea fell by an average of more than nine rating notches.[5] Table 2 lists these rating changes, Table 3 converts the ordinal rating to a numerical scale, and Table 4 compares these sovereign rating changes graphically with the sovereign ratings of other crises-ridden countries in the 1990s.

Market participants raised criticisms that the credit rating agencies were not only lax in foreseeing the vulnerabilities of the countries that eventually succumbed to crisis, but that they also responded to negative developments too slowly. This means that they were downgrading the debtor countries only after the onset of the crisis, thereby exacerbating market price movements and increasing instability (see, e.g., International Monetary Fund (1998)).

Following the Asian crisis, a number of weaknesses in the determination of sovereign ratings became obvious. For example, the International Monetary Fund (1999) criticized the lack of statistical methodology and the need for signi…cant improvements in risk assessment techniques such as extensive scenario analysis, sensitivity analysis and stress testing. However, these fundamental weaknesses of the rating process suggest that there should be

[3] S&P (2000) indicates that roughly two-thirds of all rating's outlooks for the 83 sovereigns it rates as of December 31, 1999, result in a rating change. Since rating outlooks were created in 1989, most sovereign ratings with a positive outlook were upgraded at the next rating change. Up to now, sovereigns with a positive outlook have never been downgraded at the next rating change.

[4] Rating notches are the gaps between ratings, i.e. the gap between A+ and A- is two rating notches.

[5] During the course of these downgrades, Moody's reduced Indonesia, Korea, and Thailand to non-investment-grade, whereas S&P reduced Indonesia and Korea to non-investment-grade, but assigned the lowest possible investment-grade rating to Malaysia and Thailand. For a detailed description and analysis of the rating actions and …nancial markets developments during the Asian crisis see, e.g., International Monetary Fund (1999).

ways to improve sovereign ratings. Whether the credit rating agencies failed during the Asian crisis is another question.[6]

Market analysts and asset prices also provided little warning of the impending Asian crisis. The market, as gauged by sovereign debt yields, broadly shares the relative rankings of sovereign credit risks made by S&P and Moody's. Spreads had not widened considerably in the Asian countries by the onset of the crisis (see Kaminsky and Schmukler (1999)). As with ratings, the bulk of the deterioration was observed later (see Eichengreen and Mody (1998)). Moreover, the market analysts' surveys, published by the Institutional Investor and Euromoney just prior to the crisis indicated, that these analysts gave high creditworthiness ratings to all the Asian countries receiving investment-grade ratings by the two rating agencies. As Table 5 shows, rating scores by the Institutional Investor and Euromoney were lowered substantially after the Asian crisis. This suggests that in Asia, the markets as well as analysts and rating agencies failed to foresee the …nancial crisis and the corresponding rise in default risk.

As mentioned above, the declared purpose of ratings is to indicate the likelihood of default and not to predict spreads of emerging market bonds. The largest rating downgrades typically occurred following the revelation of what the agencies regarded as new information with a signi…cant impact on the short-term liquidity of the rated sovereign. Moody's (1998), for example, argues that its major rating reviews had been triggered by

- the reports on the size of the Bank of Thailand's forward foreign exchange position,
- the extent of the Bank of Korea's placement of its foreign exchange reserves in o¤shore Korean banks, implying that these funds were not liquid, and
- the emergence of widespread political disturbances in Indonesia.

By sharply downgrading the Asian crisis countries, the agencies merely considered the likelihood of default for these countries to be higher than before the crisis. This argumentation seems plausible, because the Asian crisis certainly did not have a positive e¤ect on the ability and in particular the willingness of the a¤ected countries to service their debt in full and on time.

[6] One possible starting point for examining whether the agencies failed during the Asian crisis is to consider that sovereign ratings are only wrong if they are not changed on time in response to predictable changes in default risk. For a further discussion on this topic see Kräussl (2000).

The sovereign ratings by the agencies only reacted to the unpredictable developments which certainly in‡uence the risk of sovereign default in general. Of course, this is exactly what credit rating agencies are supposed to do.

3 Do Sovereign Ratings Add to the Dynamics of Emerging Market Crises?

An interesting question is whether credit rating agencies can add to the dynamics of …nancial crises. A necessary condition for this to occur is the existence of causality from sovereign ratings to yield spreads.

Reisen and Maltzan (1999) argue that, in principle, sovereign ratings might be able to help to attenuate boom-bust cycles in emerging-market lending. During the boom, early rating downgrades would help to dampen euphoric expectations and reduce private short-term capital ‡ows which have repeatedly been seen to fuel credit booms and …nancial vulnerability in the capital importing countries.

In contrast, if sovereign ratings had no market impact, they would be unable to smooth boom-bust cycles. Even worse when sovereign ratings lag rather than lead …nancial markets, but have a market impact, improving ratings would reinforce euphoric expectations and stimulate excessive capital in‡ows during the boom-phase, whereas during the bust-phase, downgrading might add to panic among investors, driving money out of the country and sovereign yields spreads up.

3.1 Recent Empirical Studies on Sovereign Ratings and Boom-Bust-Cycles

In examining the relationship between changes in S&P's and Moody's sovereign ratings and the change in the spread between the yields on US dollar-denominated Eurobonds and comparable US treasury bonds, somewhat mixed results were obtained by a number of empirical studies which tried to shed light on this issue using event studies and Granger causality tests.[7]

Cantor and Packer (1996) studied the e¤ect of rating announcements, i.e. of both S&P's outlooks and Moody's credit watches, and implemented sovereign ratings on spreads, i.e. the di¤erential between yields on sovereign US dollar-denominated Eurobonds and on comparable 5-year US treasury bonds. In their empirical analysis they used daily data from the periods

[7] Other event studies, e.g., Richards and Deddouche (1999), examine the performance of emerging market bank stocks around the time of rating changes by the agencies.

before and after the 79 rating announcements covered by their 35 country sample and concluded that

1. the impact of rating announcements on spreads was much stronger for non-investment-grade than for investment-grade sovereigns, and

2. announcements of possible upgrades in the agencies' ratings were followed by statistically signi…cant bond yield movements in the expected direction, i.e. a decline in yield spreads, but announcements of possible downgrades did not produce signi…cant e¤ects.

Reisen and Maltzan (1999), using data on 29 sovereigns from 1989 to 1997 and 152 rating announcements, of which 97 events a¤ected the emerging markets, conducted their study in two parts. First, they examined the interaction between spreads on sovereign bonds, namely the di¤erential between yields on US dollar-denominated sovereign bonds and yields on 10-year US treasury bonds, and implemented credit ratings by S&P and Moody's. In particular, they considered whether credit ratings Granger-caused sovereign interest spreads after controlling for macroeconomic indicators. These latter variables included the total stock market return, foreign exchange reserves, the real exchange rate, the terms of trade, and industrial production. The authors concluded that agencies' credit ratings Granger-cause yield spreads and vice versa.

Reisen and Maltzan (1999) also undertook an event study similar to the one by Cantor and Packer (1996). They also found that the largest announcement e¤ects are observed for emerging market sovereign spreads. However, in sharp contrast to the results of Cantor and Packer (1996), Reisen and Maltzan (1999) found that a signi…cant change in the yield spread in the expected direction occurred during the announcement period of 30 days before and after the rating event only when a possible downgrade was implemented.

3.2 Did Downgrades Intensify Financial Crises?

Academics and investors often argue that sovereign ratings trigger pronounced boom-bust cycles (see, e.g., Monfort and Mulder (1999)). This means that initially small capital out‡ows from an emerging market and subsequently widening spreads lead rating agencies to downgrade the country in question. This, in turn, is interpreted by many investors as a signal to withdraw additional capital. As a result, the spreads become even larger and the agencies continue to downgrade. Following this argumentation, this represents a vicious circle that can trigger a …nancial crisis at the slightest provocation. The proponents of this boom-bust cycles theory argue that the upgrading of the

Asian countries in the mid-1990s already proved the existence of a vicious circle, though in the opposite direction. This means that capital in‡ows led to higher ratings which, in turn, triggered more capital in‡ows (see Reisen and Maltzan (1999)).

Two case-studies can shed light on the question of the role of downgrades in an emerging-market crisis: the Mexican Peso crisis of 1994/95 and the case of Korea during the Asian crisis of 1997/98. To this end, one has to measure the impact of rating changes on those variables that signal a crisis. In particular, two variables play a crucial role during …nancial crises: the spread between a country's Eurobonds and Brady bonds, respectively, and US treasury bonds as well as international liquidity (see Monfort and Mulder (1999)).

3.2.1 Data

The sample consists of monthly averages of daily sovereign ratings of long-term foreign currency debt which have been assigned by the credit rating agencies S&P and Moody's. In the case of Mexico, this data set consists of sovereign ratings from the period between July 30, 1992, the …rst time Mexico was assigned a sovereign rating by S&P, and February 15, 2000. For Korea the considered period starts October 1, 1988 and also ends on February 15, 2000. The rating history has been obtained directly from the two market leaders S&P and Moody's, who cover approximately 80 percent of the sovereign ratings. The empirical study not only analyzes implemented rating assignments but also imminent rating changes.

Although the two agencies use di¤erent symbols in assessing credit risk, every S&P scale has its counterpart in Moody's rating scale. This correspondence permits a linear transformation into numbers. As Table 3 shows, this linear scale implies that di¤erences of ratings correspond one to one with di¤erences in perceptions of country risk.[8] In order to consider not only the implemented long-term foreign currency debt ratings, the numerical scale of the transformed sovereign ratings also contain positive and negative outlooks and watches, respectively.[9]

[8] Two alternative tranformation forms can be considered: the logistic transformation and a kinked function with a structural break. The logistic transformation implies the hypothesis that risk perceptions …rst deteriorate slowly as rating notches decrease, then deteriorate faster when ratings fall from investment-grade to speculative-grade, and …nally deteriorate slowly again as ratings reach the bottom of the classi…cation. Another alternative transformation form could be a kinked function with a structural break when the sovereign bond passes from investment-grade to speculative-grade.

[9] This is realized by adding 1/3 of one rating notch for a positive outlook by S&P or a positive credit watch by Moody's and -1/3 of one rating notch for a negative outlook

The second type of data needed for this analysis are the movements in relative US dollar bond yield spreads, i.e. Brady bonds in the Mexican case and Eurobonds in the Korean case. Since they are not subject to currency risk, dollar bond spreads can be assumed to primarily re‡ect country risk premia on government Eurobonds of the same maturity (see Jarrow and Turnbull (1998)). The risk-free benchmark for the computation of spreads is the ten-year US treasury bond. The relative yield spread is calculated as a fraction of the benchmark yield on central government bonds, based on data obtained on …xed-rate dollar bond redemption yields.

The data set on Mexican government Brady bonds and Korean government Eurobond yields is obtained on a monthly basis from Bloomberg, while only the most actively traded bonds were selected for the sample. The third necessary data set is a proxy for the variable "international liquidity" which is measured as the total foreign assets held by the Mexican and Korean central bank, respectively. These monthly data are also extracted from Bloomberg.

3.2.2 Methodology

If the boom-bust-cycles theory holds, international liquidity and spreads between Eurobonds or Brady bonds and US treasury bonds depend on the sovereign ratings assigned by the agencies. However, in order to examine the question of whether sovereign downgrades contribute to …nancial crises, only the in‡uence of unexpected rating changes should be measured, since only these should be able to trigger market reactions. In other words, if all market participants expect a rating change, then the latter should no longer have any impact.

A good way to measure the dynamic interaction between these three variables seems to be the speci…cation of a vector autoregressive (VAR) model. As its name implies, the method consists of regressing each current variable in the model on all the variables in the model lagged a certain number of times. The VAR approach provides a simple tool for characterizing the dynamic interaction of the data which, in turn. can be displayed by their impulse response functions.

Previous studies did not take into account the dynamic interaction between these three variables. Clearly, rating changes have simultaneous e¤ects on both bond yield spreads and liquidity. However, bond yield spreads and liquidity also have contemporaneous e¤ects on sovereign ratings. Therefore a multivariate modeling approach seems to be appropriate.

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or a negative credit watch, respectively, to the implemented sovereign rating in question. For example, a BBB- sovereign rating with a positive outlook assigned by S&P equals the number $11:\overline{3}$.

In addition to the determination of the set of variables that is used in a VAR system it is important to determine the appropriate lag length. The multivariate generalization of the Akaike information criterion indicates that 12 lags are appropriate, while the multivariate generalization of the Schwartz-Bayesian criterion suggests that one should use only three lags. Despite using monthly data, a lag-length of three months is considered sufficient, given the degrees-of-freedom considerations caused by the limited data availability.

Therefore, the resulting third-order VAR system describing the interaction between the three variables, notably, the sovereign rating r_t, the spread s_t, and the international liquidity l_t is given through

$$
\begin{aligned}
r_t &= \mu_r + \alpha_{11} r_{t-1} + \alpha_{12} r_{t-2} + \alpha_{13} r_{t-3} \\
&\quad + \alpha_{14} s_{t-1} + \alpha_{15} s_{t-2} + \alpha_{16} s_{t-3} \\
&\quad + \alpha_{17} l_{t-1} + \alpha_{18} l_{t-2} + \alpha_{19} l_{t-3} + u_{rt} \\
s_t &= \mu_s + \alpha_{21} r_{t-1} + \alpha_{22} r_{t-2} + \alpha_{23} r_{t-3} \\
&\quad + \alpha_{24} s_{t-1} + \alpha_{25} s_{t-2} + \alpha_{26} s_{t-3} \\
&\quad + \alpha_{27} l_{t-1} + \alpha_{28} l_{t-2} + \alpha_{29} l_{t-3} + u_{st} \\
l_t &= \mu_l + \alpha_{31} r_{t-1} + \alpha_{32} r_{t-2} + \alpha_{33} r_{t-3} \\
&\quad + \alpha_{34} s_{t-1} + \alpha_{35} s_{t-2} + \alpha_{36} s_{t-3} \\
&\quad + \alpha_{37} l_{t-1} + \alpha_{38} l_{t-2} + \alpha_{39} l_{t-3} + u_{lt} \quad .
\end{aligned}
$$

A useful tool to examine the impact of an unexpected rating change on spreads and international liquidity, respectively, are simulations of the VAR system via a historical decomposition of time-paths of the variables into a base projection and the accumulated effects of current and past innovations. The intuition behind this decomposition is a breakdown of the observed fluctuations of the variables at a time t into a part which was expected at time $t-1$ and shocks that occurred at time t. In other words, the historical decomposition answers the question of which shock caused the variable to fluctuate.

After estimating the intercepts and the coefficients of each equation of the VAR system by using ordinary least squares (OLS), the three variables examined at time t can be divided into a predictable and an unpredictable part. The predictable part is modeled on the basis of the past values of each variable, while the unpredictable part is given by the error terms. Given the information at $t-1$, the time path of the spreads, i.e. s_t, s_{t+1},..., s_{t+n}, and the time path of the international liquidity, i.e. l_t, l_{t+1};..., l_{t+n}; can then be attributed to the three following factors:

- the initial situation, i.e. the predictable part, based on the information available at $t - 1$

$$\begin{aligned} &\hat{\alpha}_s + \hat{A}_{21}\, r_{t-1} + \hat{A}_{22}\, r_{t-2} + \hat{A}_{23}\, r_{t-3} \\ &\quad + \hat{A}_{24}\, s_{t-1} + \hat{A}_{25}\, s_{t-2} + \hat{A}_{26}\, s_{t-3} \\ &\quad + \hat{A}_{27}\, l_{t-1} + \hat{A}_{28}\, l_{t-2} + \hat{A}_{29}\, l_{t-3} \end{aligned}$$

and

$$\begin{aligned} &\hat{\alpha}_l + \hat{A}_{31}\, r_{t-1} + \hat{A}_{32}\, r_{t-2} + \hat{A}_{33}\, r_{t-3} \\ &\quad + \hat{A}_{34}\, s_{t-1} + \hat{A}_{35} s_{t-2} + \hat{A}_{36}\, s_{t-3} \\ &\quad + \hat{A}_{37}\, l_{t-1} + \hat{A}_{38}\, l_{t-2} + \hat{A}_{39}\, l_{t-3} \quad , \end{aligned}$$

- the unexpected rating changes, i.e. the values of

$$u_{rt}; u_{rt+1}; \ldots; u_{rt+n} \quad ,$$

- and the remaining factors of the unpredictable part, i.e. the values of

$$u_{st}; u_{st+1}; \ldots; u_{st+n}$$

and

$$u_{lt}; u_{lt+1}; \ldots; u_{lt+n} \quad .$$

The primary interest lies in the influence of the second factor since it measures the effect of unexpected rating changes by the agencies on the spread and the international liquidity, respectively. To examine the issue of whether the boom-bust-cycle theory holds, the VAR system can be used for estimations of the impulse response functions.

Moreover, the estimation of the impulse response functions is an important tool to check the robustness of the underlying VAR model. This test, of whether a change in the order of this three-variable VAR(3) model implies significant different impulse response functions, has been done for the six possible specifications. The changing of the order shows robustness of the results, i.e. the decision to specify a general VAR instead of a structural VAR model goes in line with the literature (see, e.g., Christiano, Eichenbaum, and Evans (1999)).

3.2.3 Results

Figures 1 and 2 display the impulse response functions for Mexico and Korea, notably the response of the three variables to a positive one standard deviation shock of the sovereign rating in t = 0 over a horizon of 36 months. The …rst graph of each …gure shows the responses of the sovereign rating variable to its own shock after zero periods, one period, etc., up to the limit of thirty-…ve months, while the second graph displays the responses of the spread and the third graph the responses of the international liquidity to the impulse of the sovereign rating.

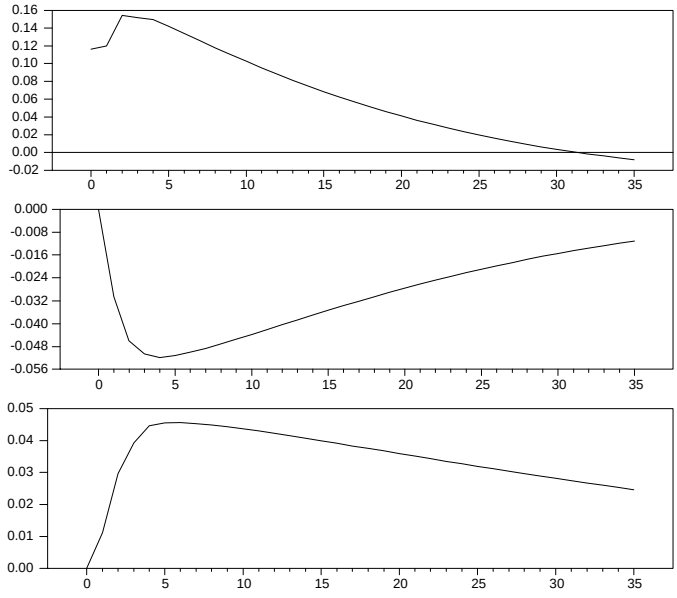

Figure 1: Mexico, Impulse responses to an unexpected sovereign rating shock

It is not surprising that in the …rst month the impulse response functions of the spread and the international liquidity show no responses to the shock of the sovereign rating, but responses from month one onwards. All these six graphs show that, eventually, all time paths resulting from the impulse response coe¢cients $Á_i$ converge to zero. The absence of explosive responses to the shock of the sovereign rating re‡ects the stability of the estimated model.

For the individual variables, the impulse response functions show the expected signs after an unexpected sovereign rating shock which go in line with the theory and the empirical analysis of previous studies (see Cantor

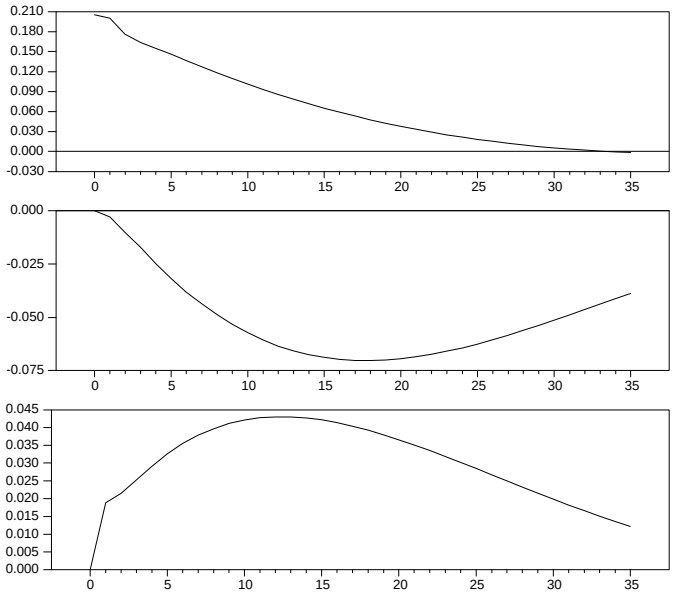

Figure 2: Korea, Impulse responses to an unexpected sovereign rating shock

and Packer (1996), Reisen and Maltzan (1999), and Monfort and Mulder (1999)). Positive rating changes should be associated with negative changes in the yield spread and a positive impact on the international liquidity.

A historical decomposition can be made by a two-step procedure to analyze the time paths of the variables. In a …rst step, it is assumed that there will be no unanticipated rating changes in the future, i.e. $u_t = 0; 8\, t = 1; :::; n$. Using the VAR system a forecast for the time paths of the spreads and of the international liquidity can be done. These forecasts give the expected development of the variables s_t and l_t, i.e. $s_{t+1};..., s_{t+n}$ and $l_{t+1};..., l_{t+n}$.

In a second step one should measure how the entire time paths of the spreads and the international liquidity are a¤ected by a stochastic shock. Therefore, the VAR system can be used for forecasting based on the assumption that unanticipated news at time t causes the downgrading of the sovereign rating. The values of the variables s_t and l_t, if the variable r_t is shocked by a change of one standard deviation in period t, are then given as $\hat{s}_{t+1};..., \hat{s}_{t+n}$ and $\hat{l}_{t+1}, \hat{l}_{t+n}$.

The di¤erence between these …rst and second step forecasts of the VAR system re‡ects the in‡uence of an unanticipated sovereign rating shock at time t on the time path of the spreads and the international liquidity in $t + 1;..., t + n$.

This third-order VAR(3) system was modeled for Mexico and Korea. The simulation results of the historical decomposition showed that there were no signi…cant di¤erences in the long-term foreign currency ratings assigned by S&P and Moody's. Therefore, the variable r_t used in the analysis is the average of the sovereign rating assigned by these two agencies.

To show the di¤erent impacts of unexpected rating changes, the initial sovereign rating was shocked by one standard deviation for di¤erent starting points prior to the two …nancial crises and for di¤erent numbers of months over which the historical decomposition was created. Finally, in the case of Mexico a starting point seven months prior to the onset of the Mexican Peso crisis of late December 1994/early January 1995, i.e. June 1994, was chosen. For Korea the starting point of the historical decomposition is March 1997, i.e. seven months before the Asian crisis sharply a¤ected Korea. In both cases the forecast horizon of the historical decomposition is 24 months.

Figure 3 and Table 6 show the impact of a downgrade of the Mexican long-term foreign currency debt rating by a one standard deviation shock on the spread of Mexican Brady bonds. The solid line shows the e¤ective time-path of the spread of Mexican Brady bonds for the period between the begin of June 1994 and the end of May 1996. The upper dashed line shows the expected development of the spreads in mid-1994, while the lower dashed line shows the impact of the unexpected downgrade of the sovereign. Both dashed lines calculated on the basis of the three-variable VAR(3) add-up to the observed behavior of the spread of Mexican Brady bonds during the period between June 1994 and May 1996.

This result suggests that a large part of the widening of the spread observed in early 1995 was due to rating changes. The fact that Mexico was not only put on the so-called credit watch list by S&P with a negative outlook on December 23, 1994, but was also downgraded from BB+ to BB on February 10, 1995, and was assigned a further negative outlook on March 23, 1995, evidently worsened the Mexican Peso crisis.[10] This result is in line with the conclusion drawn by Reisen and Maltzan (1999) that agencies' credit ratings Granger-cause yield spreads and evidently intensify …nancial crises.

However, this is not true for all emerging-market crises. Figure 4 and Table 7 show the impact of a one-unit standard deviation downgrade of the Korean long-term foreign currency debt rating on the international liquidity of Korea. The solid line shows the e¤ective time-path of the Korean international liquidity for the period between the beginning of February 1997 and the end of January 1999. The upper dashed line shows the expected devel-

[10] For a detailed discussion of the Mexican Peso crisis see, e.g., Sachs, Tornell, and Velasco (1996).

Figure 3: Historical decomposition of the time-path of the spreads of Mexican Brady bonds (in basis points)

opment of the Korean international liquidity in early 1997, while the lower dashed line shows the impact of the unexpected sovereign downgrade.

In contrast to the results of Reisen and Maltzan (1999), the downgrading appears to have little impact on the liquidity. Moreover, from mid-January 1998, Korea's sovereign rating was gradually upgraded again. For example, S&P revealed the negative outlook on January 16, 1998, and assigned a long-term foreign currency debt rating to Korea that was three rating notches higher, notably an upgrade from B+ to BB+. The results show that this improved Korea's liquidity situation.

The agreement by most of Korea's bank creditors in late December 1997 to roll forward their short-term claims, arranged under the auspices of central banks of major industrial countries, contributed signi…cantly to the change in sentiment. This went along with an acceleration of …nancial support from the International Monetary Fund and other multilaterals and pledges of a second line of defense from bilaterals (see Berg (1999) and Corsetti, Pesenti, and Roubini (1999)). Evidence of the rapid improvement in Korea's current account reinforced con…dence that the agreement could lead to a more prolonged extension of Korea's credit terms (see International Monetary Fund (1999)).

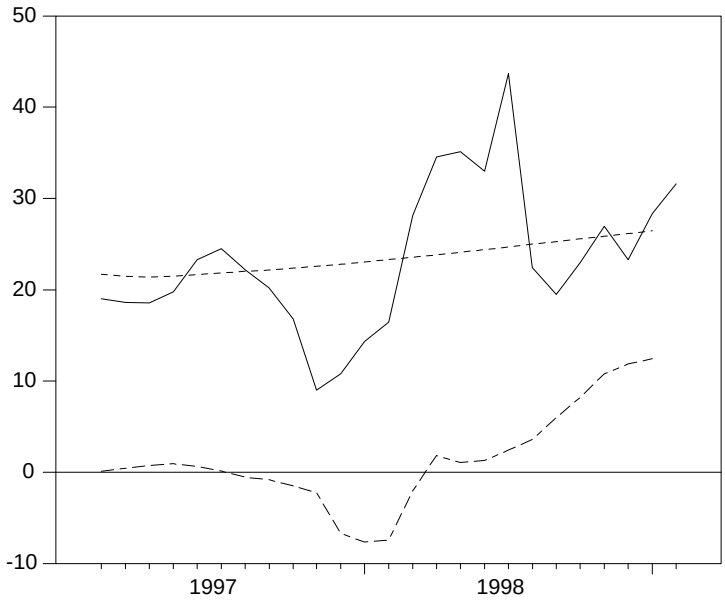

Figure 4: Historical decomposition of the time-path of Korea's international liquidity (in billion US dollar)

Therefore, if anything can be attributed to the actions of the rating agencies during the Korean crisis, it is the swift recovery in liquidity after the Asian crisis. At least partly this recovery seems to be due to the fact that the agencies upgraded their ratings of Korea more than justi…ed by the fundamental factors.

As a proof of the boom-bust cycles theory, its proponents cite studies that provide evidence that …rst, ratings are in‡uenced by capital movements and changes in the spreads, and second, that capital ‡ows and spreads react to rating changes (see, e.g., Reisen and Maltzan (1999) and Monfort and Mulder (1999)). The question is whether such a pattern really exists which could in turn be strategically used by investors. If agencies know that their rating changes trigger market reactions, they can react accordingly. Hence, instead of setting o¤ a bust-phase by a small downgrade, a farsighted rating agency would anticipate the subsequent market reactions by opting for one large downgrade. The following market reactions would then no longer lead to renewed downgrades.

4 Conclusion

Academics and investors often argue that sovereign rating actions intensify …nancial crises. Initially small capital out‡ows from an emerging market and subsequently widening spreads lead rating agencies to downgrade the sovereign. This, in turn, leads many investors to withdraw additional capital. As a result, the spreads become even larger and the agencies continue to downgrade the sovereigns.

Considering this boom-bust cycles theory this paper tried to shed light on the role of sovereign rating downgrades in emerging market crises for the cases of Mexico during the Peso crisis 1994/95 and of Korea during the Asian crisis. The empirical results suggest that sovereign downgrades not necessarily intensify …nancial crises. In the case of Mexico, a large part of the widening of the spread observed in early 1995 was indeed due to the change of the sovereign rating by an average of one rating-notch.

However, in contrast to common belief and previous studies, in the case of Korea the sharp sovereign downgrading of an average of more than nine rating-notches had little impact on international liquidity. Moreover, the swift recovery of the liquidity in early 1998 is at least partly attributable to the rating actions of the agencies during the Korean crisis.

For the agencies' rating actions during boom-bust cycles these results imply three important consequences. First, contrary to common belief, a sharp downgrade as in the case of Korea does not necessarily intensify a …nancial crisis. Moreover, it can help to end the …nancial crisis more quickly. Second, a cautious, gradual downgrading as in the case of Mexico can intensify the …nancial crisis. And third, if rating agencies act with foresight, an initial downgrade will not cause a bust-phase and an initial upgrade will not cause a boom-phase, and therefore cannot be strategically used by investors.

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Political Risk
- Form of government and adaptability of political institutions
- Extent of popular participation
- Orderliness of leadership succession
- Degree of consensus on economic policy objectives
- Integration in global trade and …nancial system
- Internal and external security risks
Income and Economic Structure
- Living standards, income, and wealth distribution
- Market vs. non-market economy
- Resources endowments and degree of diversi…cation
Economic Growth Prospects
- Size and composition of savings and investment
- Rate and pattern of economic growth
Fiscal Flexibility
- General government operating and total budget balances
- Tax competitiveness and tax-raising ‡exibility
- Spending pressures
Public Debt Burden
- General government …nancial assets
- Public debt and interest burden
- Currency composition and structure of public debt
- Pension liabilities
- Banking, corporate, other contingent liabilities
Price Stability
- Trends in price in‡ation
- Rates of money and credit growth
- Exchange rate policy
- Degree of central bank autonomy
Balance of Payments Flexibibilty
- Impact of …scal and monetary policies on external accounts
- Structure of the current account
- Composition of capital ‡ows
External Debt and Liquidity
- Size and currency composition of public external debt
- Importance of banks and other public and private entities as contingent liabilities
- Maturity structure and debt service burden
- Level and composition of reserves and other public external assets
- Debt service track record

Table 1: S&P's sovereign ratings methodology pro…le

Country	07/01/97	11/30/98
Indonesia	BBB	CCC+
Korea	AA-	BB+
Malaysia	A+	BB-
Thailand	A	BBB-

Table 2: Changes of S&P's sovereign ratings during the Asian crisis

S&P	Moody's	Scale
AAA	Aaa	20
AA+	Aa1	19
AA	Aa2	18
AA-	Aa3	17
A+	A1	16
A	A2	15
A-	A3	14
BBB+	Baa1	13
BBB	Baa2	12
BBB-	Baa3	11
BB+	Ba1	10
BB	Ba2	9
BB-	Ba3	8
B+	B1	7
B	B2	6
B-	B3	5
CCC+	Caa1	4
CCC	Caa2	3
CCC-	Caa3	2
CC	Ca	1
D	C	0

Table 3: Transformation of S&P's and Moody's ordinal rating scales into a numerical scale

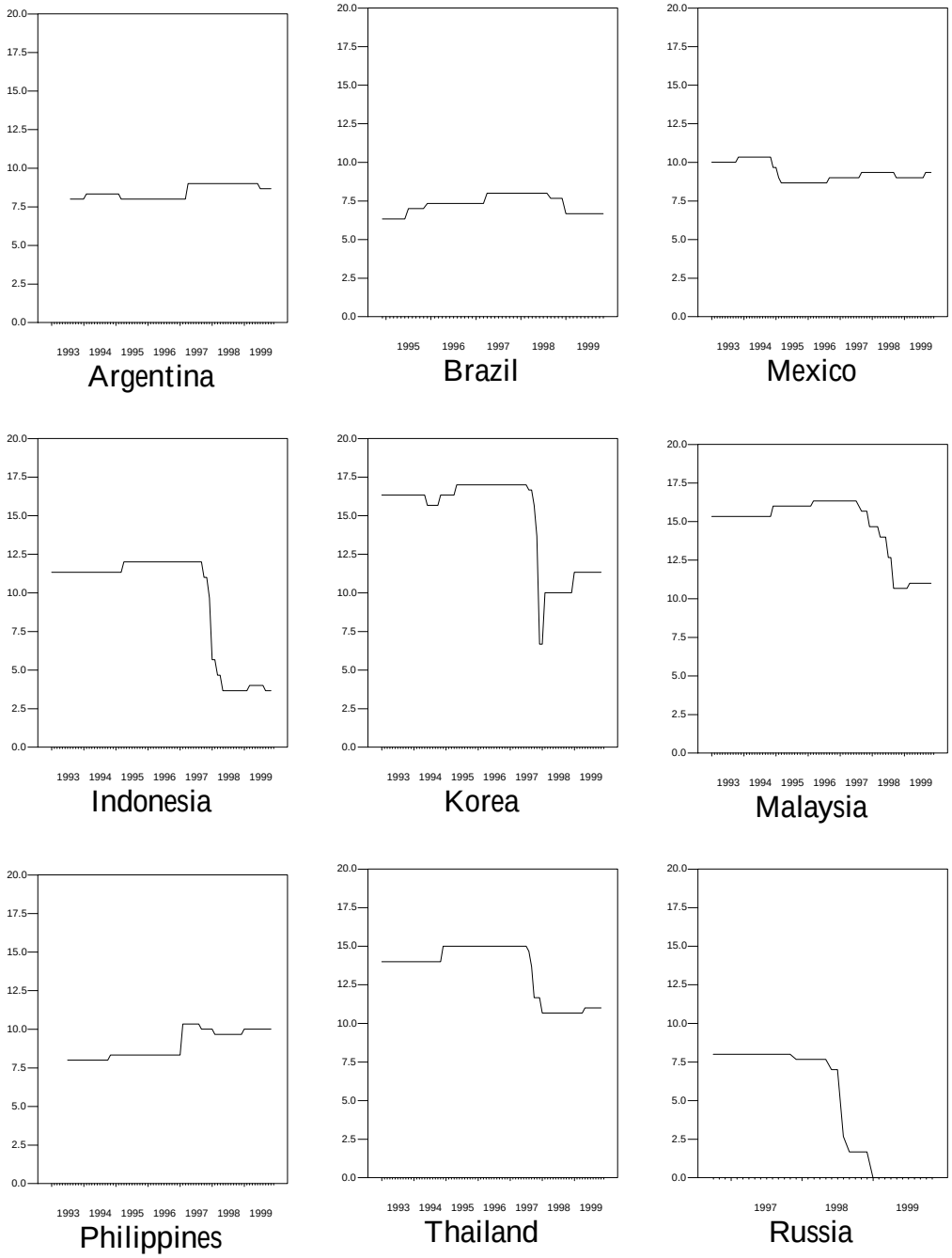

Table 4: Changes of S&P's sovereign ratings for selected countries during the 1990s

Country	II (09'96)	II (09'98)	EM (09'96)	EM (09'98)
Thailand	63	48	80	49
Indonesia	72	54	88	56
Korea	52	33	73	34

Table 5: Market ratings of Asian crisis countries by Institutional Investor (II) and Euromoney (EM), (Scores out of 100)

Date	E¤ective	Expected	Impact of Downgrade
06'1994	507.090	553.790	-41.954
07'1994	534.700	615.465	-107.477
08'1994	443.608	620.972	-135.643
09'1994	437.904	652.333	-159.861
10'1994	457.100	672.339	-157.459
11'1994	454.650	689.957	-169.727
12'1994	596.904	703.143	107.977
01'1995	1065.050	713.334	371.776
02'1995	1280.315	720.997	380.604
03'1995	1912.304	726.538	679.506
04'1995	1356.684	730.334	495.668
05'1995	1137.636	732.692	266.202
06'1995	1194.363	733.884	272.622
07'1995	964.050	734.134	230.851
08'1995	975.739	733.633	192.786
09'1995	1032.350	732.542	187.726
10'1995	1204.952	730.995	138.453
11'1995	1336.809	729.106	59.322
12'1995	1193.750	726.970	-28.597
01'1996	924.095	724.666	-72.486
02'1996	905.250	722.258	-45.794
03'1996	940.142	719.802	-11.163
04'1996	784.333	717.341	-13.467
05'1996	743.318	714.911	-7.521

Table 6: Empirical results of the historical decomposition of the time-path of the spreads of Mexican Brady bonds (in basis points)

Date	E¤ective	Expected	Impact of Downgrade
03'1997	18.616	19.448	0.256
04'1997	18.549	19.716	0.528
05'1997	19.756	19.861	0.851
06'1997	23.286	20.259	0.761
07'1997	24.550	20.765	0.290
08'1997	22.206	21.112	-0.372
09'1997	20.197	21.363	-0.576
10'1997	16.824	21.646	-1.199
11'1997	9.032	21.956	-1.904
12'1997	10.812	22.259	-6.324
01'1998	14.371	22.561	-7.218
02'1998	16.474	22.876	-6.981
03'1998	28.111	23.197	-1.588
04'1998	34.560	23.515	2.308
05'1998	35.137	23.832	1.582
06'1998	32.959	24.151	1.783
07'1998	43.691	24.468	2.983
08'1998	22.421	24.784	4.132
09'1998	19.504	25.097	6.526
10'1998	22.945	25.408	8.730
11'1998	26.966	25.717	11.328
12'1998	23.267	26.022	12.379
01'1999	28.360	26.323	12.951
02'1999	31.603	26.621	13.017

Table 7: Empirical results of the historical decomposition of the time-path of Korea's international liquidity (in billion US dollar)