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Sovereign Credit Ratings and Their Impact on Recent Financial Crises

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

JEL Classification: C22, C51, G10

Keywords: Risk Management, Value at Risk, Density Forecasting, Predictive Likelihood

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I 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 [Basle Committee on Banking Supervision, 1999]. However, not all market participants are confident 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 [International Monetary Fund, 1999]. Although major credit rating agencies accurately identified weaknesses in the financial systems of a number of Asian countries before the crisis started in July 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 pro-cyclical element into global capital flows. The behavior of the agencies was criticized, because it induced large-scale capital inflows and excessive compression in interest rate spreads by exacerbating herding behavior before the crisis and contributing to the abrupt reversal of capital flows after the Asian crisis emerged [International Monetary Fund, 1998].

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 financial crises. By using a vector autoregressive (VAR) model the way US dollar bond yield spreads and the short-term international liquidity position react to an unexpected sovereign credit 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 in this paper, sovereign credit rating changes clearly have effects on both bond yield spreads and the short-term international liquidity position. However, variations in bond yield spreads and in the short-term international liquidity position also have an effect on sovereign credit ratings. Therefore, a multivariate modeling approach seems to be appropriate.

The empirical results show that abrupt downgrades do not necessarily contribute to emerging market crises, which is in sharp contrast to the views of the proponents of the boom-bust cycles theory. For the agencies' rating actions during boom-bust cycles this result

implies three important consequences. First, contrary to common belief and previous studies, a sharp downgrade does not necessarily intensify a financial crisis. Moreover, it can help to end the financial market turmoil more quickly. Second, a cautious, gradual downgrading of the sovereign credit rating can intensify the financial crisis. And third, if credit rating agencies act with foresight, an initial downgrade will not cause a bust-phase and an initial upgrade will not cause a boom-phase.

The remainder of this paper is organized as follows. Section 2 gives an overview on the topic of sovereign risk and credit rating agencies. The first part describes the role of the agencies in international financial markets, while the second part discusses the criteria and the third part the methodology of sovereign credit ratings. Section 3 analyzes in an empirical study whether credit rating agencies may add to the dynamics of emerging market crises. To motivate this question, the first part considers the role of the agencies during the Asian crisis 1997/98 and tries to answer whether agencies failed during the financial market turmoil. The second part of section 3 discusses the recent empirical investigations by Cantor and Packer, and Reisen and von Maltzan [Cantor, 1996; Reisen, 1999]. Part 3 describes the data and methodology used in the empirical study, while the last part of section 3 presents the results. Section 4 concludes.

II Sovereign Risk and Credit Rating Agencies

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. Indeed, obtaining a sovereign credit rating has often been seen as a prerequisite for issuing a Eurobond. Furthermore, some institutional investors are constrained to hold securities that have been classified by the agencies as investment-grade, as a result of either official regulations or internal risk management practices. Moreover, sovereign credit ratings often serve as a ceiling for private sector ratings of any given country, which stretches their influence far beyond government securities [Moody's, 1999].

II.1 Sovereign Credit 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 [Standard & Poor's, 1998]. Although credit ratings are inevitably influenced by cyclical factors, agency officials 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 [Standard & Poor's, 1998].

The two major credit rating agencies, Moody's and S&P, which cover approximately 80 percent of all sovereign ratings, argue that they do not regard their ratings as providing either a prediction of the timing of default or an indication of the absolute level of risk associated with a particular obligation [Moody's Investor Service, 1999; Standard & Poor's, 1999b]. Moreover, the agencies declare that an issuer credit rating is not a recommendation to purchase, sell, or hold a financial 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. S&P, for instance, divides the factors which influence the determination of the overall sovereign rating into eight broad categories: Political risk, income and economic structure, economic growth prospects, fiscal flexibility, public debt burden, price stability, balance of payments flexibility, and external debt and liquidity. 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, while political risk addresses the sovereign's willingness to repay debt.

II.2 Sovereign Credit Rating Methodology

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-quantifiable criteria such as government stability and policy consensus. The rating agencies emphasize that they do not use a specific

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 the quantitative factors having historically received the greatest weights in the decision-making process [Cantor, 1996; Juttner, 2000].

For their ratings the agencies use an ordinary scale. S&P's rating run from AAA, the highest, through AA, A, and BBB, which is still investment-grade, and then all the way down to D, which reflects the potential default of an obligation. Similarly, Moody's ratings range from Aaa through Baa down to Caa. Ratings are also subject to refinements by adding pluses or minuses or additional numbers. Sovereign credit ratings are often divided into two broad categories: 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 sovereign credit ratings with outlooks and watches, respectively, designed to indicate the agencies' perspective on factors that might prompt a rating review over the next six to 24 months. Such reviews are denoted as positive, implying that the rating may be raised, stable, or negative, implying that the rating may be lowered. However, as S&P points out, an outlook is not necessarily a precursor of a rating change [Standard & Poor's, 2000].[1]

III Do Credit Rating Agencies Add to the Dynamics of Emerging Market Crises?

An interesting question is whether credit rating agencies can add, i.e. intensify or attenuate, to the dynamics of financial crises in emerging markets. A necessary condition for this to occur is the existence of causality from sovereign credit ratings to yield spreads. Reisen and von Maltzan argue that sovereign ratings might be able to trigger pronounced boom-bust-cycles in emerging market lending [Reisen, 1999]. This means that initially small capital outflows 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

[1] S&P 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.

downgrade. Following this argumentation, this represents a vicious circle that can trigger a financial crisis at the slightest provocation.

The proponents of this boom-bust cycle 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 inflows led to higher ratings which, in turn, triggered more capital inflows [Reisen, 1999]. To motivate the question, whether credit rating agencies can add to the dynamics of emerging market crises, the following part discusses the role of the agencies during the Asian crisis of 1997/98.

III.1 The Role of Credit Rating Agencies during the Asian Crisis of 1997-98

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 agencies, so-called rating crises, which denote a downgrade of three rating notches or more in long-term foreign currency debt, were observed. Table 1 lists the changes of S&P's credit ratings for the most crisis-ridden countries during the Asian crisis of 1997-98.

Table 1: *Changes of Standard &Poor's Sovereign Credit Ratings during the Asian Crisis*

Country	**July 1, 1997**	**November 30, 1998**
Indonesia	BBB	CCC+
South Korea	AA-	BB+
Malaysia	A+	BBB-
Thailand	A	BBB-

Table 1 indicates that Indonesia and South Korea fell both by eight rating notches, while Malaysia fell by five and Thailand by four rating notches. It is important to note that during the course of these negative sovereign rating actions, Moody's downgraded Indonesia, South Korea and Thailand to non-investment-grade, whereas S&P reduced Indonesia and South Korea to speculative-grade, but assigned the lowest possible investment-grade rating to Malaysia and Thailand.

Market participants raised criticisms that the credit rating agencies were not only lax in foreseeing the vulnerabilities of the East-Asian countries that eventually succumbed to crisis,

but that they have 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 [International Monetary Fund, 1998]. Following the Asian crisis, a number of weaknesses in the determination of sovereign credit ratings became obvious. For example, the International Monetary Fund criticized the lack of statistical methodology and the need for significant improvements in risk assessments techniques such as extensive scenario analysis, sensitivity analysis and stress testing [International Monetary Fund, 1999].

However, market analysts and asset prices 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 the agencies. Spreads had not widened considerably in the Asian countries by the onset of the crisis [Kaminsky, 1999]. As with ratings the bulk of the deterioration was observed later [Eichengreen, 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 Moody's and S&P.

Table 2: *Market Ratings of Asian Crisis Countries by Institutional Investor (II) and Euromoney (EM), (Scores out of 100)*

Country	**II 09/96**	**II 09/98**	**EM 09/96**	**EM 09/98**
Thailand	63	48	80	49
Indonesia	72	54	88	56
South Korea	52	33	73	34

As Table 2 shows, the rating scores by Institutional Investor and Euromoney were lowered substantially after the Asian crisis.

Whether the credit rating agencies failed during the Asian crisis is another question, since the declared purpose of sovereign credit 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 significant impact on the short-term international liquidity position of the rated sovereign. Moody's [Moody's Investor Service, 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 offshore South Korean banks, implying that these funds were not liquid, and
- the emergence of widespread political disturbances in Indonesia.

By sharply downgrading the East-Asian countries, the agencies merely considered the likelihood of default for these countries to be higher than before the crisis. This argumentation seems plausible, since the Asian crisis certainly did not have a positive effect on the ability and in particular the willingness of the affected countries to service their debt in full and on time. The sovereign ratings assigned by the agencies only reacted to the unpredictable developments which certainly influence the risk of sovereign default in general. Of course, this is exactly what credit rating agencies are supposed to do.

III.2 Recent Empirical Studies

In examining the relationship between changes in the sovereign credit ratings assigned by the agencies and the changes in the spread between the yields on US dollar-denominated Eurobonds and comparable US treasury bonds, somewhat mixed results where obtained by a number of empirical studies which tried to shed light on this issue using event studies and Granger causality tests.

Cantor and Packer studied the effect 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 differential between yields on US dollar-denominated Eurobonds and on comparable five-year US treasury bonds [Cantor, 1996]. In their empirical analysis they used daily data from the periods before and after the 79 rating announcements covered by their 35 country sample and concluded that

- the impact of rating announcements on spreads was much stronger for speculative-grade than for investment-grade rated sovereigns, and
- the announcements of possible upgrades in the agencies' sovereign ratings were followed by statistically significant bond yield movements in the expected direction, i.e., a decline in yield spreads, but announcements of possible downgrades did not produce significant effects.

Reisen and von Maltzan, using data on 29 sovereigns from 1989 to 1997 and 152 sovereign credit rating announcements, of which 97 events affected emerging market

countries, conducted their studies in two parts. First, they examined the interaction between spreads on sovereign bonds, namely the differential between yields on US dollar-denominated sovereign bonds and yields on ten-year US treasury bonds, and implemented sovereign credit ratings by S&P and Moody's [Reisen, 1999]. In particular, they considered whether 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' sovereign credit ratings Granger-cause yield spreads and vice versa.

Reisen and von Maltzan also undertook an event study similar to the one by Cantor and Packer [Reisen, 1999; Cantor, 1996]. They also found that the largest announcement effects are observed for emerging market sovereign spreads. However, in sharp contrast to the results of Cantor and Packer, they found that a significant 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. Reisen and von Maltzan argue that, in principle, sovereign credit 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 flows which have repeatedly seen to fuel credit booms and financial vulnerability in the capital importing countries.

III.3 Data and Methodology

The sample used in this paper consists of 20 countries and in essence that of Sachs, Tornell and Velasco, which is a geographically balanced sample [Sachs, 1996]. It includes all emerging market economies which had a share in emerging market lending of over one percent as of June 1999: Argentina, Brazil, Chile, Colombia, Hungary, India, Indonesia, Jordan, South Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Russia, South Africa, Thailand, Turkey, and Venezuela.[2] This study considers the period from June 1, 1992 to February 1, 2000, and is therefore fully capturing the financial market turmoil in the 1990s: the Mexican Peso crisis 1994/95, the Asian crisis 1997/98, the Russian crisis in mid-1998, and the Brazil currency crisis in early 1999.

[2] Two countries, China and Taiwan Province of China, are excluded here from the original Sachs, Tornell, Velasco sample, because its data are not included in the International Monetary Fund's International Financial Statistics database.

The sample consists of monthly averages of daily sovereign credit ratings of long-term foreign currency debt which have been assigned by S&P and Moody's. The rating history has been directly obtained from these two market leaders. Although the two agencies use different symbols in assessing credit risk, every S&P rating scale has its counterpart in Moody's rating scale. This correspondence permits a linear transformation into numbers. As Table 3 in the Appendix shows, this linear scale implies that differences of ratings correspond one to one with differences in perceptions of country risk.[3] In order to consider not only the implemented long-term foreign currency debt ratings but also the imminent rating changes, the numerical scale of the transformed sovereign credit ratings also contain outlooks and watches, respectively.[4]

The International Monetary Fund argues that two variables play a crucial role during financial crises: the yield spread between a country's Eurobonds and comparable US treasury bonds, and the short-term international liquidity position, i.e. total international reserves minus total short-term debt. Previous studies have shown that these two variables can explain nearly 80 percent of variation in sovereign credit ratings [International Monetary Fund, 1999]. Therefore, the second type of data needed for this analysis are the movements in relative US dollar bond yield spreads, i.e. the spreads between a country's Eurobonds and comparable US treasury bonds. Since they are not subject to currency risk, dollar bond spreads can be assumed to primarily reflect country risk premia on government Eurobonds of the same maturity [Jarrow, 1998]. The risk-free benchmark for the computation of spreads is the ten-year US Treasury bond.

The construction of a reliable and comparable dataset on spreads is not easy, given the low liquidity of some of the bonds and the wide difference of characteristics of the bonds. Following Monford and Mulder, this analysis uses the most actively traded Eurobonds, which are maturing between 2001 and 2003, and additional information on Brady bonds to capture the month-to-month market movements in case of missing data. When no sovereign bonds are available for a long enough period, the spreads are proxied by a relatively risk free corporate bond, issued for example by a public sector company or a local development bank [Monford,

[3] Two alternative transformation forms can be considered instead of the linear transformation: the logistic transformation and a kinked function with a structural break. Such a transformation implies the hypothesis that risk perceptions first deteriorate slowly as rating notches decrease, then deteriorate faster when credit ratings fall from investment-grade to speculative-grade, and finally deteriorate slowly again as ratings reach the bottom of the classification. Another alternative transformation form could be a kinked function with a structural break when the sovereign bond passes from investment-grade to speculative-grade.

[4] This is realized by adding 0.3 of one rating notch for a positive outlook by S&P or a positive credit watch by Moody's and –0.3 of one rating notch for a negative outlook or credit watch, respectively, to the implemented sovereign credit rating in question.

2000]. Further details on the bonds used are given in Table 4 in the Appendix. The data are obtained on a monthly basis from Bloomberg L.P. This analysis uses monthly averages rather than a single observation at the beginning, middle or end of the period, given the high volatility of spreads and also sometimes the lack of data of the entire month. The relative yield spread is then calculated as a fraction of the benchmark yield on central government bonds, based on data obtained on fixed-rate dollar bond redemption yields.

The third necessary dataset used in this empirical study is the short-term international liquidity position, given by the value of total international reserves (including gold at market prices) at month-end minus total short-term debt at month end. Both variables were extracted on a monthly basis from the IMF's International Financial Statistics. If the data were not available from the IFS, the dataset was eventually complemented by data from the OECD's World Economic Outlook or the publications of the Bank for International Settlements.

If the boom-bust cycles theory holds, the short-term international liquidity position and the spreads between a country's Eurobonds and US treasury bonds depend on the sovereign credit rating assigned by the credit rating agencies. However, in order to examine the question of whether sovereign downgrades contribute to financial crises, only the influence 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 sovereign credit rating change, then the latter should have no longer any impact. Previous studies did not take into account the dynamic interaction between the three variables captured in this analysis. Clearly, sovereign credit rating changes have effects on both bond yield spreads and the international liquidity position. However, bond yield spreads and the international liquidity position also have effects on sovereign credit ratings. Therefore a multivariate modeling approach seems appropriate.

A good way to measure the dynamic interaction between these three variables is the specification of a vector autoregressive (VAR) system. As its name implies, this method consists of regressing each current variable 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. A useful tool to examine the impact of an unexpected rating change on spreads and the international liquidity position, respectively, are simulations of the VAR system via a historical decomposition of the 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 tries to answer the question of which shock caused the variable to fluctuate.

III.4 Empirical Results

In addition to the determination of the set of variables that is used in the VAR system it is important to determine the appropriate lag length. The multivariate generalization of the Akaike information criterion indicates that three lags are appropriate. Therefore, the resulting third-order VAR system describing the interaction between the three variables, notably, the sovereign credit rating r_t, the spread s_t, and the short-term international liquidity position l_t is given through

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

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 short-term international liquidity position, i.e., l_t, l_{t+1}, …, l_{t+n}, can then be attributed to the three following factors:

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

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

and

$$\hat{\mu}_l + \hat{\phi}_{31} r_{t-1} + \hat{\phi}_{32} r_{t-2} + \hat{\phi}_{33} r_{t-3} + \hat{\phi}_{34} s_{t-1} + \hat{\phi}_{35} s_{t-2} + \hat{\phi}_{36} s_{t-3} + \hat{\phi}_{37} l_{t-1} + \hat{\phi}_{38} l_{t-2} + \hat{\phi}_{39} l_{t-3} \quad ,$$

2. the unexpected rating changes

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

3. and the remaining factors of the unpredictable part

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

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 sovereign credit rating changes by the agencies on the spread and on the short-term international liquidity position, respectively. To examine the issue of whether the boom-bust cycles 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. Confidence intervals, i.e. error bands, for the 90 percent and for the 95 percent level were drawn out and showed that the results are robust. 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 [Cantor, 1996; Reisen, 1999; Monford, 2000]: Positive sovereign credit rating changes should be associated with negative changes in the yield spreads and a positive impact on the short-term international liquidity positions.

A historical decomposition can be made by a two-step procedure to analyze the time-paths of the variables. In a first step, it is assumed that there will be no unanticipated rating changes in the future, i.e., $u_t = 0$, $\forall\ t = 1, \ldots, n$. Using the VAR system a forecast for the time-paths of the spreads and the short-term international liquidity position can be done. These forecasts give the expected developments of the variables s_t and l_t, i.e. $\tilde{s}_{t+1}, \ldots, \tilde{s}_{t+n}$ and $\tilde{l}_{t+1}, \ldots, \tilde{l}_{t+n}$.

In a second step one should measure how the entire time-paths of the spreads and the short-term international liquidity position are affected by a stochastic shock. Therefore, the VAR system can be used for forecasting based on the assumption that unanticipated news at

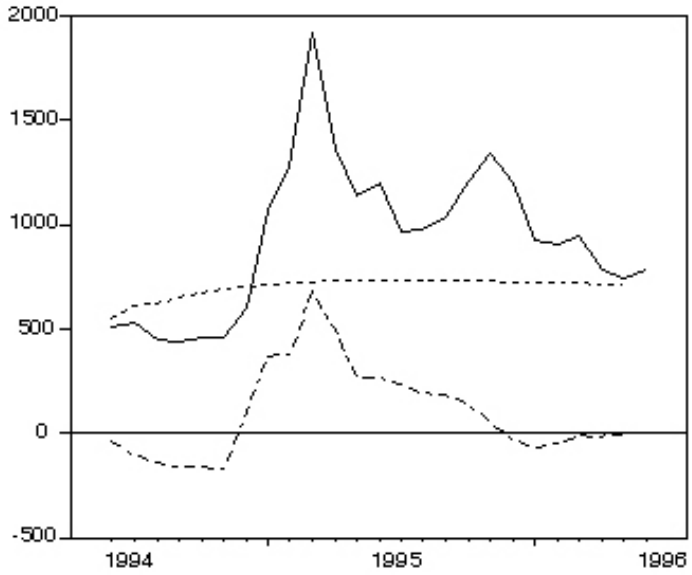
time t causes the downgrading of the sovereign credit rating. The values of the variables s_t and l_t, if the variable r_t is shocked by a change of a one-unit standard deviation in period t, are then given as $\overline{s}_{t+1},...,\overline{s}_{t+n}$ and $\overline{l}_{t+1},...,\overline{l}_{t+n}$. The difference between these first and second step forecasts of the VAR system reflects the influence of an unanticipated sovereign credit rating shock at time t on the time-paths of the spreads and the short-term international liquidity position in $t+1, \ldots, t+n$.

In the following the role of an unexpected sovereign credit rating downgrade in an emerging market crisis is explicitly analyzed for two cases: Mexico during the Mexican Peso crisis of 1994/95 and South Korea during the Asian crisis of 1997/98. The selection criteria for these two countries are that both countries suffered major financial crises during the financial market turmoil of the 1990s, both countries were newly assigned members of the OECD, especially after the Mexican and Asian currency financial crises, the correctness, timeliness and impact of sovereign credit ratings assigned by the agencies have been intensely debated in the literature, and Mexico is the common empirical example for a second-generation currency crises model, while South Korea is the common example for a country which suffered a so-called third-generation currency crisis [Juttner, 2000].

To show the different impacts of an unexpected rating change on the time-paths of the spreads and the international liquidity position, the initial sovereign credit rating was shocked by an one-unit standard deviation for different starting points prior to the two financial crises and for different number 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 South Korea, the starting point of the historical decomposition is March 1997, i.e. seven months before the Asian crisis sharply affected South Korea in October 1997. In both cases the forecast horizon of the historical decomposition is 24 months. The simulation results of the historical decomposition showed that there were no significant differences in the long-term foreign currency debt ratings assigned by S&P and Moody's. Therefore, the variable r_t used in the analysis is the average of the sovereign credit ratings assigned by these two agencies.

Figure 1 shows the impact of a downgrade of the Mexican long-term foreign currency debt rating by an one-unit standard deviation shock on the spread of the Mexican Eurobond (United Mexican States, Maturity: 09/01/2002).

Figure 1: *Historical Decomposition of the Time-Path of Spreads of Mexican Eurobonds (in basis points)*



The solid line shows the effective time-paths of the spread of the Mexican Eurobond for the period between the beginning of June 1994 and the end of May 1996. The upper dashed line shows the expected time-path of the spread 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 specified three-variable VAR(3) system approximately add-up to the observed behavior of the spread of the Mexican Eurobond during the period between June 1994 and May 1996 (see also Table 5 in the Appendix).

The empirical results suggest that a large part of the widening of the spread observed in early 1995 was due to negative sovereign credit 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. This result is in line with the conclusion drawn by Reisen and von Maltzan that agencies' sovereign credit ratings Granger-cause yield spreads and contribute to the dynamics of financial crises, i.e., that during a bust-phase a downgrade of the initial sovereign credit rating intensify the emerging market crisis.

However, this is not true for all emerging market crises. Figure 2 illustrates the impact of an one-unit standard deviation downgrade of the South Korean long-term foreign currency debt rating on the short-term international liquidity position given by the value of total international reserves minus total short-term debt of South Korea.

Figure 2: *Historical Decomposition of the Time-Path of South Korea's Short-Term International Liquidity Position (in billion US dollar)*

The solid line shows the effective time-path of the South Korean international liquidity position for the period between the beginning of March 1997 and the end of February 1999. The upper dashed line shows the expected development in early 1997, while the lower dashed line shows the impact of the unexpected sovereign credit rating downgrade on the South Korean short-term international liquidity position.

It is important to notice that South Korea faced during the Asian crisis of 1997/98 the largest and sharpest downgrading in the history of sovereign credit ratings. For example, S&P downgraded South Korea on October 24, 1997, from AA- to A+, on November 25, 1997, to A-, on December 1, 1997, to BBB-, and assigned South Korea on December 22, 1997, a speculative-grade sovereign credit rating. Overall, the negative sovereign rating actions on the South Korean long-term foreign currency debt rating summed up to 8.3 rating notches in only two months.

However, as Figure 2 and Table 6 in the Appendix indicate, these sharp sovereign credit ratings downgrading appeared to have little impact on the South Korean short-term international liquidity position. Moreover, from mid-January 1998, South Korea's sovereign credit rating was gradually upgraded again [Berg, 1999]. For example, S&P revealed the negative outlook on January, 16, 1998, and assigned South Korea an investment-grade long-term foreign currency debt rating. The empirical results show that this improved South Korea's short-term international liquidity position. Therefore, in contrast to the results by Reisen and von Maltzan, during a bust-phase in emerging-markets lending a negative

sovereign credit rating downgrade or announcement does not necessarily intensify a financial crisis.

As a proof of the boom-bust cycles theory, its proponents cite studies that provide evidence that first, sovereign credit ratings are influenced by capital movements and changes in the yield spreads, and second, that capital flows and spreads react to sovereign credit rating changes [Cantor, 1996; Reisen, 1999]. The question is whether such a pattern really exists which could in turn be strategically used by institutional investors. If credit rating agencies know that their rating changes trigger market reactions, they can react accordingly. Hence, instead of setting off a bust-phase by a small initial downgrade, a farsighted credit 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.

IV Conclusion and Outlook

Academics and investors often argue that sovereign credit rating downgrades contribute to the dynamics of financial crises during a bust-phase in emerging-markets lending. Initially small capital outflows 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, the agencies continue to downgrade the sovereign, and intensify by their rating actions the financial crisis. Considering this so-called boom-bust cycles theory this paper tried to shed light on the role of credit rating agencies during the financial turmoil of the 1990s. In particular it analyzes the impact of the sovereign credit rating downgrades during emerging market crises for the cases of Mexico during the Mexican Peso crisis of 1994/95 and for South Korea during the Asian crisis of 1997-98.

By using a vector-autoregressive model approach, the empirical results suggest that sovereign credit rating downgrades do not necessarily intensify financial crises during a bust-phase. In the case of Mexico, a large part of the widening of the yield spreads observed in early 1995 was indeed due to the negative change of the sovereign credit rating by an average of one rating notch. However, in contrast to previous studies, in the case of South Korea, the sharp sovereign credit rating downgrading by an average of eight rating notches had little impact on the South Korean short-term international liquidity position.

For the agencies' rating actions during boom-bust cycles in emerging-markets lending these results imply three important consequences. First, contrary to common belief, a sharp

downgrade as in the case of South Korea during the Asian crisis of 1997-98 does not necessarily intensify a financial crisis. Moreover, it can help to end the financial crisis more quickly. Second, a cautious, gradual downgrading as in the case of Mexico during the Mexican Peso crisis of 1994/95 can intensify the financial crisis. And third, if credit rating agencies act with foresight, an initial downgrade will not cause a bust-phase and an initial upgrade will not cause a boom-phase in emerging-markets lending, and therefore cannot be strategically used by institutional investors.

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Appendix

Table 3: *Linear Transformation of S&P's and Moody's Ordinal Rating Scales into a Numerical Scale*

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 4: *Sovereign Bonds Used in the Analysis*

Country	**Bond Used**	**Maturity**
Argentina	Republic of Argentina	12/01/2003
Brazil	Republic of Brazil	11/01/2001
Chile	Compañía Teléfono Chile	07/01/2007
Colombia	Republic of Colombia	02/01/2003
Hungary	National Bank of Hungary	04/01/2003
India	ICICI	04/01/2000
Indonesia	Republic of Indonesia	08/01/2006
Jordan	Kingdom of Jordan (Brady bond)	12/01/2023
South Korea	Korean Development Bank	05/01/2000
Malaysia	Malaysia	09/01/2000
Mexico	United Mexican States	09/01/2002
Pakistan	Republic of Pakistan	02/01/2002
Peru	Republic of Peru (Brady bond)	03/01/2017
Philippines	National Power Corporation	11/01/2000
Poland	Poland	07/01/2000
Russia	Ministry of Finance	11/01/2001
South Africa	Republic of South Africa	12/01/1999
Thailand	Kingdom of Thailand	03/01/2002
Turkey	Republic of Turkey	05/01/2002
Venezuela	Republic of Venezuela	12/01/2003

Table 5: *Empirical Results of the Historical Decomposition of the Time-Path of the Spreads of Mexican Brady Bonds (in bp)*

Date	Effective	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	1,065.050	713.334	371.776
02/1995	1,280.315	720.997	380.604
03/1995	1,912.304	726.538	679.506
04/1995	1,356.684	730.334	495.668
05/1995	1,137.636	732.692	266.202
06/1995	1,194.363	733.884	272.623
07/1995	964.050	734.134	230.851
08/1995	975.739	733.633	192.786
09/1995	1,032.350	732.542	187.726
10/1995	1,204.952	730.995	138.453
11/1995	1,336.809	729.106	59.322
12/1995	1,193.750	726.970	-28.597
01/1996	924.095	724.665	-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 South Korea's International Liquidity Position (in billion US dollar)*

Date	Effective	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