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Sovereign rating changes – Do they provide new information for stock markets?

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Abstract

The purpose of this paper is to examine the impact of sovereign rating changes on international financial markets using a comprehensive database of 42 countries, covering the major regions in the world over the period 1995-2003. In general, we find that rating agencies provide stock and foreign exchange markets with new tradable information. Specifically, rating upgrades (downgrades) significantly increased (decreased) USD denominated stock market returns and decreased (increased) volatility. Whereas the mean response is contributed evenly by the local currency stock returns and exchange rate changes that make up the USD returns, only the foreign exchange volatility was behind the USD denominated return volatility. In addition, we find significant asymmetric effects of rating announcements. The market responses – both return and volatility - are more pronounced in the cases of downgrades, foreign currency debt, emerging market debt, and during crisis periods. This study has important policy implications for international investors' asset allocation plans and for regulatory bodies such as the Basel Committee who increasingly rely upon Moody's, Standard and Poor's and Fitch's ratings for their regulatory regimes.

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1. Introduction

In recent years, the role of credit rating agencies in the international economy has been the subject of intense debate. Recently the Basel Committee has encouraged their role in international financial markets, by promoting the use of external credit ratings in its new Capital Accord (Basel Committee, 2003). However, the rating agencies have been heavily criticised within the context of emerging market financial crises. It has been suggested that they were unable to predict the Asian crisis, they were too slow to react and, once they did react, their actions intensified and perhaps even prolonged the crisis (Radelet and Sachs, 1998). In a stinging criticism of rating agencies, Ferri, Liu and Stiglitz (1999) argue that they behave pro-cyclically, upgrading sovereigns during boom times and downgrading them during periods of crisis. Similarly, others have argued that rating agencies contribute to a boom-bust cycle in international financial markets placing emerging markets at risk (Reisen and von Maltzan, 1999). Such arguments are, however, largely based on the assumption that sovereign ratings actually provide financial markets with new information, despite the fact that the empirical evidence hitherto relating to this issue is far from conclusive.

Research to date has focused on the impact of rating changes at the company level. In general, it has been found that rating downgrades are informative, but that upgrades are not (Holthausen and Leftwich, 1986; Hand, Holthausen and Leftwich, 1992; Matolscy and Lianto, 1995, Ferreira and Gama, 2007). However, a recent increase in sovereign participation in international financial markets has created a burgeoning sample of sovereign credit rating changes. Nevertheless, the few studies completed to date have produced mixed results, providing ambiguous evidence that rating actions actually impact on security prices. For example, Cantor and Packer (1996) investigated a sample of developed and emerging markets over 1987-94 and showed that sovereign rating changes have a significant impact on bond yield spreads. However, Larrain, Reisen and von Maltzan (1997) extended Cantor and Packer (1996) by incorporating data up until the Mexican crisis of 1994-95 and found that the overall impact of rating changes on bond prices to be insignificant. Brooks, et al. (2004), examined the equity market response to sovereign rating changes and revealed a significant response only following downgrades. More recently, Ferreira and Gama (2007) report asymmetric spillover effects of one country's ratings events on others' stock market returns.

An understanding of the impact of sovereign rating changes on financial markets is important on at least three levels. First, in a theoretical sense, it improves our understanding of the price discovery process, particularly in relation to the *type* of information that financial markets incorporate into asset prices. Second, there is an important implication for financial practice. As investment portfolios have been internationalised, those responsible for managing investment capital have faced the need for greater and more accurate information regarding country risk and how a country risk re-assessment can impact on their portfolios. Since sovereign ratings function as a major country risk indicator, it is important that fund managers have a good understanding of impact rating changes have on their portfolios. Third, a detailed understanding of the impact of sovereign ratings on financial markets is of critical importance from an international policy perspective. If rating changes do actually provide financial markets with new information, i.e. rating announcements produce a significant market response, it may be that international rating agencies have the capability to intensify and prolong or, on the other hand, perhaps even soothe financial crises. In addition, this study functions as a test of the efficacy of sovereign credit ratings as a regulatory tool within the context of the new Basel Accord on Bank Capital Requirements.

In this research we examine the impact of sovereign rating changes on national financial markets in an attempt to provide fresh and comprehensive empirical insights regarding the role of credit rating agencies in international finance. Specifically, our primary objective is to shed light on the disaggregated nature of sovereign credit ratings and their impact on stock market returns in a number of national markets. We use the sovereign ratings changes of 42 countries over the period 1995-2003 and investigate the disaggregated nature of sovereign credit ratings and their impact on various aspects of national stock markets on a global basis. Our study provides significant additional contributions to the literature. Specifically, this paper is an improvement over Brooks et. al. (2004) and Ferreira and Gama (2007) in terms of coverage of various rating events in additions to just upgrades and downgrades, modelling of the impact of rating changes on stock and foreign exchange market volatility, and the investigation of the process of market responses to the ratings events.

The major findings of this paper are as follows. i) In general, we find that rating agencies provide financial markets with new tradable information. ii) Rating upgrades (downgrades) significantly increased (decreased) USD denominated stock market returns and decreased (increased) volatility. iii) Whereas the mean response is contributed evenly by the local currency stock returns and exchange rate changes that make up the USD returns, only the foreign exchange volatility was behind the USD denominated return volatility. iv) There are significant asymmetric effects of rating announcements in general, and market responses – both return and return volatility - are more pronounced in the cases of downgrades, foreign currency debt, emerging market debt, and during crisis periods. Thus, we provide a significant addition to the literature and our investigation has important policy implications for international investors' asset allocation plans and for regulatory bodies such as the Basel Committee, who increasingly rely upon Moody's, Standard and Poor's and Fitch's ratings for their regulatory regimes.

The organisation of the rest of this paper is as follows. Section 2 describes the sample of sovereign rating changes and, in doing so, establishes a framework for our empirical analysis. Section 3 discusses the methodological approaches to modelling the impact of sovereign rating changes. In section 4 we report and interpret the estimation results. Section 5 concludes.

2. Data analyses

2.1. Sovereign ratings – Backgrounds of ratings arrangements

We examine sovereign rating changes of 42 countries over the period 1995 to 2003. The dataset utilises the Sovereign Credit Rating History of the world's three leading international credit rating agencies: Standard & Poor's (S&P), Moody's Investors Services (Moody's) and Fitch-IBCA (Fitch). The rating history has been sourced directly from each agency. Collectively, these three rating agencies are responsible for approximately 80 per cent of sovereign credit ratings (Reisen and von Maltzan, 1999). Although they employ different scales, credit ratings for long term debt are broadly comparable across rating agencies. For S&P and Fitch, the scale extends from AAA (extremely strong capacity to repay) through AA, A, BBB and through to D (default).[1] For Moody's ratings, the highest rating attainable is Aaa (extremely high capacity to repay), with the scale extending through Aa, A, Baa and through to C (default). In recent years, sovereign ratings have been refined to signal the relative standing of issuers within major rating categories. For S&P and Fitch, this refinement is applicable to rating categories from AA through to CCC, and incorporates the addition of a plus or minus sign to the rating. The equivalent modification for Moody's applies to categories Aa through Caa, and includes the numerical qualifiers 1, 2 and 3. The similarity in rating scales allows a simple linear transformation of the ratings on a scale of 1-20 for S&P and Moody's and 1-22 for Fitch.[2] In addition to explicit credit ratings, the agencies also

[1] Fitch has two extra rating notches at the C and D levels.

[2] Some studies of credit rating changes have employed a logarithmic scale in the belief that the impact of rating changes may be dependent on the *level* of the rating (Larrain, Resien and von Maltzan, 1997; Ferri et al., 1999).

report Credit Watches and rating outlooks, which are designed to provide information on likely future movements in sovereign credit ratings. A rating outlook is an assessment of the potential direction of a credit rating over the long-term, whereas a Credit Watch is an opinion as to the likely short-term movement in ratings.

At this point, it is important to clarify the exact definition of a rating event to be employed throughout the remainder of this paper. Since rating agencies report both explicit credit ratings and imminent rating actions (outlooks), it would seem that to focus purely on explicit rating changes would be too limiting, since doing so omits important information regarding the potential future direction of ratings. In order to include the information from both types of rating actions, we combine the level of both the explicit rating and the outlook to form an overall rating. Rating changes are then computed as changes in this overall rating. A rating event is therefore defined as a change in either explicit credit rating or a change in the imminent rating action (i.e. change in outlook). A positive rating event refers to an upgrade in either credit rating or outlook or both and a negative rating event refers to a downgrade in either credit rating or outlook or both. To maximise the sample size, we consider changes in local currency ratings, as well as foreign currency ratings. We examine not only the individual impact of the various aspects of rating changes but also aggregate impacts by considering various aggregates of the rating changes.

2.2 Rating change sample

The major rating agencies currently assess approximately 100 sovereigns. However, due to lack of data availability in some cases, it is not possible to investigate the impact of rating changes consistently across all countries during the sample period. The criteria for inclusion

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In this study, we take a different approach to addressing this issue, by comparing the impact of rating changes according to whether the sovereign is of investment or non-investment grade.

within this study are twofold. First, the sovereign must have experienced a change in credit rating during the sample period. Second, it is required that daily stock returns be reported for the relevant country through either the Datastream Global Market Indices or S&P/IFC Indices. Application of these criteria resulted in a sample of 42 countries, representing a variety of regions and income levels. There are seven Latin American countries, eleven Asian countries, six countries from Eastern Europe, nine countries from Western Europe, five Middle East and African countries, and four countries from the Pacific (see Panel B of Table 1). The study extends over the 9 year period from 1995-2003, a period selected on the basis that the International Finance Corporation (IFC) did not report daily stock prices prior to 1995. However, this period incorporates a number of international financial crises, including the Asian Crisis (1997-98), the Russian debt default (1998), the Brazilian Crisis (1999) and the Argentina Crisis (2002), leading to numerous rating changes.

In total, a sample of 690 rating change events has been collected and the time series of the distributions is displayed in Figure 1. The shaded areas highlight crisis periods[3]. Two features are immediately apparent in this figure. First, the frequency of rating changes appears to be increasing over the sample period. The increase in frequency can be attributed to the prevalence of financial crises during the latter stages of the sample. Indeed, the first spike in rating activity occurs in the second half of 1997, coinciding with the Asian financial crisis. A further mitigating factor for the increase in rating activity is that the number of sovereigns accessing international capital markets and, as a result, being rated, has expanded over time. The second important feature of Figure 1 is that rating changes tend to cluster in time, with large spikes in rating activity occurring during or in response to crisis periods. For

[3] The crisis periods refer to the Asian crisis (3rd quarter 1997-1st quarter 1998), the Russian crisis (3rd quarter 1998-4th quarter 1998), the Brazilian crisis (1st quarter 1999), the Turkey crisis (4th quarter 2000-1st quarter 2001), and the Argentina crisis 3rd quarter 2001-4th quarter 2001).

example, downgrades peaked at 27 in the 3rd quarter of 1998, coinciding with the period of the Russian debt moratorium.

The temporal clustering highlighted above can be potentially problematic for empirical analyses of rating change announcements because it may bias estimates of the announcement effect. Such a bias will arise if the event window is contaminated by the effect of previous rating events. To avoid such a problem, therefore, we only work with 'clean events'. In this case, a clean event is defined as one in which rating changes do not overlap in windows of + or – five days. This ensures that we only study the impact of one rating event at each point in time[4]. The resulting decontamination resulted in a clean sample of 627 rating events.

Table 1 displays the summary statistics for the 627 rating changes used in this study. Panel A provides a break down of the sample into various sub-groups. The rows reflect *environmental* characteristics of the countries in the sample, while the columns reflect characteristics of the *rating* itself. For the complete sample, the number of implemented rating changes (304) is broadly comparable with the number of imminent rating changes, such as outlooks and Credit Watches (323). However, the ratings changes (including outlooks) are mostly foreign currency denominated debt issues (596 out of 627). In addition, the proportion of upgrades is substantially greater than that of downgrades with the ratio of upgrades to downgrades is 1.45, providing initial evidence of a positive bias in rating announcements[5].

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[4] Such a decontamination process is consistent with other studies of sovereign rating changes (Kaminsky and Schmukler, 2002; Gande and Parsley, 2005).

[5] Although this is not the focus of this paper, such a finding would be consistent with research into stock analyst behaviour, which has found bias in research reports to be empirically relevant. See for example (Lin and McNichols, 1998; Michaely and Womack, 1999).

Working down the rows of Panel A**,** the first division groups the data by income level. Countries are considered emerging markets if they are defined as such by the International Finance Corporation. Over the sample period, rating activity was concentrated in emerging markets rather than developed markets. Emerging markets also experienced a substantially greater proportion of negative rating announcements, with a ratio of upgrades to downgrades of 1.24. The corresponding ratio for developed markets is 2.64.

During the crisis periods, the positive rating bias becomes a negative bias, with the ratio of upgrades to downgrades falling to 0.64. In contrast, this ratio is 1.93 during non-crisis periods. Such a finding provides support for the view of Ferri, Liu and Stiglitz (1999), who argue that international rating agencies behave pro-cyclically; upgrading sovereigns during boom times and then downgrading them when the economy slows..

For investment-grade sovereigns, the number of rating events (324) is broadly comparable with the number of rating events for non-investment grade sovereigns (303). However, non-investment grade sovereigns experience a greater proportion of negative rating announcements, with a ratio of upgrades to downgrades of 1.01. The corresponding ratio for investment grade sovereigns is 2.09.

The final division in Panel A groups the data into high and low debt countries. Data regarding the level of foreign indebtedness is sourced from the World Bank[6]. For the purpose of this analysis, countries are classified as high debt if the World Bank defines their level of indebtedness as 'severe'[7]. Since only six sample countries are classed as high debt, rating

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[6] The World Bank Country Classifications are available online at

<http://www.worldbank.org/data/countryclass/countryclass.html >

[7] The World Bank classifies a country as 'severely indebted' if either: (1) the present value of debt service to GNI exceeds 80 per cent or (2) the present value of debt service to exports exceeds 220 per cent.

activity is skewed towards the low debt countries[8]. However, it is apparent that high debt countries experienced a greater proportion of negative rating events during the sample period, with a ratio of upgrades to downgrades of 0.87.

3. Econometric methodologies

Our approaches to identifying the information contents of sovereign ratings are as follows. First, we investigate the overall impact of rating changes on national stock index returns and volatility (measured in USD – hence forth USD returns and volatility[9]). Second, we examine potential asymmetries in the market response to sovereign rating changes[10]. This is done by decomposing both sides of the relationship between rating changes and USD stock returns. Rating changes are broken down and compared according to various *rating* and *environmental* characteristics. The cross-sectional distribution of rating changes presented in Table 1 provides a useful framework through which to investigate the *nature* of the rating change impact and will form the basis for further empirical analysis.

3.1. Modelling the Impact of sovereign rating changes on national stock index returns and volatilities

In estimating the impact of sovereign rating changes on national stock indices, we use daily returns data. This maximises the power of hypothesis tests. However, the use of daily returns prevents us from controlling for changes in macroeconomic fundamentals, which are reported

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[8] The countries in the high debt category are: Argentina, Brazil, Peru, Indonesia, Turkey and Jordan.

[9] From this point forth, any reference to USD stock return or USD-denominated stock return refers to the national stock market returns measured in US dollars. This also applies to volatility.

[10] Analysis of corporate credit ratings has shown that the impact of rating changes may be asymmetric with, for example, downgrades appearing more informative than upgrades (Holthausen and Leftwich, 1986; Hand, Holthausen and Leftwich, 1992)..

on a less frequent basis. To model the overall impact of rating changes on national index returns, we pool the rating change data for every country and estimate the following panel regression similar to Brooks et al (2004)[11]:

$$\Delta Y_{it} = \alpha + \beta_1 RATING_{it} + \sum_k \beta_k X_{kt}^R + \varepsilon_{it} \tag{1}$$

In the base model, ΔY_{it} is defined as the daily log change in national stock market index, denominated in the US dollars. We examine a two-day holding period (-1,1) around the announcement date to account for uncertainty regarding the timing of the rating change announcement[12 13]. $RATING_{it}$ represents a change in credit rating or outlook in the country of analysis by any rating agency. It is equal to 1 if there is a one-notch upgrade in rating or outlook and equal to -1 if there is a downgrade. A two-notch upgrade (downgrade) is represented as a 2 (-2) and so on. This applies to all types of rating changes. If rating changes have a significant impact on financial market returns, we expect upgrades (downgrades) to increase (decrease) returns. The coefficient for $RATING_{it}$ should therefore be positive. X_{kt}^R is a vector of control variables which includes controls for the contemporaneous returns in the world market index (*WORLDRET*) and once-lagged return on the world index (*LAG WORLDRET*) and a world risk factor (*WRF*)[14]. If the sample countries are at least partially

[11] We implemented both the Hausman and the Breusch-Pagan LM Tests for Random Effects, both of which revealed the presence of random effects within the dataset used in this paper. Thus, we report the random effects estimations in this paper. However, the reported results are qualitatively the same as fixed effects estimations, which are available upon request.

[12] Although the dataset includes the day of announcement, it does not include the time of announcement, so it is not possible to determine whether the announcement occurs during or after trading hours.

[13] The (-1,1) window is defined as the close of market on day t-1 until the close of market on day t+1. This results in a two-day holding period return.

[14] The world risk factor is generated from applying the Baekart and Harvey (1995)'s model. It is a time varying coefficient on the conditional variance term in the mean equation of the ARCH-M model of the daily return of

integrated into the world market, we anticipate that individual country returns should be positively related to the world market return, resulting in a positive coefficient for both *WORLDRET* and *LAG WORLDRET*. Finally, we expect the coefficient of *WRF* to be positive, as an increase in the level of world risk should lead to higher expected returns.

To learn more about the *nature* of the rating impact, the USD return is first decomposed into a local currency stock return and a return on the local currency against the USD. Model (1) is then re-estimated, with ΔY_{it} representing alternately the log change in national stock market index denominated in the local currency, and the log change in exchange rate. The control variables remain the same as for the base model.

In addition to the impact of sovereign rating changes on national market returns, we also investigate their impact on national market risk (as proxied by volatility). To this end we start with the base model similar to (1) and pool the time series of rating change data for every country and estimate the following random effects panel regression:

$$\sigma_{it}^2 = \alpha + \beta_1 RATING_{it} + \sum_k \beta_k X_{kt}^V + \varepsilon_{it} \qquad (2)$$

σ_{it}^2 is defined alternately as the volatility of the national stock market index, priced in US dollars, the volatility of the national stock market index, priced in local currency, and exchange rate volatility. In each case, volatility is measured as the square of the holding period return, where the holding period is defined as the two days (-1,1) around the rating change announcement. $RATING_{it}$ represents a change in credit rating or outlook, and is the same as used in equation (1). We expect that rating upgrades will calm volatility, while downgrades will fuel it as they lead to greater investor uncertainty. The coefficient of

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the world market index. It is conditioned by world market dividend yield in access of the 30 day Eurodollar rate, the spread between the US 10 year bond and 3-month rates, and the change in the 30-day Eurodollar rate.

$RATING_{it}$ should therefore be of negative sign. X_{kt}^{V} is a vector of control variables that includes controls for the once-lagged local market volatility (*LAGVOL*), the contemporaneous volatility of the world stock market index (*WORLDVOL*), a world risk factor (*WRF*) and the natural log of local stock market trading volume ln(*VOLUME*). We expect current volatility to be positively related to past volatility, world volatility and also trading volume. The coefficients of *LAG VOL, WORLD VOL*, and *VOLUME* should therefore all be positive. Finally, we expect the coefficient of *WRF* to also be positive, as an increase in the level of risk worldwide should contribute to greater volatility of financial flows.

3.2. Modelling disaggregated impact of sovereign rating changes on national market index returns and volatilities

In an extension to models (1) and (2), we break down and compare different types of rating changes according to the various ratings characteristics (shown in columns in Table 1 – Local vs. Foreign currency, ratings vs. outlooks, upgrades vs. downgrades, and also large vs. small) and the *environment* characteristics of the rated sovereigns (shown in rows in Table 1; developed vs. emerging, crisis vs. non-crisis periods, investment vs. non-investment grades, and high vs. low debts). Ideally, the modelling of these different characteristics of the ratings change data would be done in such a way as to minimize overlaps in the definitions of the data. As the various characteristics are not independent (e.g. within emerging markets there are high and low debt markets, and within each of the low and high debt markets there are investment and non-investment divisions, etc., and this subdivision also applied to developed markets as well.), this will lead to too finer division of ratings characteristics leaving insufficient number of observations in some of the cases. Thus, we elected to investigate two broadly identifiable characteristics separately as $RATING_{it}^{a}$ and $RATING_{it}^{b}$ at a time in our analyses. The resulting extended series of models we estimate is shown below[15]:

$$\Delta Y_{it} = \alpha + \beta_1 RATING_{it}^{a} + \beta_2 RATING_{it}^{b} + \sum_k \beta_k X_{kt}^{R} + \varepsilon_{it} \tag{3}$$

The use of two rating change variables allows us to isolate to some extent the impact of certain types of rating events. For example, the specifications of model (3) compare the effect of an upgrade (characteristic *a*) with the effect of a downgrade (characteristic *b*), foreign currency (characteristic *a*) and local currency (characteristic *b*), etc. In total, we estimate eight different specifications of this model, based on the *environmental* and *rating* characteristics we discussed above. The control variables remain the same as the base model for each specification.

Consistent with our analysis of asset returns, we then break down and compare the impact of different types of rating changes according to the framework established in the paper. This is done through the incorporation of a second rating change variable:

$$\sigma_{it}^{2} = \alpha + \beta_1 RATING_{it}^{a} + \beta_2 RATING_{it}^{b} + \sum_k \beta_k X_{kt}^{V} + \varepsilon_{it} \tag{4}$$

The use of two rating change variables allows us to identify asymmetries in the impact of rating changes on volatility. Similar to our analysis of returns, we estimate eight alternate specifications of this model, representing the four *environmental* and four *rating* characteristics highlighted in the previous section. The control variables remain the same for each specification.

[15] An alternative approach to modelling asymmetries is to incorporate slope dummies for each rating characteristic. We attempted this, but the sample size is too small to produce a well functioning model.

4. Empirical results

4.1. Base model – (-1,1) window

The panel estimations measure the contemporaneous response of national financial markets to rating announcements. Table 2 displays the estimation results, using the complete sample of rating changes, for USD, local currency and exchange rate returns and volatility. Panel A reports the estimation results for the two-day holding period returns around the announcement of a sovereign rating change. Referring to the first three results columns, the base model regression investigates the impact of rating changes on the national stock market index, measured in USD. Also included are the control variables for the contemporaneous (*WORLDRET*) and once-lagged world return (*LAG WORLD*) and a world risk factor (*WRF*). The R^2 of 0.1263 is substantially higher than that of previous studies of the stock market impact of sovereign rating changes, indicating that the model has significant explanatory power[16]. The coefficient of *RATING* is positive and significant at 1%. The positive sign is consistent with *a priori* expectations and suggests that a rating upgrade (downgrade) increases (decreases) stock returns. During the event window, a one notch change in credit rating or outlook produces a 0.7 per cent in the USD denominated national stock indices in the direction of the rating change. Since the market reacts significantly to a change in sovereign rating, there is strong initial evidence here to suggest that sovereign ratings provide financial markets with new tradable information.

Consistent with *a priori* expectations, the coefficients of *WORLDRET* and *LAG WORLD* are both positive and significant at 1%. The *WRF* is also positive and significant at 5% in the USD returns. The substantial differences in the magnitude of the coefficients reflect the different scales used to measure each variable. Despite the varying scale, the economic significance of each coefficient is relatively straightforward to interpret. The

[16] Kaminsky and Schmukler (2002), for example, report an R-squared of 0.01.

coefficient of *WORLDRET*, for example, suggests that a 1% increase in the world return increases the USD-denominated stock return by approximately 1.1%. While a 1% increase in the once-lagged world return increases the USD-denominated stock return by approximately 0.41%. In relation to the world risk factor, a one unit change will result in a 12.58% change in USD-denominated stock returns.

If rating changes trigger a general re-assessment of country risk, their impact will also be felt in the foreign exchange market as international investors will reconsider both portfolio and foreign direct investment (FDI) flows[17]. To determine the relative importance of the stock and foreign exchange market responses, we decompose the USD stock return into a local currency stock return and a return on the exchange rate. The results of estimations with local currency stock returns and exchange rate returns as the dependent variables are also reported in Panel A. Since the exchange rates are implied by the relationship between US dollar and local currency stock returns, it should be possible to add the coefficients of the rating change variable for each, so as to get the coefficient of RATING in the USD returns specification[18]. It is revealed that, for both local currency returns and exchange rate returns, the rating change variable is positive and significant at 1% and 5%, respectively. This result is consistent with a priori expectations. In terms of magnitude, a one notch increase (decrease) in rating or outlook resulted in a 0.43% rise (fall) in the local currency stock return and a 0.28% appreciation (depreciation) of the local currency against the USD. Thus, the

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[17] An example of the potential FDI impact is a multinational enterprise which delays the financing of its local operations following a downgrade, thus leading to a currency demand shock. Alternatively, downgrades may cause firms to speed up the repatriation of dividends, thus causing a supply shock.

[18] Exchange rates are measured as ‘implied exchange rates’ to ensure that the appropriate exchange rate observed at the same time as each market’s stock market close is employed. Independent sources such as Datastream report exchange rates at the close of trading in London. However, if the London close does not coincide with the local market close, the exchange rate may incorporate information beyond that provided by the rating change.

significant response of USD stock returns to rating changes are driven by both local stock and foreign exchange markets[19]. Moreover, the breakdown of USD return impact is fairly even between the two markets.

Panel B of Table 2 reports the estimation results for the holding period volatility around rating events. Referring to the first three columns, the base formulation investigates the impact of rating changes on USD stock return volatility. The R^2 of 0.2138 demonstrates that the model has significant explanatory power. The results reveal a significant change in USD stock return volatility at the time of a sovereign rating change. The coefficient of the rating change variable is negative, suggesting that a rating upgrade (downgrade) reduces (increases) volatility – a finding consistent with *a priori* expectations[20]. We interpret this as evidence of a shift in the risk perception of financial markets following a rating change announcement, whereby downgrades fuel contemporaneous volatility and upgrades have a calming effect. The increased volatility around negative rating announcements may be attributed to the heterogeneous nature of market participants. Even if the rating change is observed by all market participants at the same time, volatility may increase because traders may interpret the information differently (Harris and Raviv, 1993). In contrast, upgrades may serve to calm contemporaneous volatility because there is much less uncertainty with regard to the financial market implications.

Consistent with expectations, the coefficients of *LAG VOL*, *WORLD VOL* and *VOLUME* are positive and significant. However, the coefficient of *WRF* is negative and significant at 5%. We expected the sign of *WRF* to be positive, since an increase in the level

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[19] The exchange rate impact is likely to be understated, since a number of countries in the sample maintained fixed exchange rates over the sample period.

[20] Recall that rating upgrades enter the model with a positive (+) sign, while downgrades enter with a negative (-) sign. This explains the negative coefficient for the rating variable.

of world risk should lead to a greater uncertainty amongst investors, thus fuelling volatility. The negative sign is therefore inconsistent with *a priori* expectations. A possible reason for the negative relationship is that the world price of risk is driven by developed market indicators such as the three-month Eurodollar rate and the term structure spread. As risk increases in developed markets, portfolio managers may readjust their portfolios in favour of emerging markets, which are not as highly integrated into the world economy. In doing so, emerging market returns would increase and volatility decrease. Similar to the results from the mean equation, there are substantial differences in the size of the coefficients, reflecting the different scales used to measure each variable. The coefficients are also more difficult to interpret because they no longer represent percentages. Nevertheless, the economic significance of each coefficient can be interpreted as follows. In the case of *WRF*, the negative coefficient implies that a one unit increase in the world risk factor calms volatility by 0.0287. The coefficient of *LAG VOL* indicates that a one unit increase in the lag of volatility contributes 0.859 to current volatility, while a one unit increase in world stock market volatility increases USD stock return volatility by approximately 3.812. Finally, a one unit increase in the natural logarithm of stock market turnover increases USD return volatility by 0.1.

In an attempt to detect the source of the USD stock return volatility, we re-estimate the base model using LC stock return volatility and exchange rate volatility as the dependent variables. The impact of a rating change on LC return volatility is negligible. However, rating changes do have a significant impact on exchange rate volatility. Consistent with *a priori* expectations, the coefficient of the rating change variable is negative, implying that downgrades contribute to exchange rate volatility, while upgrades soothe contemporaneous volatility. These results contrast greatly with our analysis of the first moment of USD stock returns, where rating changes impacted significantly in both the stock and foreign exchange markets. In this case of return volatility, however, the significant rating announcement effect on the USD stock return volatility appears to be driven exclusively by exchange rate volatility. This indicates that rating changes may contribute to capital flight, whereby international investors re-assess both portfolio and FDI flows, thus triggering a large increase in foreign exchange trading volumes[21].

4.2. Disaggregated effects of ratings changes

Having determined that sovereign rating changes do have a significant impact on both USD-denominated stock returns and volatility, we now attempt to reveal more about the *nature* of this impact. Prior research of rating changes at both the corporate and sovereign level has indicated that they may be asymmetric in their impact on financial markets. However, the literature on sovereign credit ratings has failed to document the exact circumstances under which sovereign rating changes will provide markets with new tradable information. We address this deficiency in the literature in this section. In order to reveal more about the nature of sovereign rating changes, we break down the rating change variable according to the *rating* and *environmental* characteristics shown in Table 1. This allows us to isolate the effects of such characteristics on the market impact[22]. The results from these estimations are reported in the panels A and B of Table 3, with the results of hypothesis tests for the

[21] The change in the coefficients of the control variables (in terms of both magnitude and significance) across different estimations is negligible, because the model remains the same except for the division of the rating variable into two.

[22] Despite the detail of the analysis, however, it is still difficult to say with complete certainty what is driving the significance of the rating impact. It is possible to say, for example, that downgrades are more informative than upgrades, and that the rating change impact is amplified in emerging markets and also during crisis periods. But it is difficult to say whether it is only downgrades in emerging markets during crisis periods, which is driving the overall significance, etc. Ideally, it should be possible to construct finer and finer partitions and then draw inference accordingly. However, the limited sample period does not allow such fine partitions.

equivalence of coefficients reported in panel C. In all, there are eight separate specifications, reflecting four rating change characteristics and four environmental characteristics. The control variables remain the same for each regression and the coefficients are not reported here in order to conserve space[23].

4.2.1. Upgrades vs. downgrades

The first estimation examines separately whether the effect of an upgrade differs from that of a downgrade. The Panel A in Table 3 shows that, for USD returns, the coefficient of *DOWNGRADES* is both positive and highly significant. More specifically, a one notch downgrade contributes to a 1.59% fall in the USD national stock market index during the event window, with the impact of the rating change spread evenly across the stock and foreign exchange markets. This is substantially greater than the overall impact reported for the base model (0.7%). Upgrades, on the other hand, appear to have no significant market impact, with the differential between the two significant at 1% as shown in Panel C. It is evident that downgrades are more informative than upgrades.

Analysis of the second moment effects provides further evidence of a differential impact. In the lower half of Panel B, we report the results of the volatility estimations. Consistent with *a priori* expectations, the coefficient of *DOWNGRADES* is negative and significant at 1%. Moreover, the USD return volatility is driven by exchange rate movements, rather than local stock market instability. This is consistent with the base model. On the other hand, upgrades have no discernible impact on the USD stock return volatility, with the differential between upgrades and downgrades statistically significant at 1%.

[23] The change in the coefficients of the control variables (in terms of both magnitude and significance) across different estimations is negligible, because the model remains the same except for the division of the rating variable into two.

The finding that downgrades are more informative than upgrades is consistent with prior research (Holthausen and Leftwich, 1986, Hand et al., 1992, Brooks et al., 2004). There are three possible explanations for this. First, positive rating events may be more accurately anticipated by the market. This anticipation could arise because sovereigns have an incentive to release favourable rating information prior to a rating change. For downgrades, however, the same incentives may not exist, ensuring that downgrades are more informative. The second explanation relates to a potential asymmetric loss function for the rating agencies. Rating agencies may be reluctant to issue downgrades through a fear of losing access to important private information or, alternatively, losing demand for their services (and fee income) (Holthausen and Leftwich, 1986, Gande and Parsley, 2005). Third, institutional investors who are required to maintain specific country allocation according to sovereign ratings are forced to rebalance their allocations when downgrades occur. However, upgrades usually do not trigger reallocation.

4.2.2. Foreign currency ratings vs. local currency ratings

Since sovereigns can monetize their local currency debt there is little likelihood of default. On the other hand, their foreign currency denominated debt must be serviced from their foreign currency earnings. Thus, there is a potential for the differing impact of rating changes in these two types of debts. We compare the impact of foreign currency (FC) and local currency (LC) rating changes in the second specification in Table 3. We find mixed support for a differential financial market response. The coefficient for *FC* is both positive and highly significant, with the impact felt in both the stock and the foreign exchange markets. In contrast, the coefficient of *LC* is insignificantly different from zero. There is thus strong evidence to suggest that foreign currency rating changes provide a stronger signal of the sovereign's creditworthiness than local currency rating changes. However, formal statistical tests reported in Panel C cannot differentiate between the impacts of the two.

With USD return volatility as the dependent variable, the coefficients of both *FC* and *LC* are negative, but only *FC* is significant, and this is driven by the foreign exchange market as in the base case.

4.2.3. Large changes vs. small changes

If ratings provide a signal as to the creditworthiness of a sovereign, we expect the magnitude of the financial market response to be related to the size of the rating change. Therefore, in the third specification, we test whether there is a differential impact for large rating changes (two notches or more) compared with small rating changes (one notch or less). We find mixed support for a differential financial market response. For USD stock returns, the coefficient of *LARGE* is significant at 5%. On the other hand, the coefficient of *SMALL* is of greater magnitude and significant at 1%. There is, however, no statistical evidence of a differential impact between the two. This finding is different from that of the corporate credit rating literature (Hand et al., 1992).

The findings for USD stock return volatility are more consistent with *a priori* expectations. The coefficient of *LARGE* is more significant and of greater magnitude than the coefficient of *SMALL*, providing some evidence that large rating changes have a greater impact on financial market volatility than small changes. The volatility associated with large rating changes suggests that there is a greater degree of heterogeneity in the response of traders to the rating announcement. This may arise because of uncertainty with regard to the implications of the rating change.

4.2.4. Implemented rating changes vs. imminent rating changes (outlook)

We separate the impact of implemented rating changes from that of imminent rating changes (outlooks and Credit Watches). Kaminsky and Schmukler (2002) show that implemented rating changes tended to be preceded by a change in outlook. In this case, actual rating changes may be partially anticipated by financial markets. We find that for USD stock returns, both implemented and imminent rating changes have a significant impact on financial markets. Imminent rating changes produce a 1.2% change in the market index in the direction of the rating change. This is twice the impact of a change in explicit rating (0.6%). Although the difference between the two coefficients is not statistically significant, it is clearly economically significant, providing evidence that implemented rating changes are, to some extent, anticipated because investors are warned of the rating outlook in advance.

In terms of the volatility impact, outlook changes produce no significant response, suggesting that they provide a clear signal to financial markets regarding future changes in a sovereign's creditworthiness. There is, however, a significant amount of volatility associated with implemented rating changes. A possible reason for this is that, although investors may receive advance warning of a rating event (in the form of a change in outlook), there is still uncertainty regarding both the exact size and the timing of the re-rating. This uncertainty is reflected in the volatility associated with implemented rating change announcements.

4.2.5. Emerging markets vs. developed markets

We segment the rating changes according to the income level of the country being rated. The lower half of Panel A reveals that, for USD-denominated stock returns, the rating coefficient for the emerging markets is both positive and highly significant. This is consistent with expectations. On average, a one notch rating change leads to a 0.76 per cent movement in the national market index in the direction of the rating change. Furthermore, the impact is felt in both the stock market and the foreign exchange market. Sovereign rating changes, therefore, appear to have a wide-ranging market impact in emerging markets. For developed markets, however, the financial market response is insignificant, suggesting that emerging market rating changes are more informative.

Analysis of the second moments of USD stock returns provides stronger evidence of a differential response to rating changes across emerging and developed markets. Referring to the lower half of Panel B, it can be seen that only the emerging market coefficients are significant. Moreover, consistent with the base model, the volatility is driven by instability in the exchange rate. Formal hypothesis testing also reveals the differential impact to be statistically significant at 10%.

The finding that emerging markets are more susceptible to sovereign rating changes is consistent with broader research into emerging financial markets which has documented a heightened sensitivity to macroeconomic events in these countries (Calvo and Mendoza, 2000; Chang, Cheng and Khorana, 2000). It is also consistent with prior studies of the bond market reaction to sovereign rating changes (Larrain et al., 1997; Reisen and von Maltzan, 1999). However, this finding has not previously been documented for stock markets.

4.2.6. Crisis vs. non-crisis periods

We also compare the impact of rating changes during crisis periods with those during non-crisis periods[24]. While the rating change variable is positive and significant for both segments, the evidence suggests that the impact of rating changes is amplified during crisis periods. In terms of USD stock returns, a rating change during times of crisis causes a 1.52% change in the national index. During non-crisis periods, this impact is only 0.43%, with the differential being significant at the 5% level. Analysis of the alternative dependent variables

[24] Footnote 3 lists various crisis periods.

yields further insights. During crisis periods, the significance of the USD return impact is driven predominantly by exchange rate movements around the rating event. On the other hand, during non-crisis periods, the significance of the USD stock return is driven exclusively by equity market movements. The importance of exchange rate movements during crisis periods provides evidence that rating downgrades may contribute to capital flight, whereby international investors reconsider their investment in a country as a whole.

Further evidence of a differential impact during crisis and non-crisis periods is provided by the analysis of volatility. The lower half of Panel B shows that the rating change variable for crisis periods is both negative and highly significant. Moreover, the volatility is prevalent in both the foreign exchange market and the domestic stock market. This is the only subset for which rating changes contribute to volatility in local currency stock returns. In contrast, the rating change variable for non-crisis periods is insignificant. As displayed in panel C, statistical testing confirms a differential impact which is significant at 1%. It is therefore apparent that sovereign rating changes contribute to volatility only during crisis periods.

The finding that financial markets are more sensitive to rating announcements during crisis periods is consistent with the models of multiple equilibria, whereby jumps between equilibria are triggered by extraneous events (Masson, 1999). Along these lines, the herding literature has shown that, in the presence of asymmetric information, a new signal that shifts market sentiment from optimism to pessimism can bring about a cascade of sell orders and thus a large movement in price (Bikchandani, Hirshleifer, and Welch, 1992, Lee, 1998). Indeed, traders are likely to be particularly sensitive to macroeconomic news events such as sovereign rating changes during crisis periods because the likelihood of market panic is greater. The findings here are also consistent with Radelet and Sachs (1998), who argue that severe downgrades during crisis periods can cause a country to become isolated from the international economy if its commercial banks become rated below investment grade, thereby amplifying the impact of the rating changes.

4.2.7. Investment grade vs. non-investment grade

Through their analysis of the creditworthiness of a sovereign, rating agencies are providing a *de facto* assessment of the relative health of the domestic economy. We expect that countries with a relatively healthy economy (as proxied by a high credit rating) will be less affected by sovereign rating changes than those with ailing ones (those with low credit ratings). In this context, specification seven in Table 3 compares the rating change impact for investment and non-investment grade sovereigns. For the USD-denominated stock returns, sovereign rating changes have a significant impact regardless of the relative health of the domestic economy. A one notch rating change for an investment grade sovereign results in a 0.76% impact on USD equity returns during the event window, while the corresponding impact for a non-investment grade sovereign is 0.68%. The statistical and economic difference between these two variables is negligible, suggesting that economic health cannot explain cross-sectional variation in the first moment impact of rating changes.

In contrast, a clear differential impact arises in our analysis of volatility. For USD stock return volatility, the coefficient of *NON-INV GRADE* is negative and highly significant. This is consistent with expectations. However, the coefficient of *INV GRADE* is insignificant, with the difference between the two coefficients statistically significant at 5%. The greater volatility response associated with economically vulnerable countries may be attributed to uncertainty regarding the implications of rating changes in these countries. Some have argued that the impact of rating changes will be amplified for non-investment grade countries because of the possibility that a change in sovereign rating will cause a country to become isolated from international markets (Radelet and Sachs, 1998). This uncertainty is reflected in the heterogeneous response of traders to the rating announcement.

4.2.8. High debt countries vs. low debt countries

Finally, we examine whether the impact of rating changes is amplified for countries with a high level of indebtedness. The expectation is that high debt countries would be more sensitive to sovereign rating changes because they face higher borrowing costs. We find mixed support for a differential market response. In relation to USD stock returns, the rating coefficient for low debt countries is positive and highly significant. In terms of magnitude, a one notch rating change results in a 0.82% USD stock return during the event window, with the impact of the rating announcement felt in both the local stock market and the foreign exchange market. On the other hand, rating changes appear to have no discernible impact at the time of the announcement in those countries classified as high debt.

The results from the volatility estimations present quite a contrast. We report that the coefficients of *HIGH DEBT* and *LOW DEBT* are both negative and significant at 1% and 5%, respectively. However, in terms of magnitude, the impact of rating changes on volatility is almost three times greater in high debt countries than low debt countries. This differential is statistically significant at 10%. It is therefore apparent that the volatility impact of rating changes is amplified in countries with high debt. Such a finding could be the result of greater uncertainty amongst traders with regard to the governmental response to the rating change. It is also consistent with Bekaert and Harvey (1997), who argue that leverage effects are most likely to be found in countries with high debt.

4.3. Alternative holding periods

In this section, we investigate alternative event windows around the announcement of rating changes. Such an approach enables a test of two hypotheses. First, Kaminsky and Schmukler (2002) found evidence of market movements prior to rating events – a finding which they interpret as evidence in favour of pro-cyclicality. Examination of alternative holding periods reveals whether this phenomenon is also present in our sample. Second, we can test for a potential delay in response from financial markets following rating changes. The use of alternative event windows also functions as a robustness check for the overall findings. Several alternative two-day windows are examined here. We examined 2-day holding periods starting from day t-7 and ending at day t+3 to ascertain the evolving nature of market responses to rating announcements at day 0. We find significant market responses for the (-3,-1) and (-5,-3) windows in addition to the (-1,1) window discussed in the previous section. We only present summaries of the results of these alternative holding periods to save space. Full analyses of the results including the relevant tables are available from the authors. Table 4 presents the summaries of the *RATING* coefficients from the base models (1) and (2) estimated over the various holding periods ranging from (-7,-5) to (1,3), and Figure 2 provides a graphical summary. As highlighted in the figure, there is no market reaction until 5 days prior to the rating announcement, at which point there is movement in both the stock and foreign exchange markets. The *RATING* coefficients then build in magnitude during each two-day window until reaching a peak at the announcement date. In the period following the announcement window, the rating coefficient reverts back to being insignificant and around zero, providing initial evidence of an efficient response to the rating announcement.

The corresponding results of the evolution of the *RATING* coefficients in the volatility equation over time are displayed graphically in panel B of Figure 2. The figure reveals an initial spike in volatility around five days prior to the rating announcement, coinciding with the first movement in asset returns. During the (-3,-1) window, however, volatility drops off, despite the continued movement in the mean. Volatility then peaks as the rating announcement is made, before once again dissipating in the period after the announcement.

A significant market response in the lead-up to a sovereign rating change contrasts with the findings of Brooks et al. (2004), who find no significant impact before either upgrades or downgrades. Such a finding is, however, consistent with Kaminsky and Schmukler (2002). Using event study methodology, they find that the stock market response begins as far as 10 days prior to the rating event and interpret this as evidence of rating agencies behaving pro-cyclically. In contrast with Kaminsky and Schmukler (2002), we report that the impact of a rating change is only felt in the five days prior to the rating change. This seems difficult to reconcile with arguments of pro-cyclical behaviour, since it is unlikely that rating agencies would consistently review their ratings based on a four-day market trend. Instead, the movement of asset prices in the days preceding a rating change is more consistent with market anticipation arising from information leakage. Such an explanation is also consistent with the volatility detected during the pre-announcement period. Since rating changes are generally unscheduled events, the unexpected rise in volatility in the (-5,-3) window suggests that there is some information leakage, which is stimulating trading and thus volatility.

If the market is efficient, price adjustments to sovereign rating changes should occur with sufficient speed to disallow arbitrage opportunities. The efficiency of the market can therefore be estimated by investigating the speed of adjustment to rating changes. The results from estimations using the (1,3) event window revealed the impact of rating changes to be insignificant. Indeed, referring to Figure 2, it can be seen that the market response drops off following the (-1,1) announcement window. Moreover, rating changes have no significant impact on local currency stock returns, exchange rate returns or volatility, suggesting that, by the close of the (-1,1) window, markets have fully adjusted to the information inherent in the rating change. We interpret this as evidence of market efficiency in relation to sovereign rating changes.

5. Conclusion

International credit rating agencies have been heavily criticised for their role during the recent Asian financial crisis. Some have argued that they failed to predict the crisis, were too slow to react and, once they did react, their actions intensified the crisis (Radelet and Sachs, 1998). Such arguments are, however, largely based on anecdotal evidence. To show that rating agencies can amplify international crises, two necessary conditions must be satisfied. First, sovereign ratings must provide financial markets with new information. Consequently, rating change announcements must cause a significant market reaction. Second, sovereign ratings must lag behind financial markets. In this case, rating changes will not provide investors with early warning of a crisis. Moreover, once a crisis begins, informative rating downgrades may serve to reinforce negative market sentiment and contribute to panic. The primary objective of this paper is to specifically address the first of these criteria, asking the question: *do sovereign ratings provide financial markets with new information?* The issue was investigated by measuring the pre- and post announcement as well as the contemporaneous responses of financial markets to rating changes.

The key findings of this paper are as follows. First, the overall impact of sovereign rating changes on US dollar-denominated national stock market returns and volatility is highly significant, providing strong support for the hypothesis that ratings provide financial markets with new tradable information. Furthermore, we find that the impact of rating changes is felt across both the stock market and the foreign exchange market, indicating that rating changes may contribute to capital flight. However, the significant volatility responses of the USD denominated stock returns are shown to be driven solely by the foreign exchange market volatility. Second, the impact of sovereign rating changes on the national stock market return and return volatility is asymmetric, with strong evidence that the effects are amplified for downgrades, foreign currency debt, in emerging markets, and during crisis periods. We also present some evidence that the rating impact is greater for high debt countries changes. Third, we show that the national financial markets are efficient with respect to their response to rating changes, with no impact felt beyond the announcement window. Finally, we identify a significant market impact associated with rating changes from as early as five days prior to the announcement date. We interpret this as evidence of market anticipation, arising from information leakage. In all, the primary contribution of this paper has been to shed light on the role of rating agencies in international financial markets. The comprehensiveness of the dataset and the uniqueness of the modelling approach ensure that this paper is a valuable addition to the literature.

There are various implications of the results we report. First, in terms of financial theory, we present strong empirical support for the hypothesis that sovereign ratings contain new information – a finding which should act to ‘pierce the fog’ that has characterised research to date. Second, in a practical sense, the findings have value for international portfolio managers, particularly those who invest in emerging markets. Portfolio managers require an understanding of how country risk re-assessments, in the form of rating changes, will impact on their portfolios. Overall, the breadth and depth of this analysis has enabled a much greater understanding of the nature of the rating change impact, revealing not only that rating changes can have a significant market impact, but that the impact may be asymmetric. The improved understanding of sovereign rating changes places portfolio managers in a stronger position to manage them in the future. Finally, the findings in this paper are of critical importance from an international policy perspective. The fact that sovereign rating changes elicit a significant market response suggests that they have the capability to intensify and prolong or, on the other hand, mitigate financial crises. We have also shown that the impact of rating changes is amplified during crisis periods. Such findings could be interpreted as support for arguments that rating agencies intensified the Asian crisis. However, before one can say with certainty that this was the case, it must be shown that rating agencies lag financial markets. This should now form the focus of future research. On a more positive note, the findings of this research also have important implications for the new Basel Accord on Bank Capital Requirements. In the new Accord, the Bank for International Settlements (BIS) has increased the scope for the use of external credit ratings in assessing risk-weighted capital requirements (Basel Committee, 2003). Since this paper has shown that sovereign ratings contain new information, it may be that the incorporation of external credit ratings into the capital adequacy framework will improve the prudential regulation of banks worldwide.

References

Bekaert, G., and C. Harvey, 1997, Emerging equity market volatility, Journal of Financial Economics 43, 29-77.

Bikchandani, S., D. Hirshleifer and I. Welch, 1992, A theory of fads, fashion, custom, and cultural change as informational cascades. Journal of Political Economy 100, 992-1026.

BIS, 2003. Basel Committee on Banking Supervision, Consultative Document: Overview of The New Basel Capital Accord. April,

Brooks, R., R. Faff, D. Hillier and J. Hillier, 2004, The national market impact of sovereign rating changes, Journal of Banking and Finance 28, 233-250.

Calvo, G. and E. Mendoza, 2000, Rational contagion and the globalization of securities markets, Journal of International Economics 51, 79-113.

Cantor, R. and F. Packer, 1996, Determinants and impact of sovereign credit ratings, FRBNY Economic Policy Review October, 37-54.

Chang, E., J. Cheng and A. Khorana, 2000, An examination of herd behavior in equity markets: an international perspective, Journal of Banking and Finance 24, 1651-1679.

Ferreira, M. and P. Gama, 2007, Does sovereign debt ratings news spill over to international stock markets?, Journal of Banking and Finance, Forthcoming.

Ferri, G., L. Liu and J. Stiglitz, 1999, The procyclical role of rating agencies: evidence from the east Asian crisis, Economic Notes 28, 335-355.

Gande, A., and D. Parsley, 2005, News spillovers in the sovereign debt market, Journal of Financial Economics 75, 691-734.

Hand, J., R. Holthausen and R. Leftwich, 1992, The effect of bond rating agency announcements on bond and stock prices, Journal of Finance 47, 733-752.

Harris, M. and A. Raviv, 1993, Differences of opinion make a horse race, Review of Financial Studies 6, 473-506.

Holthausen, R. and R. Leftwich, 1986, The effect of bond rating changes on common stock prices, Journal of Financial Economics 17, 57-89.

Kaminsky, G. and S. Schmukler, 2002, Emerging markets instability: do sovereign credit ratings affect country risk and stock returns? World Bank Economic Review, 16, 171-195.

Larrain, G., H. Reisen and J. von Maltzan, 1997, Emerging market risk and sovereign credit ratings. OECD Development Centre Technical Paper 124, April 1997,

Lin, H. and M. McNichols, 1998, Underwriting relationships, analysts forecasts and investment recommendations, Journal of Accounting and Economics 25, 101-127.

Masson, P., 1999, Multiple equilibria, contagion and the emerging market crises. Working Paper, International Monetary Fund,

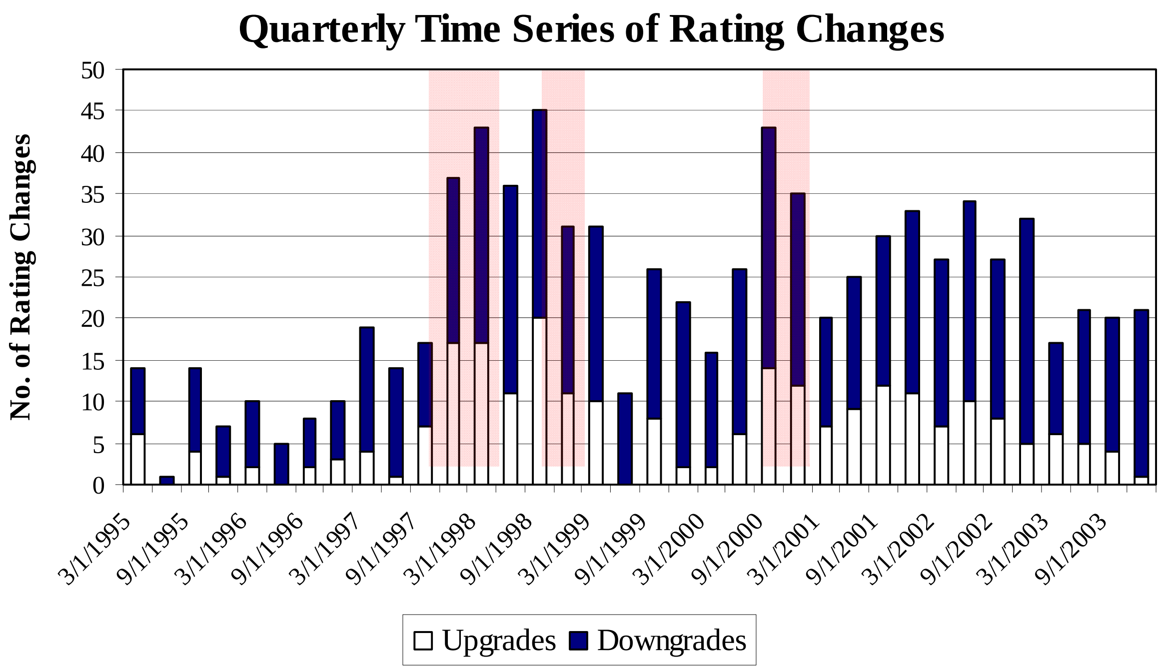
Matolscy, Z. and T. Lianto, 1995, The incremental information content of bond rating revisions: the Australian evidenc,. Journal of Banking and Finance 19, 891-902.

Michaely, R. and K. Womack, 1999, Conflict of interest and the credibility of underwriter analyst recommendations, Review of Financial Studies 12, 653-686.

Radelet, S. and J. Sachs, 1998, The onset of the east Asian financial crisis. NBER Working Paper 6680, August,

Reisen, H. and J. von Maltzan, 1999, Boom and bust and sovereign ratings. OECD Development Centre Technical Paper No. 148, June,

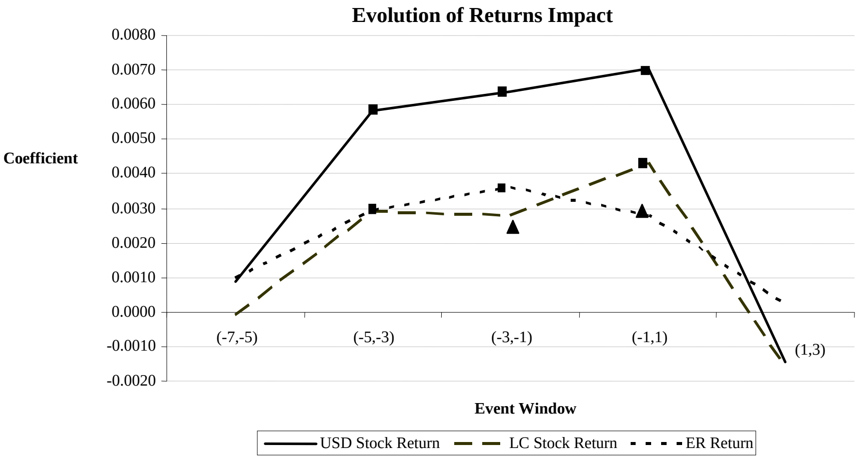
Figure 1 – Quarterly Time Series of Sovereign Rating Changes for All Countries



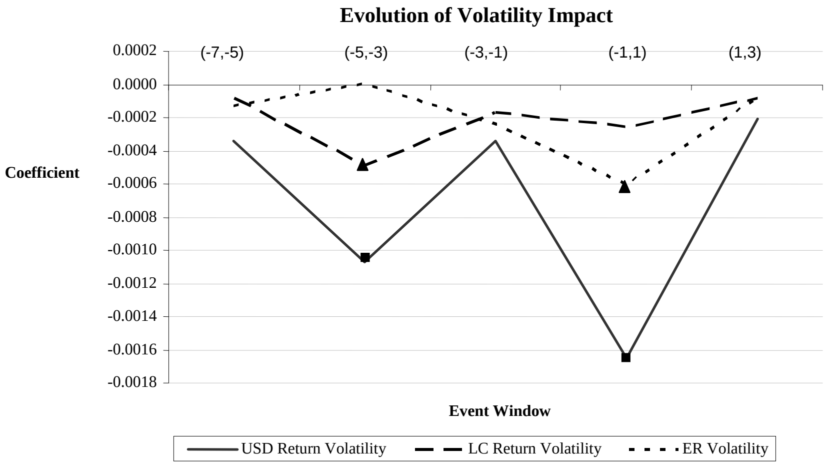
Note: The shaded areas are the crisis periods of the Asian crisis (3rd quarter 1997-1st quarter 1998), the Russian crisis (3rd quarter 1998-4th quarter 1998), the Brazilian crisis (1st quarter 1999), the Turkey crisis (4th quarter 2000-1st quarter 2001), and the Argentina crisis 3rd quarter 2001-4th quarter 2001).

Figure 2 - Evolution of Rating Change Impact over Alternate Event Windows

Panel A: Returns



Panel B: Volatility



LEGEND

▲ Significant at 5% level

■ Significant at 1% level

Table 1: Summary Statistics - Rating Sample (1995-2003)

Panel A - Cross-Sectional Distribution

	Foreign Currency Ratings					Local Currency Ratings					Overall			
	Ratings		Outlooks			Ratings		Outlooks						
	Upgrades	Downgrades	Upgrades	Downgrades	Total	Upgrades	Downgrades	Upgrades	Downgrades	Total	Upgrades	Downgrades	Total	Up/Down
Complete Sample	176	106	181	133	596	10	12	4	5	31	371	256	627	1.45
Developed Markets	61	12	41	19	133	1	4	0	4	9	103	39	142	2.64
Emerging Markets	115	94	140	114	463	9	8	4	1	22	268	217	485	1.24
Crisis Periods	26	46	33	45	150	2	2	0	2	6	61	95	156	0.64
Non-Crisis Periods	150	60	148	88	446	8	10	4	3	25	310	161	471	1.93
Investment Grade	121	31	95	58	305	2	11	1	5	19	219	105	324	2.09
Non-Investment Grade	55	75	86	75	291	8	1	3	0	12	152	151	303	1.01
High Debt	26	39	37	38	140	3	0	1	0	4	67	77	144	0.87
Low Debt	150	67	144	95	456	7	12	3	5	27	304	179	483	1.70

Panel B - Geographic Distribution

Region		Number of Countries	Upgrades	Downgrades	Total	Average
Latin America	Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela	7	62	70	132	18.9
Middle East & Africa	Egypt, Israel, Jordan, Oman and South Africa	5	27	18	45	9.0
Asia (ex. Japan)	China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Singapore, Taiwan and Thailand	11	99	91	190	17.3
Eastern Europe	Czech Republic, Hungary, Poland, Russia, Turkey and the Slovak Republic	6	88	43	131	21.8
Western Europe	Belgium, Denmark, Finland, Greece, Ireland, Italy, Portugal, Spain and Sweden	9	74	11	85	9.4
Pacific	Australia, Canada, Japan and New Zealand	4	21	23	44	11.0
Total		42	371	256	627	14.9

Table 2 - Results for Base Model using (-1,1) Event Window

The table reports the results of estimations using the complete sample of rating changes over a (-1,1) event window. Panel A reports the results of random effects regressions on the USD and LC-denominated returns and also exchange rate returns. Panel B reports the corresponding results using the volatility of each asset as the dependent variable. A constant is estimated but not reported. For extensions 1-8, the control variables remain the same as the base model, but the coefficients are not reported.

Panel A - Complete Sample - Returns

Specification: $\Delta Y_{it} = \alpha + \beta_1 RATING_{it} + \sum_k \beta_k X_k + \varepsilon_{it}$

		USD Returns				LC Returns				ER Returns			
		Coef.		p-value	r-sq.	Coef.		p-value	r-sq.	Coef.		p-value	r-sq.
Base Model	Rating	0.0070	***	(0.000)	0.1263	0.0043	***	(0.001)	0.1425	0.0028	**	(0.016)	0.0288
	World Ret	1.1098	***	(0.000)		0.8506	***	(0.000)		0.2799	***	(0.003)	
	Lag World	0.4101	***	(0.004)		0.3279	***	(0.001)		0.1126		(0.215)	
	WRF	0.1258	**	(0.018)		0.1008	***	(0.006)		0.0299		(0.378)	

Panel B - Complete Sample - Volatility

Specification $\sigma^2_{it} = \alpha + \beta_1 RATING_{it} + \sum_k \beta_k X_k + \varepsilon_{it}$

		USD Volatility				LC Volatility				ER Volatility			
		Coef.		p-value	r-sq.	Coef.		p-value	r-sq.	Coef.		p-value	r-sq.
Base Model	Rating	-0.0017	***	(0.001)	0.2138	-0.0003		(0.225)	0.1888	-0.0006	**	(0.031)	0.2238
	World Vol	3.8121	**	(0.015)		1.8566	***	(0.008)		0.2555		(0.782)	
	Lag Vol	0.8590	***	(0.000)		0.7218	***	(0.000)		1.2715	***	(0.000)	
	WRF	-0.0287	**	(0.045)		-0.0110	*	(0.084)		-0.0117		(0.163)	
	Volume	0.0010	***	(0.000)		0.0004	***	(0.000)		0.0004	***	(0.003)	

Table 3 - Results for Extended Model using (-1,1) Event Window

The table reports the results of estimations of various aspects of rating changes over a (-1,1) event window. Panel A reports the results of random effects regressions on the USD and LC-denominated returns and also exchange rate returns. Panel B reports the corresponding results using the volatility of each asset as the dependent variable. A constant is estimated but not reported. The control variables remain the same as the base model, but the coefficients are not reported. Panel C reports the hypothesis testing of equality of two ratings coefficients. The Hausman Test is for the appropriateness of random effects. Under the null hypothesis, the random effects model is consistent and efficient. The Wald Test is for the joint significance of the model. Significance at the 1%, 5% and 10% levels are represented by ***, **, * respectively.

Panel A - Returns

Specification: $$\Delta Y_{it} = \alpha + \beta_1 RATING_{it}^{a} + \beta_2 RATING_{it}^{b} + \sum_k \beta_k X_{kt}^{R} + \varepsilon_{it}$$

		USD Returns			LC Returns			ER Returns		
		Coef.	p-value	r-sq.	Coef.	p-value	r-sq.	Coef.	p-value	r-sq.
(1)	Upgrades	0.0001	(0.985)	0.1358	0.0014	(0.536)	0.1459	-0.0013	(0.536)	0.0376
	Downgrades	0.0159 ***	(0.000)		0.0080 ***	(0.003)		0.0079 ***	(0.001)	
(2)	FC	0.0074 ***	(0.000)	0.1272	0.0042 ***	(0.001)	0.1427	0.0033 ***	(0.006)	0.0340
	LC	0.0001	(0.987)		0.0068	(0.260)		-0.0071	(0.198)	
(3)	Large	0.0059 **	(0.012)	0.1271	0.0043 ***	(0.008)	0.1425	0.0014	(0.334)	0.0319
	Small	0.0088 ***	(0.002)		0.0043 **	(0.032)		0.0048 ***	(0.009)	
(4)	Ratings	0.0061 ***	(0.002)	0.1282	0.0033 **	(0.016)	0.1473	0.0028 **	(0.029)	0.0288
	Outlook	0.0118 ***	(0.008)		0.0096 ***	(0.002)		0.0030	(0.303)	
(5)	Emerging	0.0076 ***	(0.000)	0.1273	0.0047 ***	(0.001)	0.1434	0.0030 **	(0.017)	0.0291
	Developed	0.0034	(0.484)		0.0018	(0.579)		0.0015	(0.616)	
(6)	Crisis	0.0152 ***	(0.000)	0.1349	0.0054 **	(0.037)	0.1428	0.0099 ***	(0.000)	0.0470
	Non-Crisis	0.0043 **	(0.041)		0.0039 ***	(0.008)		0.0004	(0.753)	
(7)	Inv. Grade	0.0076 **	(0.017)	0.1264	0.0050 **	(0.022)	0.1427	0.0023	(0.248)	0.0289
	Non-Inv. Grade	0.0068 ***	(0.003)		0.0039 **	(0.011)		0.0030 **	(0.034)	
(8)	High Debt	0.0042	(0.224)	0.1277	0.0037	(0.116)	0.1426	0.0004	(0.847)	0.0313
	Low Debt	0.0082 ***	(0.000)		0.0045 ***	(0.003)		0.0038 ***	(0.007)	

Panel B - Volatilities

Specification: $$\sigma_{it}^{2} = \alpha + \beta_1 RATING_{it}^{a} + \beta_2 RATING_{it}^{b} + \sum_k \beta_k X_{kt}^{V} + \varepsilon_{it}$$

		USD Volatility			LC Volatility			ER Volatility		
		Coef.	p-value	r-sq.	Coef.	p-value	r-sq.	Coef.	p-value	r-sq.
(1)	Upgrades	0.0001	(0.868)	0.2243	-0.0002	(0.552)	0.1888	0.0000	(0.973)	0.2275
	Downgrades	-0.0042 ***	(0.000)		-0.0003	(0.499)		-0.0015 **	(0.016)	
(2)	FC	-0.0017 ***	(0.001)	0.2140	-0.0002	(0.293)	0.1565	-0.0006 **	(0.029)	0.2239
	LC	-0.0008	(0.719)		0.0000	(0.998)		-0.0002	(0.877)	
(3)	Large	-0.0019 ***	(0.002)	0.2144	-0.0004	(0.152)	0.1897	-0.0005	(0.154)	0.2241
	Small	-0.0013 *	(0.100)		-0.0001	(0.881)		-0.0008 *	(0.087)	
(4)	Ratings	-0.0017 ***	(0.001)	0.2138	-0.0003	(0.144)	0.1900	-0.0001	(0.937)	0.2206
	Outlook	-0.0014	(0.223)		0.0002	(0.749)		-0.0011	(0.117)	
(5)	Emerging	-0.0020 ***	(0.000)	0.2181	-0.0003	(0.230)	0.1571	-0.0007 **	(0.014)	0.2258
	Developed	0.0003	(0.795)		0.0001	(0.829)		0.0002	(0.795)	
(6)	Crisis	-0.0063 ***	(0.000)	0.2559	-0.0012 ***	(0.005)	0.1984	-0.0023 ***	(0.000)	0.2388
	Non-Crisis	-0.0001	(0.798)		0.0001	(0.792)		-0.0001	(0.800)	
(7)	Inv. Grade	-0.0002	(0.833)	0.2213	-0.0001	(0.884)	0.1569	0.0004	(0.358)	0.2345
	Non-Inv. Grade	-0.0024 ***	(0.000)		-0.0003	(0.244)		-0.0012 ***	(0.001)	
(8)	High Debt	-0.0031 ***	(0.001)	0.2185	-0.0005	(0.202)	0.1897	-0.0012 **	(0.028)	0.2260
	Low Debt	-0.0011 **	(0.043)		-0.0002	(0.523)		-0.0004	(0.226)	

Table 3 - Results for Extended Model using (-1,1) Event Window - Continued

Panel C - Results of Hypothesis Tests for the Equality of Parameters using (-1,1) Window

We report below the p-values of Wald tests of the equality of parameters in each model. Under the null hypothesis, the difference between the two coefficients is zero. The left hand side reports results of hypothesis tests from each of the returns specifications, the right hand side reports the results of hypothesis tests from each of the volatility specifications. Significance at the 1%, 5% and 10% levels are represented by ***, **, * respectively.

Specification		USD Returns	LC Returns	ER Returns	USD Volatility	LC Volatility	ER Volatility
		p-value	p-value	p-value	p-value	p-value	p-value
(1)	Upgrades Downgrades	(0.009) ***	(0.117)	(0.017) **	(0.007) ***	(0.894)	(0.109)
(2)	FC LC	(0.415)	(0.675)	(0.066) *	(0.700)	(0.820)	(0.259)
(3)	Large Small	(0.442)	(0.994)	(0.154)	(0.518)	(0.439)	(0.648)
(4)	Ratings Outlook	(0.242)	(0.062) *	(0.951)	(0.843)	(0.376)	(0.752)
(5)	Emerging Developed	(0.410)	(0.427)	(0.658)	(0.085) *	(0.508)	(0.235)
(6)	Crisis Non-Crisis	(0.013) **	(0.624)	(0.001) ***	(0.000) ***	(0.011) **	(0.001) ***
(7)	Inv. Grade Non-Inv. Grade	(0.840)	(0.692)	(0.773)	(0.023) **	(0.569)	(0.006) ***
(8)	High Debt Low Debt	(0.321)	(0.780)	(0.198)	(0.071) *	(0.451)	(0.211)

Table 4 – Summary of Results for Base Model using Multiple Event Window

We report the coefficient for the *RATING* in the base model of equations (1) and (2) over 2-day windows starting at 7 days prior to the ratings announcements and ending at 3 days after.

Panel A - Returns

	USD Returns		LC Returns		ER Returns	
Window	Coef.	p-value	Coef.	p-value	Coef.	p-value
(-7,-5)	0.0009	(0.506)	-0.0001	(0.935)	0.0010	(0.150)
(-5,-3)	0.0058 ***	(0.000)	0.0029 **	(0.013)	0.0029 ***	(0.004)
(-3,-1)	0.0064 ***	(0.000)	0.0028 **	(0.013)	0.0036 ***	(0.000)
(-1,+1)	0.0070 ***	(0.000)	0.0043 ***	(0.001)	0.0028 **	(0.016)
(+1,+3)	-0.0015	(0.300)	-0.0016	(0.158)	0.0002	(0.762)

Panel B - Volatilities

	USD Volatility		LC Volatility		ER Volatility	
Window	Coef.	p-value	Coef.	p-value	Coef.	p-value
(-7,-5)	-0.0003 ***	(0.214)	-0.0001	(0.364)	-0.0001 *	(0.067)
(-5,-3)	-0.0011 ***	(0.000)	-0.0005 *	(0.091)	0.0000	(0.300)
(-3,-1)	-0.0003	(0.118)	-0.0002	(0.153)	-0.0002	(0.500)
(-1,+1)	-0.0017 ***	(0.001)	-0.0003	(0.225)	-0.0006 **	(0.031)
(+1,+3)	-0.0002	(0.290)	-0.0001 *	(0.391)	0.0000 ***	(0.403)