Sovereign Credit Ratings Before and After Financial Crises

Reinhart, Carmen

University of Maryland

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Carmen M. Reinhart*
International Monetary Fund
700 19 Street, NW
Washington, DC 20431
(202) 623-4793
FAX(202) 623-7271
creinhart@imf.org
www.puaf.umd.edu/papers/reinhart.htm

I. Introduction

Sovereign credit ratings play a crucial role in determining the terms and the extent to which countries have access to international capital markets. Some studies have found that changes in credit ratings have a significant impact on sovereign bond yield spreads.[1] Sovereign credit ratings are supposed to serve as a summary measure of a country's likelihood of default. Upon a casual inspection of the sovereign credit ratings of a cross-section of countries, it is therefore not surprising to find that the countries with the lowest ratings are those that are unable to borrow from the international capital market altogether and depend on official loans from multilateral institutions or from individual governments. The sovereign rating also influences the terms at which the private sector can borrow from international sources.

While for industrial countries capital market access is usually taken for granted--emerging markets (EMs) access to international capital markets is precarious and highly variable. It is for the EMs that the credit ratings play their most critical role.

In principle, there is no reason why changes in sovereign credit ratings should be expected to systematically predict a currency crisis or a banking crisis. After all, industrial countries have had their share of currency crises (i.e., France and the United Kingdom in the 1992-93 Exchange Rate Mechanism crisis), banking crises (Japan, the S&L crisis in the United States), or both simultaneously (i.e., the Nordic countries and Spain).[2] In practice, however, in emerging markets (EMs) there is a strong link between currency crises and banking crises and

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[1]   See, for example, Larrain, Reisen and Von Maltzan (1997), who find evidence that ratings "Granger-cause" sovereign bond yield spreads.

[2]   For an analysis of twin crises episodes, see Kaminsky and Reinhart (1999).

default. The numerous financial crises in the 1990s and the colossal bail-out packages that were

put together in an effort to circumvent default attest to this link. Hence, if the credit ratings are

forward-looking, financial crises in EMs should be systematically preceded by downgrades.

Yet, the recent anecdotal evidence does not suggest that financial crises were preceded by

downgrades in credit ratings. As the chronology in Table 1 illustrates, the downgrades appear to

materialize after and not before the crises in Asia; Mexico was upgraded shortly before the

December 1994 crisis--which absent the United States-International Monetary Fund bail-out

would have ended in default. A question that arises from these recent episodes is if this failure on

the part of the rating agencies to anticipate debt servicing difficulties is more generalized and

systematic.

Table 1. Performance of Ratings Agencies Prior to Asian Crisis:
Moody's and Standard and Poor's Long Term Debt Ratings, 1996-1997

		Jan. 15, 1996		Dec. 2, 1996		Jun 24, 1997		Dec. 12, 1997	
		Rating	Outlook	Rating	Outlook	Rating	Outlook	Rating	Outlook
MOODY'S Foreign Currency Debt									
Indonesia		Baa3		Baa3		Baa3		Baa3	
Malaysia		A1		A1		A1		A1	
Mexico		Ba2		Ba2		Ba2		Ba2	
Philippines		Ba2		Ba2		Ba2		Ba2	
South Korea		A1		A1	stable			Baa2	negative
Thailand		A2		A2		A2		Baa1	negative
STANDARD AND POOR'S								**October 1997**	
Indonesia	**Foreign Currency Debt**	BBB	stable	BBB	stable	BBB	stable	BBB	negative
	Domestic Currency Debt			A+		A+		A-	negative
Malaysia	**Foreign Currency Debt**	A+	stable	A+	stable	A+	positive	A+	negative
	Domestic Currency Debt	AA+		AA+		AA+		AA+	negative
Philippines	**Foreign Currency Debt**	BB	positive	BB	positive	BB+	positive	BB+	stable
	Domestic Currency Debt	BBB+		BBB+		A-		A-	stable
South Korea	**Foreign Currency Debt**	AA-	stable	AA-	stable				
	Domestic Currency Debt								
Thailand	**Foreign Currency Debt**	A	stable	A	stable	A	stable	BBB	negative
	Domestic Currency Debt			AA		AA		A	negative
Mexico	**Foreign Currency Debt**	BB	negative	BB		BB			
	Domestic Currency Debt	BBB+		BBB+	stable	BBB+	positive		

Note: Rating Systems (from highest to lowest)
Moody's : Aaa, Aa1, Aa2, Aa3, A1, A2, A3, Baa1, Baa2, Baa3, Ba1, Ba2, Ba3
S&P's : AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-
Source: Radelet and Sachs (1998).

Goldstein, Kaminsky, and Reinhart (2000), who examine the links between currency and banking crises and changes in sovereign credit ratings for 20 countries for Institutional Investor and Moody's find mixed evidence on rating agencies ability to anticipate debt servicing difficulties. Neither of the ratings predict banking crises but they present some evidence that the Moody' ratings have some (very low) predictive power for currency crises.

In this paper, I cast the net wider. Depending on the rating agency, I examine the links between crises and rating changes for anywhere between 46 to 62 countries. The analysis is also extended to include Standard and Poor's sovereign ratings and a variety of approches to date the currency and banking crises. Calvo and Reinhart (2000) have suggested that one of the reasons why EMs may fear devaluations (or large depreciations) is that these are often followed by a lss of access to international credit--which, in turn, leads to severe recessions.[3] Hence, in this paper I also review the evolution of credit ratings after the crises--with an emphasis on analyzing if there are distinct patterns for developed and emerging economies.

The paper proceeds as follows. In Section II, I attempt to evaluate the predictive ability of sovereign credit ratings using the approach taken in much of the literature on currency and, more recently, banking crises and estimate a family of probit models. In Section III, I tabulate the descriptive statistics for the ratings along the lines of the "signals" approach and compare how these stack up to the other leading indicators that have been analyzed. This section also discusses some of the macroeconomic indicators that rating agencies focus on in their rating decisions. Section IV focuses on the behavior of sovereign credit ratings in the aftermath of crises, while the

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[3] They present evidence that the recessions following devaluations are deeper in Ems than in developed economies.

concluding section discusses the implications of the findings and possible extentions of this analysis.

II. Sovereign Credit Ratings on the Eve of Crises

In this section, we examine the link between changes in sovereign credit ratings and currency and banking crises. In particular, we focus on whether there is evidence that downgrades in credit ratings systematically precede the financial crises.

My analysis covers the sovereign credit ratings issued by Moody's Investor Service and Institutional Investor (II), and Standard and Poor's. The II sample begins in 1979 and runs through 1999. For the Moody's and Standard and Poor's ratings, we have an unbalanced panel.[4] For II, the ratings are an index that runs from zero (least creditworthy) to 100 (most creditworthy). The II rankings are reported twice a year and are changed frequently. For Moody's, and Standard and Poor's, which uses multiple letters to characterize a sovereign's creditworthyness, I map their letter ratings into sixteen possible categories, with sixteen corresponding to the highest rating and zero to the lowest. [5] To illustrate for the case of Moody's, this scale is reproduced in Table 2. The ratings may be changed at any time, hence we have the month during which any changes took place. Unlike the II rankings, rating changes are far more rare.

The country coverage of our sample for the three ratings is shown on Table 3. With 62

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[4] An unbalanced panel, in this case, refers to the fact that we do not have the same number of observations for all the countries.

[5] This approach follows the procedure adopted in Cantor and Packer (1996a and 1996b).

countries, II constitutes the largest sample. The smallest sample is Standard and Poor's with 46

countries included; nonetheless, this is more than twice the size of the sample used in Goldstein,

Kaminsky, and Reinhart (2000).[6]

1. Methodology issues

> To assess if sovereign credit ratings systematically help predict currency and banking

crises, I must first date the crises. I construct a three currency crises indices. This allows me to

assess whether the links between the ratings and the crises results are sensitive to the definition of

crises used. The first of these crisis indices is that used in Kaminsky and Reinhart (1999), for 20

countries--but now extended to the larger sample.

The second is the crisis definition employed by Frankel and Rose (1996). While the third is a

modified version of Frankel and Rose, that includes "milder" crises episodes.

The Kaminsky and Reinhart (1999) crisis index (KR), I, is a weighted average of the rate of

change of the exchange rate, $\rangle$ e/e, and of reserves, $\rangle$ R/R, with weights such that the two

components of the index have equal sample volatilities,

$$ I = () \ e/e) - (F_e/F_R)*( ) \ R/R) \tag{1} $$

where F_e is the standard deviation of the rate of change of the exchange rate and F_R is the

standard deviation of the rate of change of reserves. Since changes in the exchange rate enter with

a positive weight and changes in reserves have a negative weight attached, readings of this index

that were three standard deviations or more above the mean were cataloged as crises.

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[6] Their sample consisted of 20 countries.

For countries in the sample that had hyperinflation, the construction of the index was modified. While a 100 percent devaluation may be traumatic for a country with low-to-moderate inflation, a devaluation of that magnitude is commonplace during hyperinflation. A single index for the countries that had hyperinflation episodes would miss sizable devaluations and reserve losses in the moderate inflation periods, since the historic mean is distorted by the high-inflation episode. To avoid this, we divided the sample according to whether inflation in the previous six months was higher than 150% and then constructed an index for each subsample.[7] As noted in earlier studies which use the signals approach, the dates of the crises map well onto the dates obtained if one were to rely exclusively on events, such the closing of the exchange markets or a change in the exchange rate regime, to define crises.

The Frankel and Rose (FR) definition is a devaluation in a given month of 25 percent or greater--which is at least 10 percent greater than the devaluation in the preceding month.[8] The modified version of the FR index (MFR) classifies as crises a devaluation in a given month of 20 percent or greater--which is at least 5 percent greater than the devaluation in the preceding month.

For dating banking crises we relied on three studies. The Kaminsky and Reinhart (1999) definition which stressed events. Specifically, they mark the **beginning** of a banking crisis by two types of events: (i) bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions (as in Venezuela 1993); and (ii) if there are no runs,

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[7] Similar results are obtained looking at sigificant departures in inflation from a six-month and twelve-month moving average.

[8] Frankel and Rose (1996).

the closure, merging, takeover, or large-scale government assistance of an important financial institution (or group of institutions), that marks the start of a string of similar outcomes for other financial institutions (as in Thailand 1997). Secondly, I also incorporate the crises dates in Barth, Caprio, and Levine and Demirgüç-Kunt and Detragiache (1998), which allows us to cover a much larger sample of countries.

Next, I assess the predictive ability of ratings via probit estimation. The dependent variable is a crisis dummy (banking and currency crises are considered separately) and the independent variable is the 12-month change in the credit rating lagged one year. Alternative specifications, such as the 6-month change in the credit rating lagged six months are also considered.

The basic premise underpinning the simple postulated model is as follows. If the credit rating agencies are using all available information on the economic "fundamentals" to form their rating decisions, then: (i) credit ratings should help predict crises--if the macroeconomic indicators on which the ratings are based have some predictive power and; (ii) the simple model should not be misspecified--that is, other indicators should not be statistically significant, since that information would already presumably reflected in the ratings themselves. Thus, the state of the macroeconomic fundamentals would be captured in a single indicator--the ratings. Recent studies that have examined the determinants of credit ratings do provide support for the basic premise that ratings are significantly linked with selected economic fundamentals (see Lee, 1993 and Cantor and Packer, 1996a). For example, Cantor and Packer (1996a) find that per capita GDP, inflation, the level of external debt, and indicators of default history and of economic development are significant determinants of sovereign ratings. The question which we seek

answer is whether these are the "right" set of fundamentals, when it comes to predicting financial crises.

Table 2. Scale for Moody's Foreign Currency Debt Rating

Rating Scale	Assigned Value
Aaa	16
Aa1	15
Aa2	14
Aa3	13
A1	12
A2	11
A3	10
Baa1	9
Baa2	8
Baa3	7
Ba1	6
Ba2	5
Ba3	4
B1	3
B2	2
B3	1
C	0

Sources: Moody's and the authors.

Table 3. The Sample

Institutional Investors: biannual observations, 1979-1999 for 62 countries
Algeria, Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Finland, Ghana, Greece, Hong Kong, Hungary, India, Indonesia, Israel, Ireland, Italy, Jamaica, Japan, Jordan, Kenya, Malaysia, Mali, Mexico, Morocco, Nepal, New Zealand, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sri Lanka, Swaziland, Sweden, Tanzania, Thailand, Turkey, United States, Uruguay, Venezuela, Zimbabwe.
Moody's Investor Service: monthly observations, unbalanced panel for 48 countries
Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Finland, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Malaysia, Mexico, Morocco, New Zealand, Norway, Panama, Paraguay, Pakistan, Philippines, Poland, Portugal, Romania, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, Thailand, Turkey, United States, Uruguay and, Venezuela.
Standard and Poor's: monthly observations, unbalanced panel for 46 countries
Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Dominican Republic, Egypt, El Salvador, Finland, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Malaysia, Mexico, Morocco, New Zealand, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Singapore, South Korea, Spain, Sweden, Thailand, Turkey, United States, and, Uruguay.

2. Empirical evidence

Tables 4-6 present the results of the probit estimation, for the II , Moody's, and Standard and Poor's ratings as regressors, respectively for banking and currency crises. The results shown in Tables 4-6 are based on the 12-month change in the ratings, 12 months before the crisis but alternative time horizons ranging from 6-month changes to 18- and 24- month changes at a

variety of lag lengths produced very similar results.[9] The method of estimation corrected for

serial correlation and for heteroskedasticity in the residuals.

      For II (Table 4) for which we have biannual 2,195 observations, the coefficients of the

credit ratings have the anticipated negative sign for any of the three definitions of currency crises,

that is, an upgrade reduces the probability of a crisis. However, only for the MFR crisis definition

is the coefficient on the ratings significant at the five percent level; for the other two crisis

definitions it is significant at the ten percent level. In all three cases, their marginal contribution to

the probability of a currency crisis is very small. Furthermore, as shown in Appendix Table 1, this

result is not robust to other specifications. For instance, if the 6-month change in the credit

rating, 6 months before the crisis is used as a regressor, none of the coefficients are statitically

significant. For banking crises, the II ratings are not significant for either of the crises definitions.

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[9] A subset of these results are reported in Appendix Tables 1-3, the rest not reported here but
are available from the author.

Table 4. Do Changes in Sovereign Credit Ratings Predict Currency or Banking Crises?
Probit estimation with robust standard errors
Institutional Investor, 2,195 observations

Currency Crisis				
Dependent Variable: Crisis Dummy	**Coefficient** **(1)**	**Standard Error** **(2)**	**Significance Level** **(3)**	**Pseudo R²** **(4)**
Kaminsky and Reinhart Definition	-0.435	0.540	0.072	0.005
Frankel and Rose Definition	-0.288	0.015	0.059	0.007
Modified Frankel and Rose Definition	-0 .035	0.014	0.013*	0.010
Banking Crises				
Kaminsky and Reinhart Dates	-0.021	0.152	0.871	0.000
Barth, Caprio and Levine, or Kaminsky and Reinhart, or Demirguc-Kunt and Detragiache Dates	-0.006	0.0169	0.714	0.000

Notes: The independent variable is the 12-month change in the sovereign credit rating one year earlier.

For the Moody's ratings (Table 5) for which we have 4,774 monthly observations, the

coefficients on the ratings variable are statistically insignificant for all the definitions of currency

and banking crises--in the case of the FR definition of currency crises, the coefficient has the

wrong sign. Hence, for the larger 48-country sample used here the Goldstein, Kaminsky, and

Reinhart (2000) results do not hold.[10]

Table 5. Do Changes in Sovereign Credit Ratings Predict Currency or Banking Crises?
Probit estimation with robust standard errors
Moody's, 4,774 observations

Currency Crisis				
Dependent Variable: **Crisis Dummy**	**Coefficient** (1)	**Standard Error** (2)	**Significance Level** (3)	**Pseudo R^2** (4)
Kaminsky and Reinhart Definition	-0.217	0.761	0.412	0.001
Frankel and Rose Definition	0.014	1.582	0.975	0.000
Modified Frankel and Rose Definition	-0 .647	0.091	0.481	0.003
Banking Crises				
Kaminsky and Reinhart Dates	-0.170	1.102	0.873	0.001
Barth, Caprio and Levine, or Kaminsky and Reinhart, or Demirguc-Kunt and Detragiache Dates	-0.002	1.180	0.987	0.000

Notes: The independent variable is the 12-month change in the sovereign credit rating one year earlier.

The Standard and Poor's sample of 3,742 observations the results are line with those

obtained for Moody's (Table 6). Irrespective of the crisis definition used or the specification of

lag structure used none of the coeficients on the credit rating changes were statistically significant

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[10] For the Moody's sovereign ratings, they had found a statistically significant coefficient for their 20-country sample; while signifcant, though, the marginal contribution of the ratings variable was very small.

at standard confidence levels and often had the wrong sign.

Table 6. Do Changes in Sovereign Credit Ratings Predict Currency or Banking Crises?
Probit estimation with robust standard errors
Standard and Poor's, 3,742 observations

Currency Crisis				
Dependent Variable: **Crisis Dummy**	**Coefficient** (1)	**Standard Error** (2)	**Significance Level** (3)	**Pseudo R^2** (4)
Kaminsky and Reinhart Definition	-0.08	0.091	0.772	0.001
Frankel and Rose Definition	-0.014	0.076	0.721	0.001
Modified Frankel and Rose Definition	0 .532	2.720	0.845	0.003
Banking Crises				
Kaminsky and Reinhart Dates	-0.012	0.765	0.654	0.001
Barth, Caprio and Levine, or Kaminsky and Reinhart, or Demirguc-Kunt and Detragiache Dates	0.566	2.170	0.794	0.001

Notes: The independent variable is the 12-month change in the sovereign credit rating one year earlier.

These results would, on the surface, be at odds with the findings of Larraín, Reisen, and

von Maltzan (1997), who find evidence that ratings "cause" interest rate spreads. Our

interpretation, however, is that, while ratings may systematically lead yield spreads (they present

evidence of two-way causality)--yield spreads are poor predictors of crises, as highlighted in

Golstein, Kaminsky, and Reinhart (2000). Hence, the ratings inability to explain crises is not

inconsistent with its ability to influence spreads. This issue will be taken up later in the paper.

III. Credit Ratings versus Macroeconomic Indicators of Crises

I next, use the "signals" approach developed in Kaminsky and Reinhart (1999) to

compare the performance of the ratings--and some of the economic indicators which rating

agencies focus on--to some of the other (and better) predictors of financial crises. As in the

preceding section, I begin by describing the basic methodology used.

1. A sketch of the signals approach

In a nutshell, the "signals" approach involves a set of possible outcomes is presented in

the following two-by-two matrix,[11]

	Crisis occurs in the following 24 months	**No crisis occurs in the following 24 months**
Signal	A	B
No signal	C	D

A perfect indicator would only have entries in cells A and D.

With this matrix we can define several useful concepts which we will use to evaluate the

performance of each indicator. If one lacked any information on the performance of the

indicators, it is still possible to calculate, for a given sample, the **unconditional probability of**

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[11] For a more detailed description see Lizondo, Kaminsky, and Reinhart (1998) and Goldstein, Kaminsky, and Reinhart (2000).

crisis,

$$P(C) = (A+C)/(A+B+C+D). \tag{2}$$

If an indicator sends a signal and that indicator has a reliable track record, then it can be expected that the **probability of a crisis, conditional on a signal**, $P(C^*S)$, is greater than the unconditional probability. Where

$$P(C^*S) = A/(A+B). \tag{3}$$

Formally,

$$P(C^*S) - P(C) > 0. \tag{4}$$

The intuition is clear, if the indicator is not "noisy" (prone to sending false alarms), then there are relatively few entries in cell B and $P(C^*S)$. 1. This is one of the criteria that I will use to rank the indicators. We can also define the **noise-to-signal ratio**, N/S as,

$$N/S = [B/(B+D)]/[A/(A+C)]. \tag{5}$$

It may be the case that an indicator has relatively few false alarms in its track record. This could be the result of the indicator issuing signals relatively rarely. In this case, there is also the danger that the indicators misses the crisis altogether (it does not signal and there is a crisis). Hence, we also wish to calculate for each indicator the **proportion of crises accurately called,**

$$PC = C/(A+C). \tag{6}$$

In the case of the credit ratings a downgrade in the 24 prior to the crisis would be considered a signal.

2. Basic results

Table 7 compares the performance of the ratings, and some of the economic indicators which rating agencies focus on--to some of the better predictors of financial crises. These results underscore the preceding ones, which used a different approach altogether. The table presents the basic descriptive statistics that are used in the "signals" approach to gauge an indicators' ability to anticipate crises, namely: the noise-to-signal ratio, the percent of crises accurately called, and the marginal predictive power (i.e. the difference between the conditional and unconditional probabilities). We compare II sovereign ratings to averages for the more reliable monthly and annual indicators of economic fundamentals. The basic story that emerges from Table 7 is that the credit ratings perform much worse for both currency and banking crises than do the better indicators of economic fundamentals--the individual better performing indicators are shown on Table 8. The noise-to-signal ratio is higher than one for both types of crises, suggesting a similar incidence of good signals and false alarms. Hence, not surprisingly, the marginal contribution to predicting a crisis is small relative to the top indicators; for banking crises the marginal contribution is nil. Furthermore, the percent of crises called is well below those of the top indicators. Indeed, the II ratings compare unfavorably with even the worst indicators.[12] The results for the II ratings for larger sample considered here are even worse than those shown in Goldstein, Kaminsky, and Reinhart (2000).

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[12] See Goldstein, Kaminsky, and Reinhart (2000) for details.

Table 7 Institutional Investor sovereign ratings and the fundamentals

Type of crisis and indicator	Noise-to-signal (1)	Percent of crises accurately called (2)	Difference between conditional and unconditional probability (3)
Currency crisis:			
Institutional Investor sovereign rating	1.07	29	5.2
Average of the top 5 monthly indicators	0.45	70	19.1
Average of the top 3 annual indicators	0.49	36	15.4
Memorandum item: Debt-to-exports ratio	0.91	53	6.1
Banking crisis:			
Institutional Investor sovereign rating	1.62	22	0.9
Average of the top 5 monthly indicators	0.50	72	9.1
Average of the top 3 annual indicators	0.41	44	16.3
Memorandum item: Debt-to-exports ratio	1.04	56	0.9

Sources: The author and Goldstein, Kaminsky and Reinhart (2000).

Table 8. Currency and banking crises:
Best performing indicators

	CURRENCY CRISES	BANKING CRISES
High-frequency Indicators		
	REAL EXCHANGE RATE	REAL EXCHANGE RATE
	BANKING CRISIS	EQUITY PRICES
	EQUITY PRICES	M2 MULTIPLIER
	EXPORTS	OUTPUT
	M2/INTERNATIONAL RESERVES	EXPORTS
Low-Frequency Indicators		
	CURRENT ACCOUNT IMBALANCE/GDP	SHORT-TERM CAPITAL INFLOWS/GDP
	CURRENT ACCOUNT IMBALANCE/INVESTMENT	CURRENT ACCOUNT IMBALANCE/INVESTMENT

Sources: The author and Goldstein, Kaminsky and Reinhart (2000).

3. Why are sovereign ratings such poor predictors of financial distress?

Generally, financial crises are difficult to forecast--witness the poor performance of international interest rate spreads and currency forecasts.[13] Specifically, however, the results presented here offer a tentative (although partial) answer to this question. It would appear that rating agencies have tended to focus on the "wrong" set of fundamentals--when it comes to anticipating crises. For instance, much weight is given to debt-to-exports ratios--yet, as shown in Table 7 (memorandum item) these have tended to be poor predictors of financial stress. Little

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[13] See Lizondo, Kaminsky and Reinhart (1998) and Goldfajn and Valdés (1998), on the performance of interest rate spreads and currency forecasts, respectively.

weight is attached to indicators of liquidity, currency misalignments, and asset price behavior, which as highlighted in Table 8, are more reliable leading indicators of financial stress.

IV. Sovereign Credit Ratings in the Aftermath of Crises

As discussed earlier, the anecdotal evidence from the recent crises episodes suggests that the downward adjustments in sovereign credit ratings came after the crisis was well underway. In this section, I review the evolution of credit ratings after the crises--with an emphasis on analyzing if there are distinct patterns for developed and emerging economies.

Tables 9 and 10 present several results from the analysis of the II and Moody's sovereign ratings, respectively. We report a variety of statistics that are meant to capture the various manifestations of the extent and the terms of access to international lending around currency crises episodes. The statistics reported include: the probability of a downgrade for various time horizons following the currency crisis, the probability of multiple downgrades, and the level of the assigned rating at the time of the crisis, and six and twelve months following that event. We also report the percent change in the ratings at several time horizons. We report the results for emerging and developed countries separately and test for differences among the two groups. Significant differences are denoted by one or more asterisks, depending on the significance level.

Turning to the II results first, as shown in the top panel of Table 9, we find no significant differences between developed countries and EMs in the probability of a downgrade (or multiple downgrades) following the currency crisis. However, this is where the similarities among the two country groups end. It is worth noting (see middle panel, Table 9) that at the time of the crisis, the average rating for the EMs is 37.6, slightly less than half of the average score for developed

countries. This, of course, suggests that even in the absence of a crisis, access to international lending is far from even for the two country groupings. Furthermore, that vast gap widens further in the aftermath of the devaluations associated with the currency crises. In the twelve months following the currency crisis, the magnitude of the downgrade is about five times greater for EMs than it is for developed economies. On average, EMs's sovereign rating index falls 10.8 percent in the twelve months following the currency crisis. The differences between the post-crisis downgrade for emerging and developed economies is significant at standard confidence levels.

Table 9. The Probability and Magnitude of Downgrades Around Currency Crises:
Institutional Investor Sovereign Credit Ratings, 1979-1999

Country Group	Probability of (in percent)		
	a downgrade in six months following the crisis	a downgrade in twelve months following the crisis	more than one downgrade in the twelve months following the crisis
Emerging	39.0	79.3	31.7
Developed	38.4	73.1	30.8
Difference	0.6	6.2	0.9
	Index level		
	At crisis period	Next six months	12 months later
Emerging	37.6	36.0	33.5
Developed	76.0	74.9	74.5
Difference	-38.4**	-38.9**	-41.0**
	Magnitude of the downgrade in (percent change)		
	six months following the crisis	the next six months	the twelve months following the crisis
Emerging	4.3	6.9	10.9
Developed	1.4	0.5	1.9
Difference	2.8*	6.4**	8.9**

Notes: One asterisk (*) denotes significance at the ten percent level, while two asterisks (**) denote significance at the five percent level.
Sources: Calvo and Reinhart (2000) and the author.

The gulf between EMs and developed economies is even greater when a comparable

exercise is performed for the Moody's ratings. As with II, the level of the ratings at the outset of

the currency crisis is significantly lower for EMs--the sovereign rating level is about a third of that

assigned to developed economies. Also, as the II results, the magnitude of the downgrade is far

greater for EM--about 9 percent versus less than one percent for developed countries. However,

as shown in Table 11, in the case of Moody's sovereign ratings, both the probability of a

downgrade in the twelve months following the crisis and the probability of multiple downgrades

is significantly higher for the EMs in our sample.

Table 10. The Probability and Magnitude of Downgrades Around Currency Crises:
Moody's Sovereign Credit Ratings, 1979-1999

	Probability of (in percent)		
Country Group	a downgrade in six months following the crisis	a downgrade in twelve months following the crisis	more than one downgrade in the twelve months following the crisis
Emerging	20.0	26.7	6.7
Developed	10.0	10.0	0.0
Difference	10.0**	16.7**	6.7*
	Index level		
Emerging	4.9	4.5	4.3
Developed	15.0	14.9	14.9
Difference	-10.1**	-10.4**	-10.6**
	Magnitude of the downgrade in (percent change)		
	six months following the crisis	the next six months	the twelve months following the crisis
Emerging	8.2	4.4	12.2
Developed	0.7	0.0	0.7
Difference	7.5**	4.4**	11.5**

Finally, to complement the preceding analysis, I examine whether knowing that there was a currency crisis indeed helps to predict sovereign credit rating downgrades for emerging and developed economies.

For Institutional Investor, for which there is a continuous time series, we regress the six-month change in the credit rating index on the crisis dummy variable (both currency and banking), which takes on the value of one when there is a crisis and zero otherwise, six months earlier. The method of estimation is generalized least squares, correcting for both generalized forms of heteroskedasticity and serial correlation in the residuals. For Moody's, the dependent variable is three-month changes in the rating, while the explanatory variable is the crisis dummy three months earlier. The latter specification will allow us to glean more precisely whether downgrades follow rapidly after crises take place. In the case of Moody's, the sovereign rating dependent variable is allowed to assume the value of minus one, zero, or one, depending on whether there was a downgrade, no change, or an upgrade. We estimate the parameters of interest with an ordered probit technique that allows us to correct for heteroskedastic disturbances.

The results of the estimation are summarized in Table 11 for both II and Moody's ratings. In the case of EMs, currency crises help predict downgrades, irrespective which rating index is used. For developed countries, however, there is no conclusive evidence that ratings react to

currency crises in a systematic and significant way. For EMs, while the coefficients are

significant at standard confidence levels, their marginal predictive contribution remains small.

For example, in the case of Moody's, a currency crisis increases the likelihood of a downgrade

by five percent. This would suggest that other economic fundamentals play an important role in

explaining changes in sovereign credit ratings (see Cantor and Packer 1996a and 1996b, on this

issue).

Table 11. Reactive Credit Ratings: Developed and Emerging Markets

Dependent variable: Institutional Investor six-month changes in sovereign rating	Estimation method: OLS with robust standard errors		
Independent variable is a currency or banking crisis dummy	Coefficient (1)	Standard error (2)	R^2 (4)
Developed	-0.007	0.023	0.01
Emerging	-0.06**	0.011	0.07
Dependent variable: Moody's three-month changes in sovereign rating	Estimation method: Ordered probit		
Independent variable is a currency crisis or banking dummy	Coefficient (1)	Standard error (2)	Pseudo R^2 (4)
Developed	-0.08	0.76	0.000
Emerging	-0.23**	0.11	0.060

Note: An asterisk (*) denotes difference is significant at the ten percent level, while two asterisks denote significant differences at the five percent level.

These results are also in line with the findings of Larraín, Reisen, and von Maltzan (1997),

who find evidence of two-way causality between sovereign ratings and market spreads. Hence

not only do international capital markets react to changes in the ratings, but the ratings systematically react (with a lag) to market conditions, as reflected in the sovereign bond yield spreads.

V. Results and Implications

This paper has addressed the following questions: Do sovereign credit ratings systematically help predict currency and banking crises? If not, why not? What needs to change? What is the behavior of credit ratings following the crises? Are there important differences in the behavior of credit ratings between developed and emerging markets? The answers revealed by the analysis can be summarized as follows:

As to the ability of rating changes to anticipate financial crises, the empirical tests presented here on sovereign credit ratings and financial crises suggest that sovereign credit ratings systematically fail to anticipate banking and currency crises. This result appears to be robust across alternative crises definitions, model specification, and approaches. Only for the Institutional Investor ratings is there some (weak) evidence that downgrades precede currency crises. In none of the cases are banking crises systematically preceded by downgrades.

As regards the behavior of ratings after the crisis and differences between developed and emerging markets, there is evidence that sovereign credit ratings tend to be reactive--particularly when it comes to EMs. Both the probability of a downgrade and the magnitude of the downgrade are significantly higher for EMs. Taken together, these findings point to a procyclicality in the ratings.

In a related paper (Calvo and Reinhart, 2000), also ask how these differences between

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developed and emerging markets in access to international capital markets influence the outcomes of a currency crisis--particularly as regards output. They present evidence that EMs are, indeed, very different from developed economies in several key dimensions. In EMs devaluations, or large depreciations for that matter, are contractionary, the adjustments in the current account are far more acute and abrupt. Hence, currency crises become credit crises as sovereign credit ratings often collapse following the currency collapse and access to international credit is lost.

On why are sovereign ratings such poor predictors of financial distress, we conclude that generally, financial crises are difficult to forecast--witness the poor performance of international interest rate spreads and currency forecasts. Specifically, however, the results presented here offer a tentative (although partial) answer to this question. Rating agencies have tended to focus on the "wrong" set of fundamentals. For instance, much weight is given to debt-to-exports ratios--yet these have tended to be poor predictors of financial stress. Little weight is attached to indicators of liquidity, currency misalignments, and asset price behavior.

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Appendix Table 1. Do Changes in Sovereign Credit Ratings Predict
Currency or Banking Crises?
Alternative specification, probit estimation with robust standard errors
Institutional Investor, 2257 observations

Currency Crisis				
Dependent Variable: **Crisis Dummy**	**Coefficient** (1)	**Standard Error** (2)	**Significance Level** (3)	**Pseudo R^2** (4)
Kaminsky and Reinhart Definition	-0.335	1.540	0.2872	0.001
Frankel and Rose Definition	-0.022	0.029	0.435	0.001
Modified Frankel and Rose Definition	-0.054	0.024	0.024	0.008
Banking Crises				
Kaminsky and Reinhart Dates	-0.023	0.193	0.762	0.000
Barth, Caprio and Levine, or Kaminsky and Reinhart, or Demirguc-Kunt and Detragiache Dates	0.007	0.031	0.826	0.000

[1] Number of observations for each sample are shown in parentheses.
Notes: The independent variable is the 6-month change in the sovereign credit rating one year earlier.
Sources: The author.

Appendix Table 2. Do Changes in Sovereign Credit Ratings Predict
Currency or Banking Crises?
Alternative specification, probit estimation with robust standard errors
Moody's, 5058 observations

Currency Crisis				
Dependent Variable: **Crisis Dummy**[1]	**Coefficient** **(1)**	**Standard Error** **(2)**	**Significance Level** **(3)**	**Pseudo R^2** **(4)**
Kaminsky and Reinhart Definition	-0.041	1.023	0.913	0.000
Frankel and Rose Definition	0.001	1.582	0.988	0.000
Modified Frankel and Rose Definition	-0.098	0.123	0.425	0.003
Banking Crises				
Kaminsky and Reinhart Dates	0.032	0.863	0.814	0.000
Barth, Caprio and Levine, or Kaminsky and Reinhart, or Demirguc-Kunt and Detragiache Dates	-0.014	1.223	0.943	0.000

[1] Number of observations for each sample are shown in parentheses.
Notes: The independent variable is the 6-month change in the sovereign credit rating one year earlier.
Sources: The author.

Appendix Table 3. Do Changes in Sovereign Credit Ratings Predict
Currency and Banking Crises?
Probit estimation with robust standard errors
Standard and Poor's, 4042 observations

Currency Crises				
Dependent Variable: **Crisis Dummy**	**Coefficient** (1)	**Standard Error** (2)	**Significance Level** (3)	**Pseudo R^2** (4)
Kaminsky and Reinhart Definition	-0.013	0.126	0.721	0.001
Frankel and Rose Definition	-0.267	0.051	0.600	0.001
Modified Frankel and Rose Definition	0.356	2.336	0.879	0.000
Banking Crises				
Kaminsky and Reinhart Dates	-0.014	0.548	0.761	0.000
Barth, Caprio and Levine, or Kaminsky and Reinhart, or Demirguc-Kunt and Detragiache Dates	0.379	1.841	0.837	0.000

[1] Number of observations for each sample are shown in parentheses.
Notes: The independent variable is the 6-month change in the sovereign credit rating one year earlier.
Source: The author.