Sovereign Debt Rating Changes and the Stock Market*

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Abstract

We use an event-study methodology to analyze the effect of sovereign debt rating changes on daily stock market returns around the world. We find evidence that the stock market moves before the public announcement of a sovereign rating downgrade, resulting in a significant market reaction prior to the event, weak reaction at the event and a mild correction after the event. The results are much weaker for upgrades. Using instrumental variables techniques we build a causal case to argue that these findings are more pronounced in non-developed markets, in countries with civil (relative to common) law systems, lower measures of law and order institutional quality, and higher measures of corruption.

JEL Classification: G14, G15, G24.

Key Words: sovereign ratings, event studies, international finance, institutional quality.

1 Introduction

Rating agencies, their actions and the effects these actions have on yields, returns and government policies have become an important topic of discussion among market participants and regulators in the last twenty years. The global financial crisis of 2008 and the Euro area sovereign debt crisis of 2011 have only served to heighten the intensity of the discussion. As an illustration of the potential effects that rating changes might have, Figure 1 plots the Dow Jones cumulative raw daily returns 20 trading days before, and 20 trading days after, the August 5th 2011 Standard and Poor's (S&P) U.S. government debt downgrade. The Figure provides motivation for two hypotheses. First, the drop in the stock market started 10 days before the actual downgrade. Second, the change in stock market returns was economically significant.

Our purpose is to empirically investigate whether the case for the U.S. is an exception, or whether it is a more widespread phenomenon around the world. It should be noted that anecdotal evidence in the popular press (Wall Street Journal, September 20th, 2011) indicates that information about the imminent U.S. downgrade leaked to the market before the actual announcement. Moreover, the U.S. Securities and Exchange Commission (SEC) launched an investigation regarding the potential leakage of information before the downgrade.[1] If rating announcements in a tightly regulated/monitored capital market such as the American one generate "concerns" (according to the SEC), then rating announcements might generate

[1] In the SEC's September 30th 2011 summary report after examining ten rating agencies under its oversight, the SEC identified a number of concerns: "These concerns included apparent failures in some instances to follow ratings methodologies and procedures, to make timely and accurate disclosures, to establish effective internal control structures for the rating process and to adequately manage conflicts of interest."

even more “concerns” in other less-regulated/monitored capital markets. Our main purpose is to investigate empirically stock market reactions around rating agency announcements around the world, motivated by the SEC investigation.

To achieve this goal, we employ an event-study methodology to examine local, daily, stock market reactions to sovereign debt rating changes around the world. We are interested in possible abnormal local stock market returns before, at and after the public announcement of rating changes. To test our hypothesis we collect the universe of changes in sovereign debt ratings by Fitch, Moody's and Standard & Poor's (S&P) from February 1988 to August 2011. We focus on the three largest credit-rating agencies, both because these agencies hold a substantial fraction of market power in the industry, but also because they have recently come under intense scrutiny in the market for corporate bond ratings (SEC, 2003; Beaver et al., 2006; SEC, 2008; Cheng and Neamtiu, 2009).

For each country rated by either of the three rating agencies, we collect daily data of that country's local stock market return. Using short-horizon event study analysis, which is "relatively straightforward and trouble-free" according to the recent excellent survey by Kothari and Warner (2007) on the econometrics of event studies, we examine the behavior of local stock returns twenty days before, and twenty days after, each announcement. We do so using both raw and cumulative raw returns and also after adjusting these returns using a world CAPM index return.

Moreover, to mitigate the problem arising from simultaneous rating actions across agencies, we construct our preferred definition of an event that takes into account the rating agency that moves first in making a public announcement. Intuitively, we view the first change as more important for the stock market than changes that might occur soon after the initial move. To address this problem, we construct a universal rating agency representing the "first mover" of the three rating agencies. This universal agency defines our event in the baseline case: the event stays in the sample if it is not preceded by a rating change by that or another rating agency in the thirty trading days prior to the event (we do experiment and find consistent results with shorter windows).

We find statistically and economically significant movements in sovereign index returns for the periods before, at, and after the actual announcements of sovereign debt rating downgrades. The pre-announcement negative abnormal returns are sizable and strongly statistically significant, while the announcement effects are statistically weaker. The negative abnormal returns are largely reversed in the post-announcement period, generating a cumulative abnormal return graph with a near "V" shape around the event. Overall, for our sample of downgrades, the pre-announcement and announcement evidence is consistent with either a leakage of information in the days prior to the announcement of the rating downgrade or an anticipation of not only the downgrade, but its approximate timing as well. The post-announcement positive market reaction points to an over-reaction in the pre-announcement period and a correction after the dust of the announcement settles.

For upgrades there appears to be weaker evidence of information leakage or anticipation of the announcement and a stronger, statistically significant, announcement effect in the predicted direction. However, the post-announcement period exhibits a significant reversal of the documented announcement effect. The economic significance of the market reaction to upgrades appears to be significantly muted relative to the market reaction to downgrades consistent with findings in the corporate bond ratings' literature (Holthausen and Leftwich, 1986; Hand et al., 1992; Ederington and Goh, 1998). This is also consistent with evidence in the accounting literature of asymmetric market reaction to surprise negative earnings relative to positive earnings announcements (Skinner, 1994; Soffer, Thiagarajan, and Walther, 2000; Hutton, Miller, and Skinner, 2003; Anilowski, Feng, and Skinner, 2007; Kothari, Shu, and Wysocki, 2010).

The finding that downgrades are statistically more significant than upgrades indicates that perhaps the variance during the event-window might be higher than the one used in the statistical tests, especially since downgrades are most likely to occur during a recession. Using a lower variance than the true one will bias the results in our favor when doing statistical significance testing. To guard against that possibility we take a conservative approach and report statistics based on metrics that take into account event-induced variance. The results are also robust to changing the event-window size, bootstrapping standard errors, and performing different statistical tests as outlined in Kolari and Pynnonen (2010). We also exclude periods of high volatility in financial markets (for instance, the post-2008 global financial crisis period) and our results are unchanged.

Cross-sectional differences across countries can help us identify any potential link between institutional quality and abnormal stock returns. We proceed in two steps. In the first step we do not worry about endogeneity and try to determine whether there are observable characteristics across countries that correlate strongly with these results. In the second step we build a causal story linking country characteristics and abnormal stock return behavior. Starting with the first step, we conduct event studies separately for developed versus non-developed economies. We find that the results are largely driven by the events in non-developed countries. Moreover, countries with civil (relative to common) law seem to generate this abnormal stock return pattern more often in the data, consistent with the conclusions in the excellent survey by La Porta et al. (2008). We also sort countries according to law and order quality, different measures of corruption and an investor protection index. Our results illustrate that the quality of the institutional framework correlates with stock market abnormal returns during sovereign debt downgrades.

In the second step we move away from correlations to build a causal story. Specifically, we identify appropriate instrumental variables to resolve endogeneity problems from running cumulative abnormal return regressions on variables like law and order or the level of corruption. The instrumental variables we use are combinations of recently used variables in the literature proxying for institutional quality. Specifically, we use the origin of the local legal system (La Porta et al., 2008), ethnic and religious fractionalization (Alesina et. al., 2003) and a zero-one indicator for the country being landlocked (Easterly and Levine, 2003). The chosen instruments pass weak instrumental variable tests and the final regressions the over-identification Sargan/Hansen test statistic. Our results provide evidence for a causal relation between institutional quality and stock market reaction before and after a downgrade announcement: the coefficients in the regression are statistically significant and have the expected sign.

The causal estimates are also economically significant. Less developed countries generate cumulative average abnormal returns ($CAARs$) of about 3.5% (p-value of 0.061) lower than those in developed countries in the pre-announcement period (from five days before to three days before the announcement; $CAAR[-5,-3]$). Moreover, a one-standard deviation decrease in the (transparency international) corruption index score gives a 1.3% (p-value of 0.019) decrease in $CAAR[-5,-3]$, while the Law & Order variable indicates an overall decrease in the $CAAR$ of 1.2% (p-value of 0.030) when the score decreases by one standard deviation.

One possible explanation for these findings is that information leaks to the market before the public announcement. Another explanation is that the market anticipates the event through other public information sources. Our results seem more consistent with the leakage of information about the content and timing of the pending announcement rather than the market anticipation story. We take that view because the presence of significant negative pre-event abnormal returns predominantly in low institutional quality markets points to actions that raise "concerns," since it is hard to justify that markets with low institutional quality are better at anticipating credit rating actions.

Why should we care about these empirical findings? There has been increasing regulatory activity related to rating agencies (2002 Sarbanes-Oxley Act section 702 (b); 2006 Credit Rating Agency Duopoly Relief Act). The abnormal stock return pattern and the characteristics of the countries where this pattern is more pronounced raise concerns about capital market regulation around the public announcement of downgrades. Our results indicate that rating agencies and capital market regulators need to take measures to prevent potential leakage of information before the actual announcement takes place. Regulators in countries with lower indicators of institutional quality seem to be the ones that should be worrying the most about information leakage.

The literature on the effects of sovereign debt downgrades on stock markets is relatively nascent and recent. Kaminsky and Schmukler (2002) analyze the issue in a similar fashion but we differ by having a more extended data set (both in terms of country and time coverage) and explicitly making the connection between the potential for leakage of information ahead of a rating announcement and the quality of institutions. A recent paper by Brooks et al. (2004) also finds (for data up to 2001) a negative effect of rating downgrades on stock returns, but we differ by emphasizing that in our empirical results (which go up to 2011) the effect seems to show up earlier than the actual announcement. Martell (2005) and Hill and Faff (2010) also find evidence for movements in stock returns before ratings announcements. We differ from both papers primarily because we argue for a causal link between sovereign institutional quality and stock market reaction before and after ratings downgrades.

The remainder of the paper is organized as follows. In Section 2, we present descriptive statistics on the assembled data set. In section 3 we present our empirical results and perform robustness checks. In Section 4 we examine how our results differ across institutional regimes. Section 5 concludes.

2 Data and Descriptive Statistics

We download historical sovereign ratings data from the websites of Fitch, Moody's and S&P. S&P and Fitch publish letter ratings corresponding to the same scale. Moody's uses letter grades that are slightly different. Following prior articles in the bond rating literature (Johnson, 2004 and Beaver et al. 2006 among others), we transform letter grades by S&P and Fitch (Moody's) as follows: "AAA" (Aaa) = 1; "AA+" (Aa1) = 2; "AA" (Aa2) = 3;

"AA-" (Aa3) = 4; "A+" (A1) = 5; "A" (A2) = 6; "A-" (A3) = 7; "BBB+" (Baa1) = 8; "BBB" (Baa2) = 9; "BBB-" (Baa3) = 10; "BB+" (Ba1) = 11; "BB" (Ba2) = 12; "BB-" (Ba3) = 13; "B+" (B1) = 14; "B" (B2) = 15; "B-" (B3) = 16; "CCC+" (Caa1) = 17; "CCC" (Caa2) = 18; "CCC-" (Caa3) = 19; "CC" (Ca) = 20; "C" (C) = 21. In the case of default, restricted default or other action associated with a sovereign in financial distress (i.e. ratings of D, RD, SD e.t.c.) we assign the number 22.

We identify changes in (local and foreign currency) ratings by comparing successive letter grades for each country. We find 317, 617 and 437 changes in ratings for Fitch, Moody's and S&P that begin in 1994, 1986 and 1982, respectively. To test market reactions around the announcement of ratings changes, we match the union of these ratings changes with the panel of daily prices for each country's local currency index and also the World MSCI index from Datastream. Our analysis begins with the earliest date of the world MSCI index (01/01/1988) and ends on 21/09/2011. After removing duplicate observations (i.e. changes in ratings happening on the same day) and observations with no index return data, the sample of changes in ratings comprises 849 observations (486 upgrades and 363 downgrades) for 65 countries.

Figure 2, Panel A reports the total number of changes in sovereign debt ratings for the three largest agencies (Fitch, Moody's and S&P) from February 1989 to August 2011. Downgrades seem to be more concentrated than upgrades and tend to happen in periods of recession or global financial turmoil. The 1997 East Asian crisis, the 1998 Russian crisis, the short 2001 U.S. recession, and the ongoing world financial crisis since 2008 figure prominently in the number of downgrades in Panel A. Our analysis is done on events for each agency separately but also after considering all events together from all agencies (Figure 2 Panel A).

Multiple ratings for the same sovereign around the same time are very unlikely to have the same impact on the local index's returns because they are not independent of each other as they are based, to a large degree, on analyzing the same information about the sovereign. To mitigate the problem arising from such cross-correlation across rating actions, we construct our preferred definition of an event that takes into account the rating agency that moves first in making a public announcement. Intuitively, we expect the second change for the same sovereign to have a less pronounced effect than the original change. To prevent this synchronization from contaminating our analysis, we construct a universal rating agency representing the "first-mover" of the three rating agencies. This universal agency is the one that defines our event in the baseline case.[2]

We implement this idea as follows. We keep ratings for a sovereign that are not preceded by other rating announcements of the same, or other, rating agency in the previous thirty trading days. This generates 234 downgrade events (from an initial of 363) and 402 upgrade events (from an initial of 486) from 65 countries which represent the core events that make up the baseline specification. Figure 2, Panel B plots the "first mover" events over time. Comparing Panel A and B we observe that the definition does have "bite" in the sense that a substantial number of individual rating changes from Panel A are removed, especially during periods of heightened financial turmoil and/or recession (1997, 1998, 2001, 2008 and 2011). In our analysis we conduct a sensitivity analysis based on the definition of "first-mover" by

[2]This methodology is followed by Martell (2005).

altering the number of days required to have no other change in rating before the observation chosen.[3]

Figure 3 also plots the cross sectional distribution of sovereign debt ratings after a change (downgrade or upgrade). We report the frequency distribution separately for each rating agency and also for our "first mover" definition. The graphs illustrate that rating changes are not concentrated on one specific grade-level. Instead, changes generate a spectrum of resulting grades, both for upgrades and downgrades.

The next step before preparing the data for the event study analysis is requiring each rating change to have at least 60 daily observations in the estimation period (from day -270 to day -21), consistent with Low (2009). This filter removes two additional observations from our dataset. The final data step deals with potential problems of illiquidity due to including frontier markets in the analysis. We follow Bekaert et al. (2007) in using the percentage of zero returns as a proxy for illiquidity. Specifically, we examine the number of days of zero returns that exist in each country's testing period (day -21 to +21) and exclude observations that have more than ten days of zero returns. We confirm that our results are not affected by this filter, by re-running our analysis without it.

In section 4, our analysis focuses on the institutional characteristics in rated countries. These are: (a) the type of law present (common vs. civil); (b) the country's classification by the World Bank (developed vs. emerging and frontier); (c) the level of corruption from the Political Risk Services Group (high vs. low relative to the median score); (d) the Law & Order level also from the Political Risk Services Group (high vs. low relative to the

[3] Specifically, we decrease the thirty-day window to twenty and zero and our results are unchanged.

median score); (e) the Corruption Perceptions Index (CPI) from Transparency International (high vs. low relative to the median score); and (f) the strength of investor protection from Djankov et al. (2008) (high vs. low relative to the median score). Definitions and the range of values for each institutional characteristic are given in the appendix.

For each of these institutional characteristics, we identify appropriate instrumental variables to address potential endogeneity issues. We select from the following list: the type of legal system (common vs. civil law, (La Porta et al., 1998)), the ethnicity and religion fractionalization measures developed by Alesina et al. (2003), and a landlocked indicator (Easterly and Levine, 2003). In section 4.2 we describe the methodology and in the data appendix we provide further details about these variables.

3 Empirical Results

3.1 Econometric Analysis

We use a short-horizon event-study methodology using daily return data on the MSCI indices of all countries in our sample to capture the dynamic effects of ratings changes on stock returns. The estimated abnormal returns around a rating change (downgrade or upgrade) can provide evidence on the effect of the rating agency's action on the local stock market. They can also help us assess whether the impact of rating changes on the stock market is merely transient or more sustained.

We use the world CAPM to calculate abnormal returns[4] as follows. For every country, the

[4] We also conduct our analysis using raw returns and these are reported later on in the paper.

following time series regression is estimated using data in the window $[-270, -21]$ trading days relative to the event date:

$$R_{it} = \alpha_i + \beta_i R_{Wt} + \varepsilon_{it} \tag{1}$$

where R_{it} is the country i's MSCI index return, and R_{Wt} is the world MSCI index return . We then calculate abnormal returns (AR) from the residuals for the window $[t_1, t_2] = [-20, +20]$ around the event:

$$AR_{it} = R_{it} - \widehat{\alpha}_i - \widehat{\beta}_i R_{Wt} \tag{2}$$

Finally, we obtain cumulative abnormal returns (CARs) for different sub-periods $[t_1, t_2]$ by adding up the corresponding AR's over the event study window

$$CAR_i[t_1, t_2] = AR_{it_1} + ... + AR_{it2} \tag{3}$$

We use different estimators to test for the statistical significance of average abnormal returns and average cumulative abnormal returns (and we do this separately for upgrades and downgrades). We first form a test using the cross-sectional variation of abnormal returns in the event window under the assumption that AR_{it} are independently and identically distributed following a normal distribution with mean zero (under the null) and variance σ^2 [see Charest (1978) and Penman (1982)]. Using s_t as an estimator for σ, we can then define the test statistic based on the average abnormal return (AAR_t)

$$Z = \sqrt{N} \ \frac{AAR_t}{s_t} \sim t_{N-1} \tag{4}$$

where N is the number of events and

$$AAR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{it} \tag{5}$$

$$s_t = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (AR_{it} - AAR_t)^2} \tag{6}$$

In a similar fashion, for the CARs we define the following test statistic

$$Z = \sqrt{N} \frac{CAAR_i[t_1, t_2]}{s} \ \sim N(0, 1) \tag{7}$$

where the Cumulative Average Abnormal Return ($CAAR$) is

$$CAAR[t_1, t_2] = \frac{1}{N} \sum_{i=1}^{N} CAR_i[t_1, t_2] \tag{8}$$

and the standard deviation is

$$s = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (CAR_i[t_1, t_2] - CAAR[t_1, t_2])^2} \tag{9}$$

This test statistic accounts for event-induced variance as it uses an estimate of the cross-sectional variation of abnormal returns in the event window (testing period). An alternative way to account for event-induced variance is proposed by Boehmer et al. (1991) and is based on standardized abnormal returns as in Patell (1976). Abnormal returns AR_i in the event window are standardized by the time series standard deviation of AR_{it} in the estimation period $[-270, -21]$. We define

$$\overline{AR_i} = \frac{1}{250} \sum_{t=1}^{250} AR_{it} \tag{10}$$

and

$$\overline{s_i} = \sqrt{\frac{1}{249} \sum_{t=1}^{250} (AR_{it} - \overline{AR_i})^2} \tag{11}$$

The standardized abnormal returns are then defined as

$$SAR_{it} = \frac{AR_{it}}{\overline{s_i}} \tag{12}$$

The Boehmer et al. (1991) t-test is constructed by dividing the average SAR_{it} by their cross-sectional standard deviation:

$$T_{BMP} = \sqrt{N}\, \frac{ASAR_t}{S} \tag{13}$$

where

$$ASAR_t = \frac{1}{N} \sum_{i=1}^{N} SAR_{it} \tag{14}$$

and

$$S = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (SAR_{it} - ASAR_t)^2} \tag{15}$$

Kolari and Pynnonen (2010) provide a further adjustment to the Boemer et al. (1991) test that also accounts for cross-sectional correlation of abnormal returns:

$$T_{KP} = T_{BMP} * \sqrt{\frac{1-\overline{r}}{1+(N-1)\overline{r}}} \tag{16}$$

where $\overline{r}$ is the average of the sample cross-correlations of the estimation period residuals.

We also use the more traditional method proposed by Brown and Warner (1980). This method estimates the standard deviation of average abnormal returns from the time series of average abnormal returns in the estimation period $[-270, -21]$:

$$\overline{s} = \sqrt{\frac{1}{249}\sum_{t=1}^{250}(AAR_t - \overline{AAR})^2} \tag{17}$$

where AAR_t is defined in (5) and

$$\overline{AAR} = \frac{1}{250}\sum_{t=1}^{250} AAR_t \tag{18}$$

The corresponding estimation of the standard deviation for the CAARs for a window $[t_1, t_2]$ is given by:

$$s^* = \sqrt{(t_2 - t_1 + 1)}\overline{s} \tag{19}$$

We use the cross-sectional variation of abnormal returns as defined in (4) for the baseline case. In the robustness section we also report results using the other three estimators.

3.2 Results

3.2.1 Overall sample

Table 1 reports daily average abnormal returns (AAR_t) for the event window [-20, +20], along with their statistical significance based on the cross-sectional variation of AR_{it} as defined in (4). Results are reported for both upgrades and downgrades.[5] The corresponding

[5] We have also experimented with separating changes in ratings beyond one grade, the idea being that changes above one grade might have a larger effect on the stock market than the single grade changes. We

raw return results are also reported for completeness.

An examination of the daily average abnormal returns reveals several important conclusions regarding the pre-announcement, announcement, and post announcement periods. First, the economic impact of downgrades appears to be significantly higher than that of upgrades as revealed by the absolute magnitude of the corresponding AAR around the announcement of the rating change. For example in the window $[-5, +1]$ statistically significant $AARs$ range from -0.472% to -0.109% for downgrades and from -0.046% to 0.165% for upgrades. Second, for downgrades, there is a statistically significant abnormal market reaction prior to the announcement of the ratings change, with AAR_{-5}, AAR_{-4}, AAR_{-3}, and AAR_{-1} being negative and statistically significant at least at the 10% level. For upgrades, while the AAR_t are typically positive for the five days prior to the announcement, only AAR_{-3} is statistically significant (p-value is 0.043). Third, both upgrades and downgrades exhibit a further market reaction in the expected direction at the announcement window of [0, 1]. For downgrades both AAR_0 and AAR_{+1} are negative (-0.109% and -0.318%, respectively), with the latter being statistically significant at the 10% level, while for upgrades the corresponding average abnormal returns are positive (0.133% and 0.086%, respectively) with the latter being significant at the 10% level. Finally, for both upgrades and downgrades we observe a statistically significant market reaction after the announcement of the ratings change, but in the opposite direction to the one found in the pre-announcement and announcement periods. More specifically, for downgrades we find positive and statistically significant average abnormal returns on days +3 and +4 relative to the announcement day

did not find any statistically different results relative to our baseline and we therefore report the results for all changes without distinguishing between the number of grades being changed.

(0.648% and 0.237%, respectively) and for upgrades we document negative and significant average abnormal returns on days +2 and +3 (−0.161% and −0.172%, respectively).

The aforementioned observations regarding the abnormal return behavior around the announcement of sovereign rating changes are confirmed in Figure 4A and in Table 2. Figure $4A$ graphs the Cumulative Average Abnormal Returns ($CAARs$) for both upgrades and downgrades. Figure $4B$ also reports the cumulative average raw returns for completeness. The stark difference in abnormal returns around rating downgrade announcements relative to upgrade announcements is immediately obvious in Figure $4A$. Figure $4A$ shows that the stock market reacts more strongly throughout the pre-announcement period for downgrades rather than for upgrades. Moreover, the post-announcement effect is also larger after downgrades than upgrades and it goes in the opposite direction relative to the pre-announcement period.

Table 2 breaks up the information in Figure 4A by cumulating returns over different windows in the pre-announcement, announcement, and post-announcement periods and also offers statistical tests for the respective $CAARs$. For downgrades we document an economically and statistically significant negative market reaction in the pre-announcement period ($CAAR[-5,-1] = -1.102\%$ with a p-value of 0.008), accompanied by a weaker, but still significant announcement effect ($CAAR[0,+1] = -0.427\%$ with a p-value of 0.073), and a significantly positive reaction in the post announcement period ($CAAR[+2,+5] = 1.176\%$ with a p-value of 0.011). The near V-shape $CAAR[-5,+5]$ graph for downgrades in Figure $4A$ provides a visual verification of these findings. Table 2 reveals that the $CAAR[-5,+5]$ is -0.353% with a p-value of 0.301 indicating that most of the negative reaction in the pre-announcement period is partially reversed after the announcement of the ratings downgrade.

For upgrades there is weaker evidence of positive abnormal returns in the pre-announcement period ($CAAR[-5,-1] = 0.261\%$ with a p-value of 0.089), accompanied by a more significant announcement effect ($CAAR[0,+1] = 0.219\%$ with a p-value of 0.02), and a significantly negative reaction in the post announcement period ($CAAR[+2,+5] = -0.393\%$ with a p-value of 0.009). The $CAAR[-5,+5]$ is 0.087% with a p-value of 0.384 indicating that most of the positive pre-announcement and announcement reaction is reversed. We conclude that the reaction after upgrades follows a similar pattern as the one after downgrades but the absolute magnitudes in all three phases (pre-, at and post- announcement) are much weaker.

The conclusions are consistent with the results in Figure $4B$ that plots the cumulative average raw returns after upgrades and downgrades. Figure $4B$ shows a continuous upward trend for the sample of rating upgrades, while for downgrades the shape of the graph is closer to the shape of the corresponding $CAAR$ graph. We interpret this finding as evidence that stock market reactions after downgrades tend to be stronger than after upgrades.

Overall for our sample of downgrades, the pre-announcement and announcement evidence is consistent with either a leakage of information in the days prior to the announcement of the rating downgrade or an anticipation of not only the downgrade, but its approximate timing as well. The post-announcement positive market reaction points to an over-reaction in the pre-announcement period and a correction after the dust of the announcement settles. For upgrades there appears to be weaker evidence of information leakage or anticipation of the announcement and a stronger, statistically significant announcement effect in the predicted direction. However, the post-announcement period exhibits a significant reversal of the documented announcement effect.

The economic significance of the market reaction to upgrades appears to be significantly muted relative to the market reaction to downgrades consistent with findings in (Brooks et al. (2004), Holthausen and Leftwich, 1986; Hand et al., 1992; Ederington and Goh, 1998). This is also consistent with evidence in the accounting literature of asymmetric market reaction to surprise negative management forecasts relative to positive ones (Skinner, 1994; Soffer, Thiagarajan, and Walther, 2000; Hutton, Miller, and Skinner, 2003; Anilowski, Feng, and Skinner, 2007; Kothari, Shu, and Wysocki, 2010).

Another potentially important finding is that the effect of sovereign ratings changes on the local stock markets appears to be limited to a temporary effect around the announcement of the rating change. The temporary nature of the rating change effect on the stock market is indicated by the insignificant cumulative average abnormal returns for the three symmetric windows ($CAAR[-5,+5]$, $CAAR[-10,+10]$, and $CAAR[-20,+20]$) around the announcement of the rating change for both upgrades and downgrades.

3.3 Robustness Checks

3.3.1 Estimator Choice

We now investigate how robust our results are to estimator choice. We repeat the same analysis as in Table 1, but use three additional ways to test for statistical significance for abnormal returns. In addition to the cross-sectional method in the baseline case, we also report results from the following methods. BW80 is the Brown and Warner (1980) method that estimates the standard deviation outside the event window; BMP91 is the Boehmer et al. (1991) method that allows for event-induced variance; and KP10 is the Kolari and Pynnonen (2010) method that allows for both event-induced variance and cross-correlation across rating changes simultaneously.

Table 3 shows the statistical significance of average abnormal returns using the four different estimators, for both upgrades and downgrades. If the evidence from using all estimators is taken together, upgrades seem to be less important than downgrades in generating statistically significant abnormal returns. For upgrades, the event generates a positive abnormal return on the announcement date that is statistically significant on the event day across all estimators. There is no robust significant reaction across the four estimators in the five days before the announcement or in the post-announcement period. We conclude that upgrades do not provide robust evidence for pre- and post-announcement abnormal returns, but rather generate abnormal returns only on the announcement day.

For downgrades, our baseline results are robust to all estimators. We document significant pre-announcement and announcement effects, as well as significant post-announcement effects in the opposite direction. In fact, the results from the additional estimators are typically at least as statistically significant as the baseline case. Using the Brown-Warner (1980) test statistic, the only estimator that does not account for event-induced variance, generates higher significance relative to the baseline estimator consistent with the presence of event-induced variance in our sample. Due to space considerations we do not report CAAR results, but statistical significance carries over from the average abnormal returns to the CAARs. We conclude that the downgrade results are robust to the choice of estimator.

3.3.2 Without "The Great Recession"

Given that our results are so robust to downgrades, a skeptic might wonder whether the higher volatility during recessions is not well accounted for in the estimators of the previous subsection. A particularly volatile time is the period of "The Great Recession" after 2008. We therefore repeat the same analysis but exclude all events after 2008, focussing solely on "first mover" periods during the period of "The Great Moderation" (up to 2007). Our results are depicted in Figure 5 and they are very similar to our baseline results, confirming that our conclusions are not driven by what happened by events after 2007.

3.3.3 Without "First Mover"

A skeptic might also wonder whether our definition of "first mover" might also be responsible for our findings. We repeat the same methodology by including all rating agency changes and the results are plotted in Figure 6. Our conclusions remain unchanged as the graph remains very similar to our baseline ones. Downgrades show substantial pre-announcement stock market effects, with partial reversal while that is not the case for upgrades.

4 What Drives the Results?

4.1 Correlations

In this subsection we correlate our measures of leakage to the quality of institutions around the world. To do so we use various measures of institutional quality that have been used in the literature. Some of these measures can be thought of as exogenous variables as in many instances they were determined many decades before the actual rating change. The differential experience of common law versus civil law countries is one such dichotomy. Any differential results found there can, given the exogeneity of legal origins to trading mechanisms post 1991, be interpreted as causal. Other categorizations might suffer more from endogeneity issues. The division of the countries in the sample between non-developed and developed offers one such example. We expect less developed countries to be associated with higher incidence of abnormal returns prior to a public announcement being made, but we do not interpret that as causal. Nevertheless, we think that uncovering such correlations is still informative for future research on the topic, while in the next subsection we are more careful in trying to disentangle cause and effect.

Given our results to date, we also focus on downgrades. To better understand the behavior of abnormal returns around the announcement of sovereign downgrades, we repeat our econometric analysis on splits of our overall downgrades sample based on a number of country level characteristics aimed to proxy for the quality of a country's institutional framework or government. We first condition on emerging/frontier (non-developed) and developed countries based on the World Bank classification. We also condition on the origin of the legal system (civil vs common law), the law and order and corruption indices from The Political Risk Services Group (PRS-law and order and PRS-corruption, respectively), the corruption perception index from Transparency International (TI-corruption), and the investor protection index from the World Bank's Doing Business website. The data appendix contains further details about variable definitions and sources of this part of the data.

Figure 7 plots the cumulative abnormal returns around downgrades after sorting the countries in our dataset according to different observable metrics. For countries that have a continuous index, we take a very conservative approach and separate countries above and below the median value of that measure. The main message from the results that follow is that the identified patterns in abnormal returns are more pronounced for countries with "lower quality" institutions/government.

Figure 7, Panel A plots civil versus common law systems, and there is some evidence that downgrades have a bigger impact before the event in civil law countries. Table 4 shows that the results for civil law countries are statistically significant for all $CAARs$ from ($t = -5$ *to* $t = -3, -2, -1$) and with a magnitude ranging from -1.08% to -1.5%, whereas the results for common law countries and for the same time windows are statistically insignificant from zero. At the same time, for civil law countries $CAAR[+2, +5]$ is positive (1.45%) and statistically significant (p-value 0.012), whereas the common law coefficient is not statistically significant. Furthermore, we do not document a significant announcement effect $CAAR[0, 1]$ for both civil and common law countries. We conclude that downgrades are more likely to have an impact in civil law, rather than common law, countries in the pre- and post- announcement periods.

Figure 7, Panel B plots the $CAARs$ for non-developed relative to developed (advanced) economies. The graph illustrates that non-developed countries tend to exhibit the posited leakage effect more than developed countries. Table 4 illustrates this statistically. For $CAAR[-5, -3]$ and $CAAR[-5, -1]$ the non-developed market effect is economically larger and statistically significant relative to the developed market effect which is statistically insignificant. The positive effect after the event is also statistically significant for non-developed, but not for developed economies. We conclude that our empirical results are more likely to appear in non-developed rather than developed economies.

The TI-corruption results for downgrades are reported in Panel C. The results are striking: countries with a higher corruption perception index react much more strongly prior, at and after the downgrade. For all $CAAR$ windows for high-corruption countries from ($t = -5$ to $t = -3, -2, -1$) there is a pre-event effect ranging between -1.20% and -1.64%, which are statistically significant at least at the 5% level. During the announcement window, the reaction is -0.93% which is statistically significant at the 5% level. Most of these negative returns are reversed in the post-announcement window $CAAR[+2, +5]$ where there is a positive abnormal return of 1.58% with a p-value of 0.002. On the contrary, the pre-, at- and post- announcement effects for countries with a low corruption perception index are nowhere statistically significant.

Panel D reports the results from splitting countries according to the PRS-law and order index. The results match very closely the results from the TI-corruption index. Table 4 reports that for all $CAAR$ windows from ($t = -5$ to $t = -3, -2, -1$) the effect is statistically significant at the 1% level and ranges between -1.29% and -1.73% for countries with a low PRS-law and order ranking. For the same group of countries Table 4 also documents statistically significant $CAARs$ for the announcement ($CAAR[0, 1]$) and post announcement ($CAAR[+2, +5]$) windows of -0.59% and 1.83%, respectively. The results are statistically insignificant for the countries with a high ranking in the law and order index.

Panel E reports results from splitting countries according to the PRS-corruption index. High corruption countries seem to generate more negative $CAARs$ than low corruption countries in the pre-announcement period, and this visual impression is confirmed by Table 4. On the other hand, on the announcement day, there is only a statistically significant negative effect in the low corruption countries. At the same time, the reversal after the announcement is positive and statistically significant only in the high corruption countries.

Panel F reports the investor protection results. Here, there does not seem to be a statistically significant difference across countries sorted according to this criterion. However, the results in Table 4 reval a significant pre-announcement and announcement effect for the low investor protection countries at least at the 10% level and no significance for the high investor protection countries. Both groups of countries exhibit significant post announcement effects at the 5% level.

4.2 Causal Evidence

Most, if not all, independent variables in the previous subsection (law and order, corruption and investor protection indices) are likely to suffer from endogeneity bias. Correlation does not imply causation, and this section will use instrumental variables techniques to give a causal interpretation to the uncovered correlations. In so doing, we provide evidence supporting the idea that the mechanism through which rating announcements reach the capital market needs to concern capital market regulators around the world. Specifically, we conduct two stage least squares (2SLS) regressions of $CAARs$ before and after the event on each of the potentially endogenous variables that can proxy for institutional quality: Emerging/Frontier vs. Developed; TI Corruption; PRS Law and Order; PRS Corruption; Investor Protection.

What are appropriate instrumental variables for these regressors? First, we consider the separation based on the legal system: common vs. civil law (La Porta et al., 1998), where an indicator takes the value of 1 for common law system and 0 otherwise. The next two instruments are the ethnicity and religion fractionalization measures developed by Alesina et al. (2003) as explained in the data appendix. The fourth candidate instrument is the landlocked indicator (Easterly and Levine, 2003). The four instrumental variables are arguably exogenous because they have been determined many decades before the ratings events we study. Moreover, legal origin, fractionalization and geography are good candidates for random variation that might be correlated with the endogenous variable of interest but not directly affect the dependent variable, the two conditions needed for a valid instrument.

We view our five endogenous variables as proxying the quality of capital market institutions in a country. We therefore do five separate 2SLS regressions, one for each of the five endogenous variables. For each of these variables we identify the best instruments using the method of Baum, Schaffer and Stillman (2010). Specifically we compute and report tests for model under-, weak-, over-identification as well as for the redundancy of instrumental variables. For all endogenous variables we start by assuming that the four instruments are valid. The null hypothesis under the redundancy test is that the specified instrument is redundant. As shown in Table 5, most of the chosen instruments are valid (p-values<0.05; panel A). The procedure is repeated for each endogenous variable until no more redundant instruments appear (panel B).[6] For instance, for the endogenous variable TI Corruption, all

[6] As a sensitivity test in the 2SLS regressions we re-run our analysis with no restriction on redundancy of instrumental variables (i.e. we use the same four instruments for all endogenous variables) and obtain similar results. The only difference is that we can more strongly reject weak instruments when using the

but one IV are statistically significant and therefore in the second step, the redundant IV (landlocked) is not included. Therefore, in the 2SLS estimation, TI Corruption is proxied using common/civil law, ethnicity and religion fractionalizations.

Results of the 2SLS regressions are shown in Table 6 and 7. Our dependent variable is $CAAR[-5,-3]$[7] (Table 6) and $CAAR[+2,+5]$, (Table 7) We expect that abnormal market reactions before the event will have a positive relation with measures of institutional quality (i.e. since $CAARs$ are negative, we expect that when institutional quality is better, $CAARs$ will be more positive). We find both statistically and economically significant results for three out of the five endogenous variables we use.

Emerging/Frontier countries (using common law, ethnic fractionalization and landlocked as instruments) generate $CAARs$ of about 3.5% (p-value of 0.061) lower than those of developed countries. The weak identification test (WID) passes the critical values of Stock and Yogo (2002)[8] critical values for 10% maximal IV relative bias and IV size. Also, the Hansen J statistic, does not reject the over-identification (OID) hypothesis. Similarly, a positive coefficient is obtained for the TI Corruption score (using common law, ethnic and religion as instruments). A one-standard deviation (2.2) decrease in the TI corruption core gives a 1.3% (p-value of 0.019) decrease in the $CAAR$, where all identification tests are again satisfied. The coefficient for PRS Law & Order (using common law and ethnic as instruments) is also positive, indicating an overall decrease in $CAAR$ of 1.2% (p-value of 0.030) when the score

redundancy procedure.

[7]We also conduct our regressions on $CAARs$ ($t = -5$ *to* $t = -1$) and we obtain the same results.

[8]In the case that the Stock and Yogo tests are not available (PRS Law & Order; PRS Corruption) the first stage F statistic is checked against the cut-off value of 10 (as suggested, for instance, by Stock, Wright and Yogo (2002)).

decreases by one standard deviation (1.29).[9] Lastly, the coefficients for PRS Corruption (using landlocked as instrument) and the Investor protection index (using common law and landlocked as instruments) are in the expected direction but are not statistically significant.

The next step is conducting the 2SLS regressions on abnormal stock market returns after the event using $CAAR[+2,+5]$. We report these results in Table 7. We obtain the opposite signs than the period before the event, consistent with the graphs in the previous subsection. Specifically, emerging/Frontier countries have a 4.1% higher $CAAR$ (p-value of 0.086) after the event than developed countries. All identification tests are consistent with the pre-downgrade analysis. In the case of the TI Corruption score, a decrease by one standard deviation results in an increase in the $CAAR$ by 1.2% (with a p-value of 0.044). Results for PRS Law & Order, PRS Corruption and the Investor Protection score are also not statistically significant, even though the coefficients are in the opposite direction of the pre-downgrade analysis.

From these results we can conclude that information leaks in many capital markets in the five trading days prior to the event, and those markets tend to be mostly in countries with low institutional quality. The excessive decrease in abnormal stock returns prior to a downgrade seems to reverse in the period after the event, again in those countries with weak institutional quality, albeit to a lesser degre. This generates a near "V" shape in abnormal stock market reactions around the announcement. These results seem more consistent with the leakage of information about the content and timing of the pending announcement as an explanation of the significant negative abnormal returns in the pre-announcement period, rather than the

[9] Countries with the highest (lowest) score in TI Corruption have the lowest (highest) corruption. The same rationale applies for PRS Law & Order.

market anticipation story. We take that view because the presence of significant negative pre-event abnormal returns predominantly in low institutional quality markets points to actions that raise "concerns", since it is hard to justify that markets with low institutional quality are better at anticipating credit rating actions. The leakage of information could be coming from the rating agency itself, but also from local government bodies that the rating agency is obliged to inform and ask for their feedback after the rating is close to completion but before the rating's public announcement. Further evidence is necessary before reaching firm conclusions but we view our results as supportive of the idea that the mechanism through which rating announcements reach the capital market needs to be a possible concern for capital market regulators around the world.

5 Conclusion

We find evidence that sovereign debt rating agency downgrades affect negatively the local stock market before the announcement is made, generating also a weaker positive stock market response after the announcement. Upgrades, on the other hand, seem to generate a response closer to intuition, namely a positive stock market response on the announcement date. The conclusions are robust over periods with lower volatilty in the stock market, across different estimators and without our more involved definition of a "first mover" when defining the event.

We then show that this result is generated mostly by countries that are less developed, tend to be more corrupt, have weaker law enforcement, and are under the civil (rather than common) law system. Using instrumental variables techniques we also build a causal argument that sovereign debt downgrades generate a negative stock market reaction before the public announcement in countries with lower institutional quality in terms of law enforcement, corruption and development. Our results have implications for regulations in financial markets and the way rating agency changes are communicated to capital markets around the world.

Data Appendix: Country Level Characteristics

Common vs. civil law countries: We use the country's legal origin classification from Djankov, La Porta, Lopez-de-Silanes, Schleifer (2008). La Porta et al. (1998) find that common law countries provide stronger legal protections for investors relative to civil law countries.

Emerging and frontier (non-developed) versus developed country classification: In our analysis we differentiate between developed and emerging/frontier markets following the World Bank classification system into emerging, frontier and developed countries. We account for countries that moved from Emerging to developed market status during our sample period.

The measure of corruption is from the Political Risk Services Group (PRS-corruption) and is defined as follows: "A measure of corruption within the political system that is a threat to foreign investment by distorting the economic and financial environment, reducing the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introducing inherent instability into the political process". This variable takes values from 0 to 6 with 6 denoting the lowest level of corruption. The variable is available on a monthly frequency.

Law and order is another measure taken from the Political Risk Services Group (PRS-law and order): Two measures comprise this risk component. Each sub-component equals half of the total. The "law" sub-component assesses the strength and impartiality of the legal system, and the "order" sub-component assesses popular observance of the law. This variable takes values from 0 to 6 with 6 denoting countries scoring the highest on law and order quality. The variable is available on a monthly frequency.

We also use an alternative measure of corruption, namely the Corruption Perceptions Index from Transparency International (TI-corruption). First launched in 1995, it has been widely credited with putting the issue of corruption on the international policy agenda. The CPI ranks almost 200 countries by their perceived levels of corruption, as determined by expert assessments and opinion surveys. The variable is available on an annual frequency. We use the 1995 values for events before 1995.

Strength of investor protection index: The strength of investor protection index is the average of the extent of disclosure index, the extent of director liability index and the ease of shareholder suits index. The index ranges from 0 to 10, with higher values indicating more investor protection. This methodology was developed in Djankov, La Porta, Lopez-de-Silanes, Schleifer (2008).

Ethnic and religious fractionalization measures the ethnic and religious heterogeneity in a country, respectively. These measures are developed by Alesina et al. (2003). In both cases, fractionalization takes values from 0 to 1, where 1 shows no fractionalization and 0 shows the existence of multiple ethnic and religious groups (fractions) in each country.

The landlocked indicator takes the value of 1 if the country has no outlet to the sea and 0 otherwise. Easterly and Levine (2003) show that not having access to the sea is negatively correlated with institutional quality.

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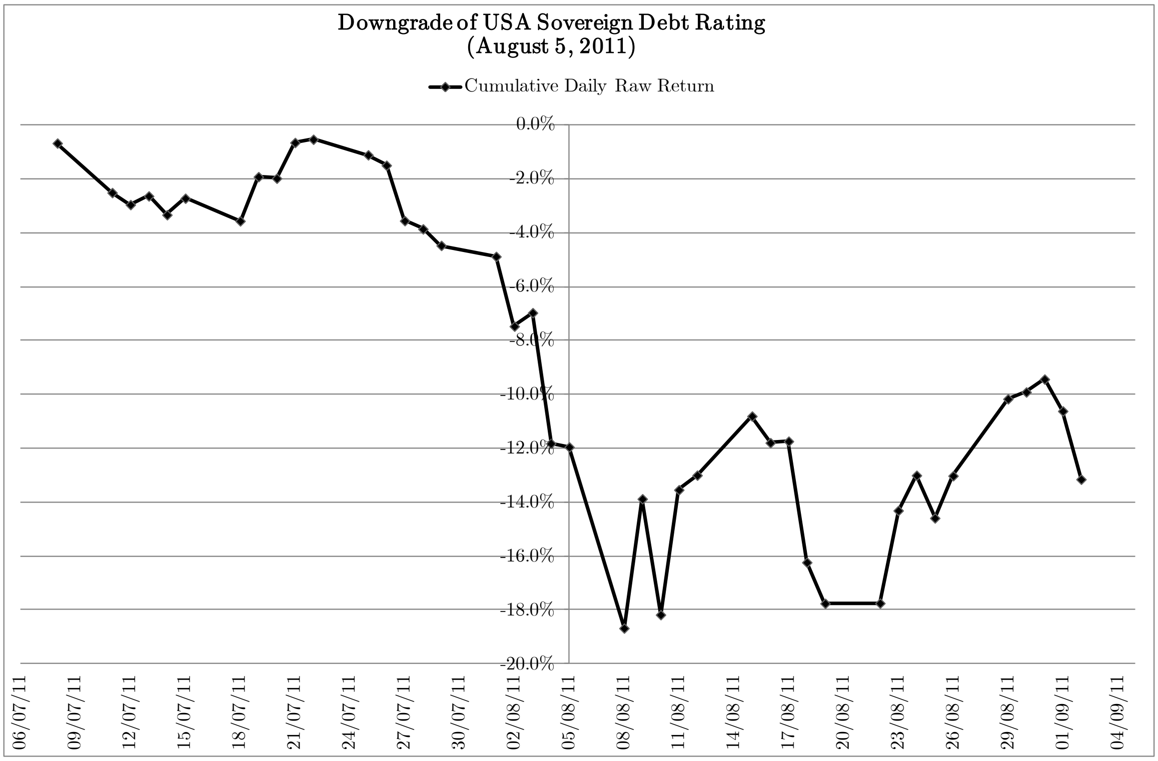

Figure 1: US Downgrade by Standard & Poor's: Cumulative Raw Returns in the thirty days before and after the downgrade of the US sovereign debt rating by Standard & Poor's on August 5th, 2011.

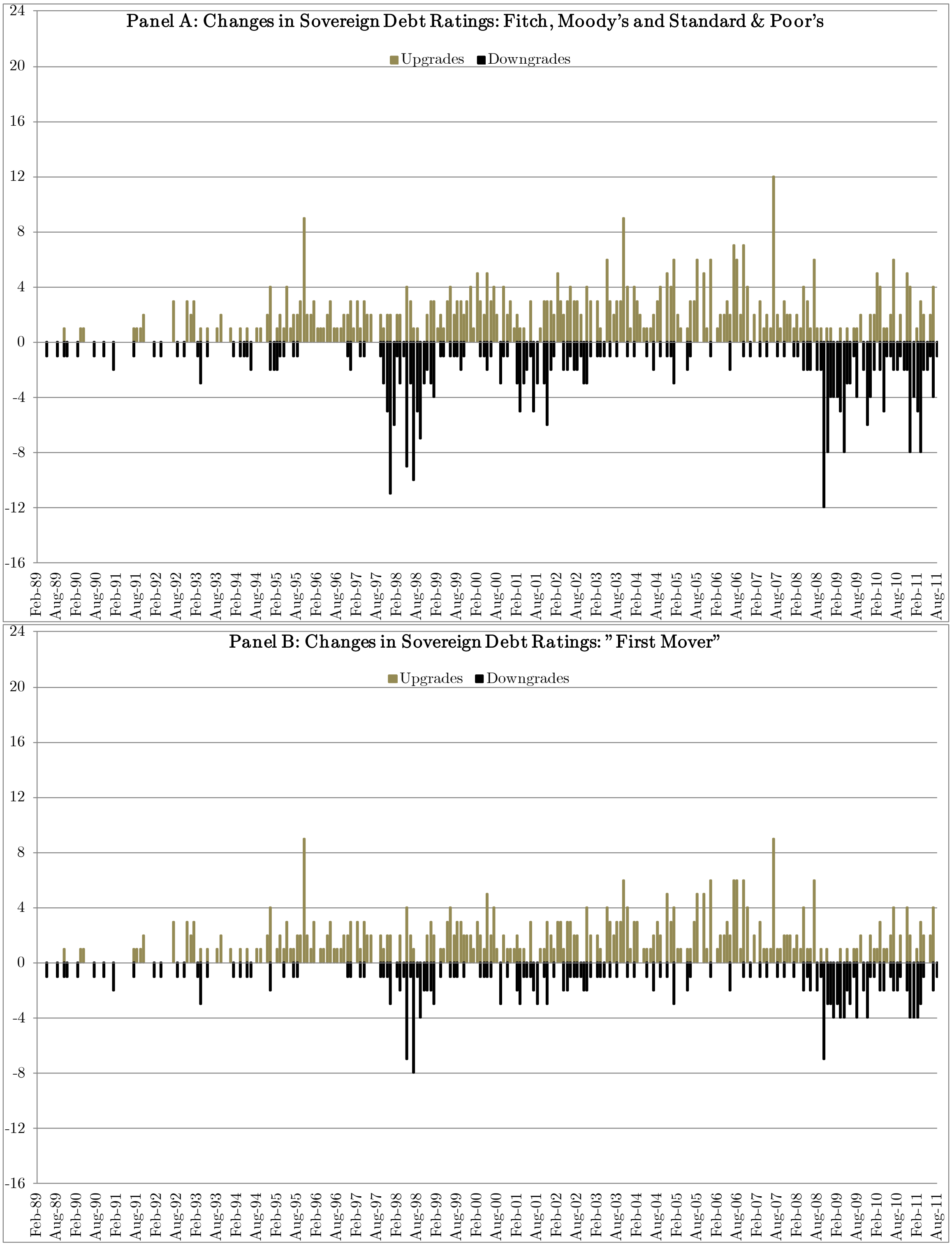

Figure 2: Changes in Sovereign Debt Ratings over time. In Figure 2A we plot all changes in ratings by Fitch, Moody's and Standard & Poor's. The sample comprises 486 upgrades and 363 downgrades for 65 countries. In Figure 2B, we show the changes in ratings that are free from another change in rating in the previous thirty days from the same or another rating agency ("First Mover" Rating agency). These comprise 402 upgrades and 234 downgrades from 65 countries.

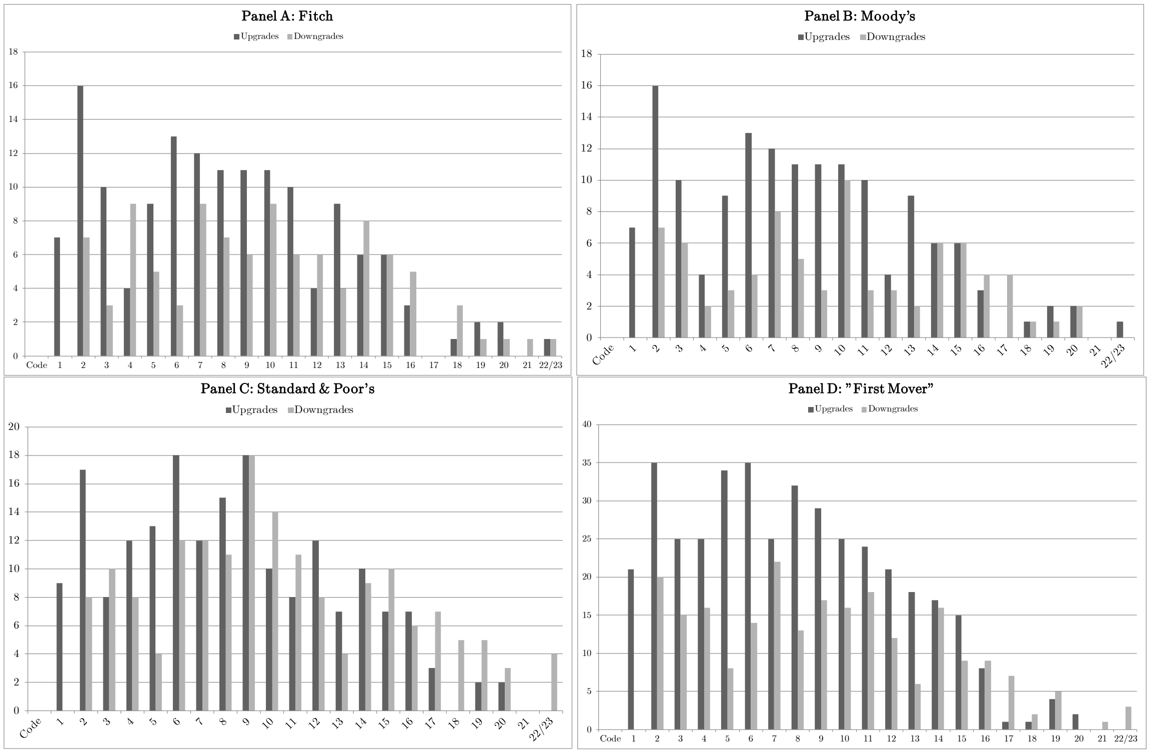

Figure 3: Distribution of Changes in Sovereign Debt Ratings. In Figure 3A we plot the 148 upgrades and 100 downgrades by Fitch Ratings; In Figure 3B we plot the 148 upgrades and 94 downgrades by Moody's Ratings; In Figure 3C we plot the 190 upgrades and 169 downgrades by Standard & Poor's Ratings. A change in rating is defined by either a change in the Local or Foreign Currency Rating. In Figure 3D we plot the 402 upgrades and 234 downgrades that are free from another change in rating in the previous thirty days from the same or another rating agency ("First Mover" Rating agency).

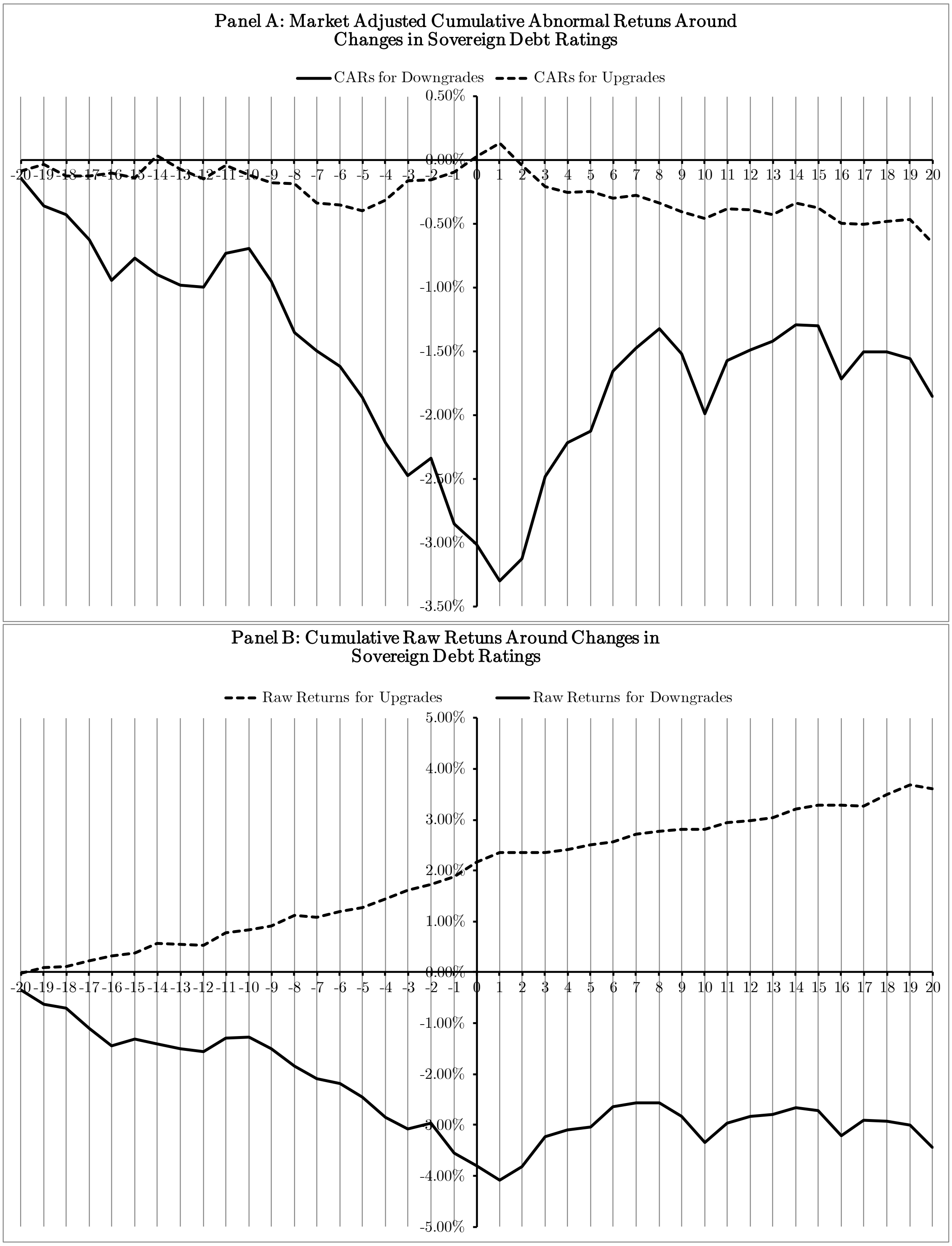

Figure 4: Cumulative Returns around Changes in Sovereign Ratings. Panel 4A shows market adjusted cumulative abnormal returns (CARs) for 380 upgrades and 217 downgrades in sovereign ratings. Panel 4B shows cumulative raw returns around the time of upgrades and downgrades respectively. Changes in ratings are free from noise from other rating changes as all rating changes in the preceding thirty days from the same or other rating agencies are removed.

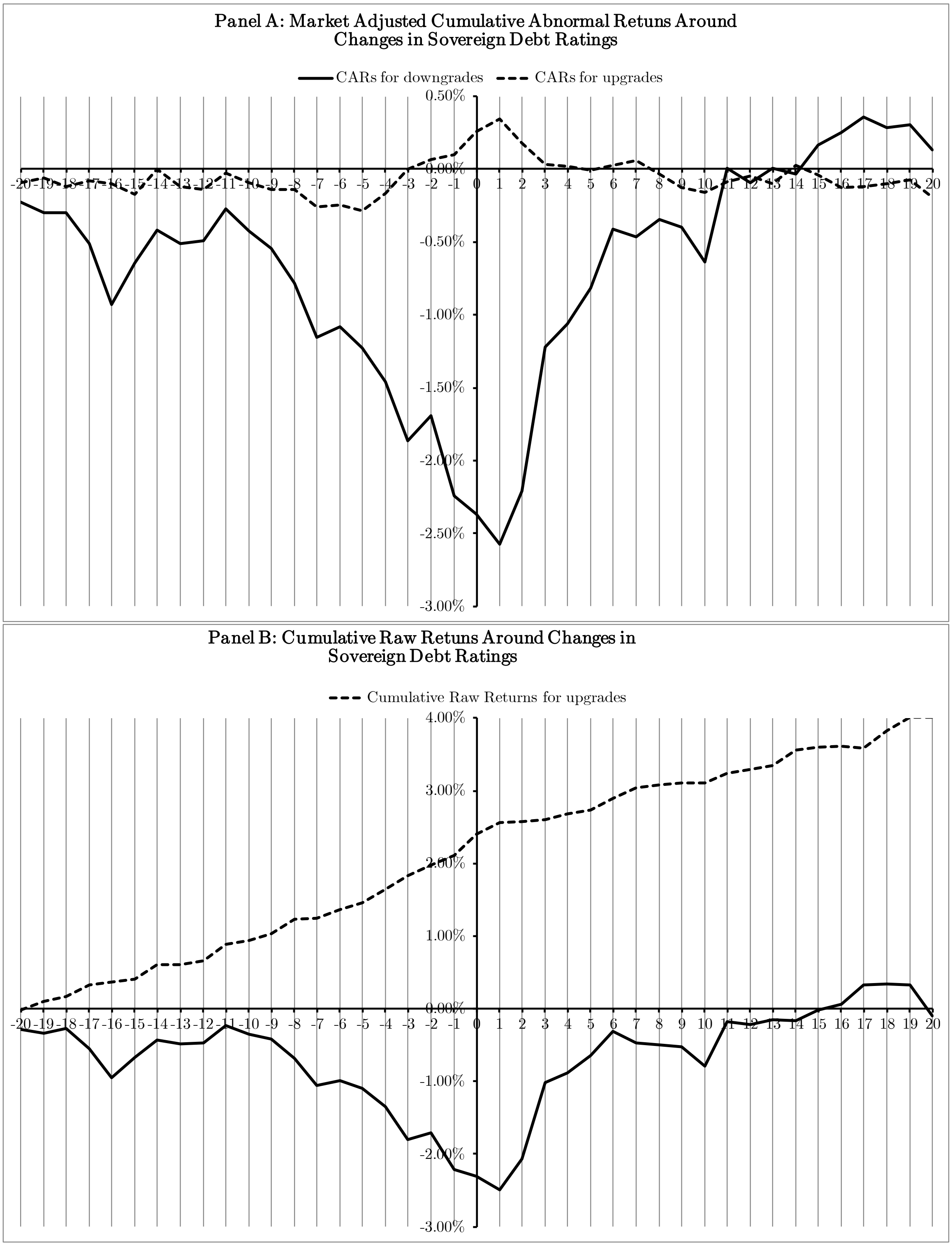

Figure 5: Cumulative Returns around Changes in Sovereign Ratings (up to 2007). Panel 5A shows market adjusted cumulative abnormal returns (CARs) for 324 upgrades and 138 downgrades in sovereign ratings. Panel 5B shows cumulative raw returns. Changes in ratings are free from noise from other rating changes as all rating changes in the preceding thirty days from the same or other rating agencies are removed.

Figure 6: Cumulative Returns around Changes in Sovereign Ratings (Union of Rating Agencies). Panel 6A shows market adjusted cumulative abnormal returns (CARs) for the sample comprising of the union of all changes in ratings by Fitch, Moody's and Standard & Poor's. This sample consists of 459 upgrades and 333 downgrades in sovereign ratings. Panel 6B shows cumulative raw returns.

Figure 7: Cumulative Abnormal Returns Around Downgrades in Sovereign Ratings. All Panels show the cumulative abnormal returns (CARs) for downgrades in sovereign ratings, according to individual country characteristics. Panel 7A shows the breakdown according to the local law. There are a total of 165 observations with Civil law and 52 with Common law. Panel 7B shows the breakdown based on the World Bank's classification of Developed vs. Emerging and Frontier countries. There are a total of 147 emerging and frontier, and 70 developed countries. Panel 7C shows the breakdown according to the Transparency Index (low vs. high has 113 vs. 104 observations respectively). Panel 7D shows the breakdown according to the Law and Order Index (low vs. high has 114 vs. 103 observations respectively). Panel 7E shows the breakdown according to the Corruption Index (low vs. high has 45 vs. 172 observations respectively). Panel 7F shows the breakdown according to the Investor Protection Index (low vs. high has 120 vs. 97 observations respectively).

Table 1

Event Study of Changes in Sovereign Ratings on Local Stock Indices

This table presents the event-study results of how changes in sovereign debt ratings affect the respective sovereign daily, local stock market return. Results are reported separately for upgrades and downgrades. Changes in Ratings are those happening first among Fitch, Moody's and Standard & Poor's. The first change in rating is defined as one which is not preceded by another change in rating by the same or other rating agency in the previous thirty trading days, for a given sovereign. Relative day is the trading day relative to the event day (day 0). AAR(i,t) is the average abnormal return for all observations i for each day t, using a world-CAPM model. Mean R(i,t) is the average raw return for all observations i for each day t. The sample includes 380 upgrades and 217 downgrades. P-values are based on the cross-sectional approach. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level, respectively.

	Upgrades						Downgrades					
Relative Day	AAR(i,t) (%)		P-value	Mean R(i,t)		P-value	AAR(i,t) (%)		P-value	Mean R(i,t)		P-value
-20	-0.063		0.200	0.009		0.456	-0.180		0.184	-0.364	**	0.037
-15	-0.056		0.247	0.042		0.321	0.225	*	0.071	0.185		0.134
-10	-0.073		0.166	0.058		0.236	0.023		0.446	0.037		0.426
-9	-0.055		0.227	0.084		0.132	-0.267	**	0.033	-0.210	*	0.090
-8	-0.023		0.370	0.174	**	0.019	-0.444	***	0.002	-0.359	**	0.014
-7	-0.146	**	0.026	-0.023		0.389	-0.148		0.190	-0.234		0.112
-6	-0.022		0.404	0.097		0.158	-0.136		0.245	-0.105		0.302
-5	-0.046		0.287	0.082		0.176	-0.227	*	0.081	-0.247	*	0.078
-4	0.091		0.111	0.166	**	0.018	-0.265	*	0.058	-0.305	**	0.038
-3	0.165	**	0.043	0.194	**	0.026	-0.259	*	0.078	-0.244		0.106
-2	0.005		0.473	0.096		0.126	0.122		0.290	0.092		0.339
-1	0.046		0.258	0.155	**	0.017	-0.472	***	0.005	-0.566	***	0.002
0	0.133	*	0.052	0.287	***	0.001	-0.109		0.263	-0.223		0.115
1	0.086		0.121	0.166	**	0.020	-0.318	*	0.076	-0.321	*	0.082
2	-0.161	**	0.023	0.013		0.439	0.173		0.223	0.253		0.143
3	-0.172	**	0.035	-0.016		0.434	0.648	***	0.008	0.581	**	0.018
4	-0.063		0.198	0.038		0.306	0.237	*	0.093	0.082		0.321
5	0.003		0.486	0.091		0.128	0.118		0.240	0.108		0.272
6	-0.013		0.439	0.101		0.143	0.421	**	0.015	0.330	**	0.044
7	0.014		0.437	0.126	*	0.080	0.179		0.129	0.079		0.318
8	-0.068		0.168	0.043		0.284	0.114		0.240	-0.031		0.433
9	-0.061		0.194	0.042		0.296	-0.182		0.129	-0.250	*	0.063
10	-0.071		0.166	-0.012		0.443	-0.466		0.157	-0.480		0.135
15	-0.039		0.314	0.073		0.211	-0.012		0.469	-0.062		0.343
20	-0.192	***	0.008	-0.077		0.178	-0.287	*	0.056	-0.442	**	0.022

Table 2

Cumulative Abnormal Returns Around Changes in Sovereign Debt Ratings

This table presents cumulative abnormal returns in the local stock index, in the period of thirty days before and after changes in sovereign debt ratings. Results are reported separately for upgrades and downgrades. Changes in Ratings are those happening first among Fitch, Moody's and Standard & Poor's. The first change in rating is defined as one which is not preceded by another change in rating by the same or other rating agency in the previous twenty trading days for a given sovereign. CAAR is the cumulative average abnormal return for the specified event window. P-values using the cross sectional method are reported.***, **, and * denote statistical significance (SS) at the 1, 5, and 10 percent level, respectively.

	Upgrades				Downgrades			
Event Window	N	CAAR %	P Value (Cross Sect.)	SS	N	CAAR %	P Value (Cross Sect.)	SS
[-5,-3]	380	0.210	0.077	*	217	-0.752	0.013	**
[-5,-2]	380	0.216	0.103		217	-0.630	0.095	*
[-5,-1]	380	0.261	0.089	*	217	-1.102	0.008	***
[0,+1]	380	0.219	0.020	**	217	-0.427	0.073	*
[+2,+5]	380	-0.393	0.009	***	217	1.176	0.011	**
[-5,+5]	380	0.087	0.384		217	-0.353	0.301	
[-10,+10]	380	-0.431	0.147		217	-1.258	0.107	
[-20,+20]	380	-0.682	0.144		217	-1.883	0.122	

Table 3

Event Study of Changes in Sovereign Ratings on Local Stock Indices (Robustness)

This table presents the event-study results for different estimators. Results are reported separately for upgrades and downgrades. Changes in Ratings are those happening first among Fitch, Moody's and Standard & Poor's. The first change in rating is defined as one which is not preceded by another change in rating by the same or other rating agency in the previous thirty trading days for a given sovereign. Rel day is the trading day relative to the event day (day 0). Mean AR(i,t) is the average abnormal return for all observations i for each day t,using a world-CAPM model. The sample includes 380 upgrades and 217 downgrades. P-values using four methods are reported: Cross-sect. is the cross sectional method; BW80 is the Brown and Warner (1980) method; BMP91 is the Boehmer et al. (1991) method; KP10 is the Kolari and Pynnonen (2010) method. ***, **, and * denote statistical significance at the 1, 5, and 10 percent level respectively.

	Upgrades									Downgrades								
Rel Day	AAR (i,t) (%)	SS	P-val	SS	P-val	SS	P-val	SS	P-val	AAR (i,t) (%)	SS	P-val	SS	P-val	SS	P-val	SS	P-val
		(Cross-sect.)		(BW80)		(BMP91)		(KP10)			(Cross-sect.)		(BW80)		(BMP91)		(KP10)	
-20	-0.063		0.200		0.235		0.401		0.402	-0.180		0.184		0.108		0.222		0.237
-15	-0.056		0.247		0.260		0.165		0.169	0.225	*	0.071	*	0.061	*	0.061	*	0.074
-10	-0.073		0.166		0.202		0.105		0.108	0.023		0.446		0.437		0.343		0.353
-9	-0.055		0.227		0.267		0.439		0.440	-0.267	**	0.033	**	0.034	*	0.055	*	0.068
-8	-0.023		0.370		0.396		0.368		0.370	-0.444	***	0.002	***	0.001	**	0.011	**	0.016
-7	-0.146	**	0.026	**	0.048	**	0.034	**	0.036	-0.148		0.190		0.155	*	0.066	*	0.079
-6	-0.022		0.404		0.401		0.320		0.322	-0.136		0.245		0.176		0.103		0.119
-5	-0.046		0.287		0.302		0.434		0.435	-0.227	*	0.081	*	0.060	**	0.036	**	0.046
-4	0.091		0.111		0.149		0.191		0.194	-0.265	*	0.058	**	0.034	**	0.033	**	0.043
-3	0.165	**	0.043	**	0.030		0.117		0.121	-0.259	*	0.078	**	0.038		0.111		0.127
-2	0.005		0.473		0.476		0.298		0.300	0.122		0.290		0.201	*	0.062	*	0.075
-1	0.046		0.258		0.302		0.321		0.323	-0.472	***	0.005	***	0.001	***	0.001	***	0.003
0	0.133	*	0.052	*	0.064	**	0.018	**	0.020	-0.109		0.263		0.228		0.129		0.145
1	0.086		0.121		0.164		0.139		0.142	-0.318	*	0.076	**	0.015	**	0.012	**	0.017
2	-0.161	**	0.023	**	0.033		0.189		0.192	0.173		0.223		0.118		0.257		0.271
3	-0.172	**	0.035	**	0.025		0.161		0.165	0.648	***	0.008	***	0.000	**	0.028	**	0.037
4	-0.063		0.198		0.236		0.120		0.124	0.237	*	0.093	*	0.052	*	0.096		0.111
5	0.003		0.486		0.488		0.291		0.293	0.118		0.240		0.209		0.459		0.462
6	-0.013		0.439		0.439		0.214		0.217	0.421	**	0.015	***	0.002	***	0.010	**	0.015
7	0.014		0.437		0.438		0.456		0.457	0.179		0.129		0.111		0.142		0.159
8	-0.068		0.168		0.217		0.232		0.235	0.114		0.240		0.217		0.219		0.234
9	-0.061		0.194		0.243		0.370		0.372	-0.182		0.129		0.106	**	0.025	**	0.034
10	-0.071		0.166		0.209		0.249		0.252	-0.466		0.157	***	0.001		0.106		0.122
15	-0.039		0.314		0.327		0.306		0.308	-0.012		0.469		0.468		0.444		0.448
20	-0.192	***	0.008	**	0.014	**	0.010	**	0.011	-0.287	*	0.056	**	0.025	*	0.058	*	0.071

Table 4

Cumulative Abnormal Returns Around Downgrades in Sovereign Debt Ratings by Country Characteristics

This table presents cumulative abnormal returns in the local stock index, twenty days before, and after, downgrades in sovereign debt ratings. Downgrades used are those happening first among Fitch, Moody's and Standard & Poor's. The first change in rating is defined as one which is not preceded by another change in rating by the same or other rating agency in the previous thirty trading days, for a given sovereign. CAAR[t_1,t_2] is the cumulative average abnormal return for the period staring on t_1 and ending at t_2 relative to event day (day 0). We examine CAARs separately, for each of the six categories. For a given CAAR, Common Law (vs. Civil Law) is shown on the first (second) row; Emerging & Frontier (vs. Developed) is shown on the first (second row); TI Corruption Index (Low vs. High; low score - first row - implies low institutional quality); PRS Law & Order (Low vs. High; low score - first row - implies low institutional quality); PRS Corruption (Low vs. High; low score - first row - implies high institutional quality); Investor Protection (Low vs. High; low score - first row - implies low institutional quality). The separation of each category is made at the mean value. N is the number of observations in each subcategory. P-values using the cross sectional method are reported and ***, **, and * denote statistical significance at the 1, 5, and 10 percent level, respectively.

	Common Law				Emerging & Frontier				TI Corruption				PRS Law & Order				PRS Corruption				Investor Protection			
Event Window	N	CAAR	P-Val	SS	N	CAAR	P-Val	SS	N	CAAR	P-Val	SS	N	Mean CAR	P-Val	SS	N	CAAR	P-Val	SS	N	CAAR	P-Val	SS
[-5,-3]	165	-1.08%	0.001	***	70	-0.57%	0.123		113	-1.32%	0.001	***	114	-1.29%	0.001	***	45	-0.35%	0.158		120	-0.96%	0.018	**
	52	0.28%	0.370		147	-0.84%	0.029	**	104	-0.13%	0.401		103	-0.16%	0.385		172	-0.86%	0.020	**	97	-0.50%	0.163	
[-5,-2]	165	-1.11%	0.008	***	70	-0.65%	0.211		113	-1.20%	0.012	**	114	-1.26%	0.007	***	45	-0.50%	0.110		120	-0.89%	0.075	*
	52	0.90%	0.250		147	-0.62%	0.149		104	-0.01%	0.495		103	0.06%	0.469		172	-0.66%	0.132		97	-0.31%	0.341	
[-5,-1]	165	-1.50%	0.002	***	70	-0.62%	0.213		113	-1.64%	0.004	***	114	-1.73%	0.002	***	45	-0.69%	0.077	*	120	-1.40%	0.019	**
	52	0.16%	0.438		147	-1.33%	0.009	***	104	-0.52%	0.220		103	-0.41%	0.282		172	-1.21%	0.016	**	97	-0.73%	0.107	
[0,+1]	165	-0.44%	0.112		70	-0.09%	0.425		113	-0.93%	0.017	**	114	-0.59%	0.070	*	45	-0.68%	0.009	***	120	-0.66%	0.085	*
	52	-0.39%	0.189		147	-0.59%	0.053	*	104	0.12%	0.374		103	-0.25%	0.284		172	-0.36%	0.160		97	-0.14%	0.310	
[+2,+5]	165	1.45%	0.012	**	70	0.15%	0.363		113	1.58%	0.002	***	114	1.83%	0.022	**	45	1.59%	0.209		120	1.44%	0.049	**
	52	0.32%	0.314		147	1.67%	0.011	**	104	0.74%	0.203		103	0.45%	0.124		172	1.07%	0.004	***	97	0.85%	0.020	**
[-5,+5]	165	-0.49%	0.260		70	-0.56%	0.226		113	-0.99%	0.107		114	-0.49%	0.319		45	0.23%	0.453		120	-0.62%	0.274	
	52	0.09%	0.475		147	-0.25%	0.394		104	0.35%	0.378		103	-0.20%	0.406		172	-0.50%	0.234		97	-0.03%	0.487	
[-10,+10]	165	-0.99%	0.209		70	-0.91%	0.291		113	-2.83%	0.009	***	114	-1.63%	0.146		45	0.78%	0.391		120	-1.26%	0.216	
	52	-2.11%	0.107		147	-1.43%	0.132		104	0.45%	0.394		103	-0.84%	0.254		172	-1.79%	0.043	**	97	-1.26%	0.128	
[-20,+20]	165	-2.41%	0.116		70	-3.69%	0.100	*	113	-3.36%	0.032	**	114	-1.60%	0.254		45	1.61%	0.351		120	-2.28%	0.195	
	52	-0.22%	0.460		147	-1.02%	0.301		104	-0.27%	0.461		103	-2.20%	0.152		172	-2.80%	0.052	*	97	-1.39%	0.186	

Table 5

Selection of Instrumental Variables

Results of the selection of most appropriate instrumental variables for the endogenous regressors approximating institutional quality. The five instrumental variables tested for each of the five endogenous variables are: Common vs. Civil Law (La Porta et al., 1998); Ethnicity fractionalization (Alesina et al., 2003); Religion fractionalization (Alesina et al., 2003); a landlocked indicator (1 if landlocked; 0 otherwise). The Null Hypothesis tested is "Instruments are redundant". We report robust test statistics estimated using (Baum et al., 2010) which are distributed according to a chi-squared distribution with degrees of freedom equal to the product of the number of endogenous regressors (1) and the numbers of instruments tested. The procedure begins with the five instruments listed below, and is repeated successively until all redundant instruments are eliminated. The final list of instrumental variables for each endogenous regressor is determined in Round 2.

Endogenous (down)	Common/Civil Law			Ethnicity			Religion			Landlocked		
	Test Stat	P-Val	SS	Test Stat	P-Val	SS	Test Stat	P-Val	SS	Test Stat	P-Val	SS
Round 1												
Emerging/Frontier	8.597	0.000	***	25.863	0.000	***	1.242	0.265		14.701	0.000	***
TI Corruption	17.461	0.000	***	51.007	0.000	***	9.359	0.002	***	5.606	0.018	**
PRS Law & Order	16.202	0.000	***	49.812	0.000	***	2.448	0.118		0.004	0.949	
PRS Corruption	1.254	0.263		1.809	0.179		0.031	0.861		10.595	0.001	***
Investor Protection	35.361	0.000	***	2.116	0.000	***	0.090	0.764		6.873	0.009	***
Round 2												
Emerging/Frontier	10.456	0.001	***	25.987	0.000	***				13.306	0.000	***
TI Corruption	24.246	0.000	***	59.216	0.000	***	6.251	0.012	**			
PRS Law & Order	19.125	0.000	***	49.677	0.000	***						
PRS Corruption										9.509	0.002	***
Investor Protection	71.078	0.000	***							4.329	0.038	**

Table 6

Two Stage Least Squares Regression of *Pre-Event* Stock Market Reaction on Institutional Quality

This table presents two-stage least square (2SLS) regressions on the cumulative abnormal returns in the local stock index, in the period starting five days and ending three days (t = -5 to t =-3) *before* downgrades in sovereign debt ratings. Downgrades used are those happening first among Fitch, Moody's and Standard & Poor's. The first change in rating is defined as one which is not preceded by another change in rating by the same or other rating agency in the previous thirty trading days, for a given sovereign. Instruments (description in Table 5) used for "Emerging & Frontier" are Common/Civil Law, Ethnic fractionalization and landlocked. Instruments used for "TI Corruption" are Common/Civil Law, Ethnic fractionalization, Religion fractionalization and Landlocked. Instruments used for "PRS Law and Order" are Common/Civil Law and Ethnic fractionalization. The instrument used for "PRS Corruption" is landlocked. Instruments used for Investor Protection" are Common/Civil Law and landlocked. "Exp Sign" is the expected sign of the regression coefficient ("Coeff."). "Z" and "P-val" are the robust z-value and p-value of the coefficient. UID is the under-identification test, which reports the Kleibergen-Paap rk LM statistic and associated chi-square p-value. OID is the over-identification test, which reports the Hansen J Statistic and associated chi-square p-value. In the case of PRS Corruption the endogenous variable is "just identified" hence the Hansen J statistic is not defined. WID is the weak-identification test reports both the Cragg-Donald Wald F-statistic and also the Kleibergen-Paap rk Wald F statistic. There are 217 observations in each regression.

	Exp Sign	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS
Intercept		0.016	1.230	0.219		-0.036	-2.720	0.007	***	-0.048	-2.440	0.015	**	0.008	0.150	0.881		-0.047	-1.750	0.081	*
Emerging/Frontier	-	-0.035	-1.870	0.061	*																
TI Corruption	+					0.006	2.340	0.019	**												
PRS Law & Order	+									0.009	2.170	0.030	**								
PRS Corruption	-													-0.006	-0.310	0.759					
Inv. Protection	+																	0.007	1.440	0.151	
			Stat	P-val			Stat	P-val			Stat	P-val			Stat	P-val			Stat	P-val	
UID (Kleibergen-Paap rk LM)			36.482	0.000			52.835	0.000			48.079	0.000			10.303	0.001			49.533	0.000	
WID (Cragg-Donald Wald F)			15.948				25.220				54.140				8.598				58.936		
WID (Kleibergen-Paap rk Wald F)			35.884				46.598				59.251				25.205				62.721		
OID (Hansen J)			0.901	0.637			1.588	0.662			0.922	0.337			-	-			0.036	0.849	

Table 7

Two Stage Least Squares Regression of *Post-Event* Stock Market Reaction on Institutional Quality

This table presents two-stage least square (2SLS) regressions on the cumulative abnormal returns in the local stock index, in the period starting two days and ending five days (t = +2 to t =+5) *after* downgrades in sovereign debt ratings. Downgrades used are those happening first among Fitch, Moody's and Standard & Poor's. The first change in rating is defined as one which is not preceded by another change in rating by the same or other rating agency in the previous thirty trading days, for a given sovereign. Instruments (description in Table 5) used for "Emerging & Frontier" are Common/Civil Law, Ethnic fractionalization and landlocked. Instruments used for "TI Corruption" are Common/Civil Law, Ethnic fractionalization and Religion fractionalization. Instruments used for "PRS Law and Order" are Common/Civil Law and Ethnic fractionalization. The instrument used for "PRS Corruption" is landlocked. Instruments used for Investor Protection" are Common/Civil Law and landlocked. "Exp Sign" is the expected sign of the regression coefficient ("Coeff."). "Z" and "P-val" are the robust z-value and p-value of the coefficient. UID is the under-identification test, which reports the Kleibergen-Paap rk LM statistic and associated chi-square p-value. OID is the over-identification test, which reports the Hansen J Statistic and associated chi-square p-value. In the case of PRS Corruption the endogenous variable is "just identified" hence the Hansen J statistic is not defined. WID is the weak-identification test reports both the Cragg-Donald Wald F-statistic and also the Kleibergen-Paap rk Wald F statistic. There are 217 observations in each regression.

	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS	Coeff.	Z	P-val	SS
Intercept	-0.141	-0.860	0.388		0.047	2.460	0.014	**	0.053	1.950	0.051	*	-0.042	-0.650	0.514		0.054	1.750	0.081	*
Emerging/Frontier	0.041	1.720	0.086	*																
TI Corruption					-0.007	-2.010	0.044	**												
PRS Law & Order									-0.009	-1.560	0.119									
PRS Corruption													0.019	0.880	0.381					
Inv. Protection																	-0.007	-1.430	0.153	
		Stat	P-val			Stat	P-val			Stat	P-val			Stat	P-val			Stat	P-val	
UID (Kleibergen-Paap rk LM)		36.482	0.000			52.835	0.000			48.079	0.000			10.303	0.001			49.533	0.000	
WID (Cragg-Donald Wald F)		15.948				25.220				54.140				8.598				58.936		
WID (Kleibergen-Paap rk Wald F)		35.884				46.598				59.251				25.205				62.721		
OID (Hansen J)		0.460	0.795			1.430	0.699			0.795	0.373			-	-			0.230	0.632	