Rating the Rating Agencies

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Assessing Financial Vulnerability: An Early Warning System for Emerging Markets
Notes from Chapter 4
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The discussion in the preceding sections focused on the ability of a variety of indicators to signal distress and pinpoint the vulnerability of an economy to banking or currency crises. In this section, we begin by assessing the ability of sovereign credit ratings to anticipate crises. In addition, given the wave of sovereign credit ratings downgrades that have followed the crises in Asia, we investigate formally the extent to which credit ratings are reactive. Along the way, we discuss a small but growing literature that examines to what extent financial markets anticipate crises.

Do sovereign credit ratings predict crises?

In what follows, we attempt to answer this question using two different approaches. First, we tabulate the descriptive statistics for the ratings along the lines of the "signals" approach and compare how these stack up to the other indicators we have analyzed. Second, we follow the approach taken in much of the literature on currency and, more recently, banking crises and estimate a probit model, where the dependent variable is a crisis dummy that takes on the value of one if there is a crisis and zero otherwise and the explanatory variable is the credit ratings.

Our exercise is very much in the spirit of Larraín, Reisen, and von Maltzan (1997), who, using Granger causality tests, assess whether credit ratings lead of follow market sentiment as

reflected in interest rate differentials. These differentials reflect the ease or difficulty with which sovereign countries can tap international financial markets. In their analysis, they focus on Moody's and Standard and Poor's ratings; in what follows, we examine the behavior around financial crises of Institutional Investor and Moody's sovereign credit ratings.

The Institutional Investor sample begins in 1979 and runs through 1995. This gives us the opportunity to study 50 currency crises and 22 banking crises. There are twenty countries in our sample, 32 observations per country for a total of 640 observations.[1] For Moody's, we have an unbalanced panel. During this varied time period we have 21 currency crises and seven banking crises. Hence, in the remainder of the discussion more emphasis will be placed on the results from the Institutional Investor database, which are based on a more comprehensive sample of crises.

[1] The twenty countries are those in the Kaminsky and Reinhart (1996) sample; Argentina, Bolivia, Brazil, Chile, Colombia, Denmark, Finland, Indonesia, Israel, Malaysia, Mexico, Norway, Peru, Philippines, Spain, Sweden, Thailand, Turkey, Uruguay, and Venezuela.

Table 4.1 shows the basic descriptive statistics that we have used to gauge an indicators' ability to anticipate crises--the noise-to-signal ratio, the percent of crises accurately called, and the marginal predictive power--for the Institutional Investor sovereign rating as well as averages for the more reliable monthly and annual indicators. By all three metrics the ratings do poorly for both currency and banking crises. 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 other indicators. This compares unfavorably with even the worst indicators. For instance, consider the performance of the terms-of-trade ahead of banking crises; this is shown in row 13 of Table 4.1. The terms-of-trade has a noise-to-signal ratio of about one, making it almost as noisy as the credit rating. Yet, it accurately called 92 percent of the crises--so while it sends many false alarms it misses few crises. The ratings, on the other hand, score poorly on both counts as, in addition to noisiness, they miss anywhere between 3/4 and 2/3 of the crises, depending on which type of crisis we focus on.

Table 4.1. Ratings and the fundamentals: Currency and banking crises

Type of crisis and indicator	Noise-to-signal	Percent of crises accurately called	P(C|S)-P(C)
	(1)	(2)	(3)
Currency crisis:			
Institutional Investor sovereign rating	1.05	31	5.4
Average of the top 5 monthly indicators	0.45	70	19.1
Average of the top 3 annual indicators	0.49	36	15.4
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

Sources: The authors and tables 3.1-4.

We next assess the predictive ability of ratings via probit estimation. As noted, the dependent variable is a crisis dummy (banking and currency crises are considered separately) and the independent variable is the change in the credit rating in the preceding 12 months. Hence, ratings are allowed to enter with a lag. 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: a) credit ratings should help predict crises because, as shown in the previous section, macroeconomic indicators have some predictive power and; b) the simple model should not be misspecified, in that other indicators should not enter significantly, since that information was already presumably reflected in the

rating. Thus, the state of the macroeconomic fundamentals would be captured in a single indicator--the ratings.

Recent studies which have examined the determinants of credit ratings do, indeed, provide support for the basic premise that ratings are significantly linked with selected economic fundamentals (see Lee, 1993 and Cantor and Packer, 1996a). For instance, Cantor and Packer (1996a) find that per capita GDP, inflation, the level of external debt and indicators of default history and 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.

Alternative time horizons ranging from 6-month changes in the credit ratings to 18- and 24- months changes were also estimated with very similar results as those reported in these tables.[2] The method of estimation corrected for serial correlation and heteroskedasticity in the residuals. For banking crises the coefficients of the credit ratings have the anticipated negative sign, that is an upgrade should reduce the probability of a crisis. However, neither credit rating is statistically significant and their marginal contribution to the probability of crisis (the third column) is very small.

[2] These results are not reported here but are available from the authors.

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 Tables 3.1-2. Hence, the ratings inability to explain crises is not inconsistent with its ability to influence spreads. This issue will be taken up later in this section.

4.2 Do Ratings Predict Banking Crises?
Probit estimation with robust standard errors

Independent variable:	**Coefficient** **(1)**	**Standard error** **(2)**	**Marginal effects** **(3)**	**Probability** **(4)**	**Pseudo R^2** **(5)**
12-month change in the Institutional Investor rating	-0.921	1.672	-0.070	0.421	0.004
12-month change in Moody's rating	-0.053	0.193	-0.001	0.770	0.001

The results for the analogous exercise for currency crises are reported in Table 4.3. As for banking crises, the coefficients have the anticipated negative sign, but only in the case of the Moody's rating is the coefficient statistically significant at standard confidence levels. Statistical significance notwithstanding, its marginal contribution to the probability of a crisis is quite small; a one unit downgrade in the rating increases the probability of a crisis by about one percent. These differences in the outcomes for the two rating agencies are not surprising, for instance, Cantor and Packer (1996b) provide extensive evidence of rating agency disagreements.

4.3 Do Ratings Predict Currency Crises?
Probit estimation with robust standard errors

Independent variable:	Coefficient (1)	Standard error (2)	Marginal effects (3)	Probability (4)	Pseudo R^2 (5)
12-month change in the Institutional Investor rating	-0.561	1.250	-0.075	0.590	0.058
12-month change in Moody's rating	-0.22*	0.101	-0.009	0.013	0.021

*Denotes significance at the five percent level.

Why do credit ratings fail to anticipate crises?

In this subsection we take up the issue of why the credit ratings are a poor predictor of financial crises. We focus on two explanations.

The first explanation would stress that sovereign credit ratings are meant to provide an assessment of the likelihood of sovereign default. Hence, to the extent that a domestic banking crisis or a currency crisis is decoupled from the probability of sovereign default, credit ratings should not a priori be expected to predict currency or banking crises. After all, the three Nordic countries included in our sample had both currency and banking crises in the 1990s, yet default on sovereign debt was never an issue. However, while this argument may prove satisfactory for industrialized economies, it may be problematic for developing countries and transition economies. Indeed, not every currency crisis or banking crises in emerging markets has ended in default--but nearly every default episode was preceded by banking and/or currency crises. Latin America in the early 1980s attests to this pattern. Furthermore, had it not been for large-scale rescue packages under the auspices of the IMF, Mexico in 1994-95 and Indonesia, Korea, and

Thailand in 1997-98 would have been new additions to this list.

Formally, this argument would imply that the rating agencies should do better in predicting currency and banking crises in developing countries, since such events are more closely linked to the probability of sovereign default. To examine this issue empirically, we re-estimated our simple model of crises and ratings excluding industrial countries from the sample. The results, shown in Tables 4.4-4.5 are not appreciably different from those for the full sample; for banking crises neither rating is significant.[3] For currency crises, Institutional Investor ratings remain insignificant and Moody's are significant (as before)--yet its marginal effect remains below 3 percent.

4.4 Do Ratings Predict Banking Crises?
Probit estimation with robust standard errors: Emerging markets

Independent variable:	**Coefficient** **(1)**	**Standard error** **(2)**	**Marginal effects** **(3)**	**Probability** **(4)**	**Pseudo R^2** **(5)**
12-month change in the Institutional Investor rating	-0.827	2.346	-0.052	0.871	0.002
12-month change in Moody's rating	-0.075	0.413	-0.001	0.864	0.001

[3] We do not place much weight on the Moody's results as the number of banking crises is very small.

4.5 Do Ratings Predict Currency Crises?
Probit estimation with robust standard errors: Emerging markets

Independent variable:	Coefficient (1)	Standard error (2)	Marginal effects (3)	Probability (4)	Pseudo R^2 (5)
12-month change in the Institutional Investor rating	-0.753	1.430	-0.093	0.690	0.048
12-month change in Moody's rating	-0.34*	0.161	-0.026	0.011	0.041

*Denotes significance at the five percent level.

The second argument as to why ratings fail to predict crises has received much attention from the popular press surrounding the Asian crises. Namely, this argument stresses that credit ratings are lagging not leading indicators of crises and, as such, down grades follow on the heels of financial crises. The anecdotal evidence surrounding the events in Asia presented in Table IV.6 seems to point in this direction. Only in the case of Thailand did there appear to be any substantive action as regards downgrades.

To examine this issue formally, we examine whether knowing that there was a crisis helps to predict credit rating downgrades. Hence, dependent and independent variables now switch roles. 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 six months earlier.[4] The method of estimation is generalized least squares, correcting for 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

[4] We want to examine whether the rating changes follow immediately after the crises, but as the index is only published twice a year this ability to discriminate is not possible.

4.6. Rating agencies on the eve and aftermath of the Asian crises

Country	Date	Events and action taken
Hong Kong	October 20-23	Stock market plunges as speculators attack Hong Kong dollar.
	October 30	Moody downgrades Hong Kong banks on concerns about property exposure.
Korea	June 8	S&P and Moody's changes outlook from "stable" to "negative."
	October 22	Finance minister announces small-scale bank bail-out and government takeover of Kia Motors.
	October 24	S&P downgrades government debt.
	October 27	Moody's downgrades government debt.
	November 27	Moody's downgrades ratings.
	December 3	IMF pact.
	December 10	Moody downgrades ratings.
	December 11	S&P downgrades ratings.
Malaysia	July 14	Ringit falls as central bank abandons support.
	August 18	S&P cuts ratings from "positive" to "stable."
	September 25	S&P changes outlook to negative.
Thailand	September 1996	Moody downgrades short term government debt.
	February 1997	Moody puts government debt under review.
	April	Moody's cuts ratings, but still rates government debt "investment grade," S&P reaffirms rating.
	June	S&P reaffirms rating.
	August 13	Government seeks IMF bail-out; S&P puts ratings under review.
	September 3	S&P cuts rating to A-.
	October	Moody's and S&P downgrade Thailand.
	November 4	Prime minister resigns.
	November 27	Moody's lowers ratings to near junk.

Source: Goldstein (1998).

specification will allow us to glean more precisely whether downgrades follow rapidly after

crises take place. Since the Moody's rating assumes 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.

The results of the estimation are summarized in Tables 4.7-4.8. As regards banking crises, the historical experience through 1995 does not suggest that credit rating agencies behaved in a "reactive" manner. However, currency crises helps predict downgrades, irrespective which rating is used. That is as the explanatory variable increases (from zero to one when there is a crisis) ratings fall. However, while the coefficients are significant at standard confidence levels, its 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.

4.7 Reactive credit ratings: Do financial crises help predict downgrades?

Dependent variable: Institutional Investor six-month changes in sovereign rating		**Estimation method: OLS with robust standard errors**		
Independent variables:	**Coefficient (1)**	**Standard error (2)**	**Probability value (3)**	**R^2 (4)**
Banking crisis dummy	-0.009	0.019	0.61	0.01
Currency crisis dummy	-0.04*	0.014	0.005	0.06

4.8 Reactive credit ratings: Do financial crises help predict downgrades?

Dependent variable: Moody's three-month changes in sovereign rating		**Estimation method: Ordered probit**		
Independent variables:	**Coefficient (1)**	**Standard error (2)**	**Probability (3)**	**Pseudo R^2 (4)**
Banking crisis dummy	-0.11	0.90	0.901	0.001
Currency crisis dummy	-0.27*	0.14	0.048	0.02

These results are 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. That is not only do markets react to changes in the ratings, but the ratings systematically react (with a lag) market sentiment, as reflected in the ratings.

Do financial markets anticipate crises?

The evidence presented here has suggested that ratings, by and large, fail to anticipate financial crises and are, instead, adjusted ex-post. However, in light of the evidence on other market indicators, this result is not surprising. Kaminsky and Reinhart (1996) show domestic-foreign interest rate differentials are not good predictors of crises, particularly currency crises. This result is re-enforced in Tables 3.1-2. If market participants anticipate a crisis, these expectations should be reflected in a rising risk premia as the crisis nears--unless, of course, there are explicit or implicit guarantees, a point that has been stressed by Dooley (1997). A similar argument could be made about the rating agencies, if they internalize that the IMF will provide a bail-out to the sovereign debtors. In that case, there is no need to reassess the risk of default.

However, even in the absence of debt guarantees, it is not clear that the evidence suggests that markets are very capable of predicting crises. Goldfajn and Valdéz (1997), for instance, use the survey data on exchange rate expectations culled from the Financial Times to ask the same questions we have asked here. Namely, do market expectations foresee financial crises? Using a broad array of crises definitions and approaches, their answer is a negative one and much along the lines of what we have found for the sovereign ratings. Hence, it would appear that an "early warning" system should not depend on market expectations and sovereign ratings as its guides.

APPENDIX A: DATA AND DEFINITIONS

Crisis index: The index is a weighted average of exchange rate and reserve changes, with weights such that the two components of the index have equal conditional volatilities. 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. 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 hyperinflations. 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 percent and then constructed an index for each subsample. Our cataloging of crises for these countries coincides fairly tightly with our chronology of currency market disruptions. Eichengreen, Rose, and Wyplosz (1995) also include interest rates in this index, however, our data on market-determined interest rates for developing countries does not span the entire sample.

The indicators:

Sources: International Financial Statistics (IFS), International Monetary Fund; Emerging Market Indicators, International Finance Corporation (IFC); World Development Indicators, the World Bank, when data was missing from these sources, central bank bulletins and other country-specific sources were used as supplements. Unless otherwise noted, we used **12-month percent changes**.

1. M2 multiplier: The ratio of M2 to base money, (IFS lines 34 plus 35) divided by IFS line 14.

2. Domestic credit/nominal GDP: IFS line 52 divided by IFS line 99b (interpolated). Monthly nominal GDP was interpolated from annual or quarterly data.

3. Real interest rates on deposits: IFS line 60l, monthly rates, deflated using consumer prices (IFS line 64) expressed in percentage points.

4. The ratio of lending rates to deposit rates: IFS line 60p divided by IFS line60l; was used in lieu of differentials to ameliorate the distortions caused by the large percentage point spreads observed during high inflation. In levels.

5. "Excess" real balances: M1 (IFS line34) deflated by consumer prices (IFS line 64) less an estimated demand for money. The demand for real balances is determined by real GDP (interpolated IFS line99b), domestic consumer price inflation, and a time trend. Domestic inflation was used in lieu of nominal interest rates, as market-determined interest rates were not available during the entire sample for a number of countries; the time trend (which can enter log-linearly, linearly, or exponentially) is motivated by its role as a proxy for financial innovation and/or currency substitution. Excess money supply (demand) during pre-crisis periods (mc) is reported as a percent relative to excess supply (demand) during tranquil times (mt)--that is, 100 x (mc-mt)/mt.

6. M2 (in US dollars)/reserves (in US dollars): IFS lines 34 plus 35 converted into dollars (using IFS line ae) divided by IFS line 1L.d.

7. Bank deposits: IFS line 24 plus 25.

8. Exports (in US dollars): IFS line 70.

9. Imports (in US dollars): IFS line 71.

10. The terms of trade: the unit value of exports (IFS line 74) over the unit value of imports

(IFS line 75). For those developing countries where import unit values (or import price indices) were not available, an index of prices of manufactured exports from industrial countries to developing countries was used.

11. The real exchange rate: This measure used is based on consumer price indexes (IFS lines 64) and is defined as the relative price of foreign goods (in domestic currency) to the price of domestic goods. If the central bank of the home country pegs the currency to the dollar (Deutsche mark), the relevant foreign price index is that of the United States (Germany). Hence, for all the European countries the foreign price index is that of Germany while for all the other countries, consumer prices in the United States were used. The trend was specified as, alternatively, log-linear, linear, and exponential; the best fit among these was selected on a country-by-country basis. Deviations from trend during crisis periods (dc) were compared to the deviations during tranquil times (dt) and are shown in Figures 2 and 3 as a percent of the deviations in tranquil times (i.e.,100 x (dc-dt)/dt).

12. Reserves: IFS line 1L.d**.**

13. Domestic-foreign interest rate differential on deposits: Monthly rates in percentage points. IFS lines 60l. Interest rates in the home country are compared with interest rates in the United States (Germany) if the domestic central bank pegs the currency to the dollar (Deutsche mark). The real interest rate is given by $100 \times [((1+ i_t)p_t / p_{t+1-1}]$.

14. Output: For most countries, the measure of output used is industrial production (IFS line 66). However, for some countries (the commodity exporters) an index of output of primary commodities is used (IFS lines 66aa).

15: Stock returns (in dollars): IFC global indices are used for all emerging markets; for industrial countries the quotes from the main bourses are used.

16. Overall budget balance/GDP: Consolidated public sector balance as share of nominal GD