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ABSTRACT

Sovereign Debt Rating Changes and the Stock Market*

Using event studies we find statistically and economically significant, negative daily abnormal stock market returns prior to sovereign debt rating downgrade announcements. Instrumental variable techniques show that these findings are more pronounced in countries with lower institutional quality. Our analysis of the frequency and content of news shows that results cannot be explained away by unrelated, concurrent bad news. Instead, we find support for the explanation of leakage, which could take the form of leaked private information to a group of investors, but could also take the form of a rumor that eventually appears in the public domain.

JEL Classification: G14, G15 and G24
Keywords: event studies, institutional quality, international finance, sovereign ratings, TRMI

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1. Introduction

Credit Rating Agencies (CRA), their actions and the effects these actions have on capital markets and government policies have become an important topic of discussion among market participants and regulators in the last twenty years. Jeopardizing the confidentiality of information related to a forthcoming, unscheduled sovereign debt rating change might be associated with economically significant destabilizing effects on local stock markets.

An example from Cyprus might be illuminating. On Thursday August 4th 2011, the Cyprus stock market fell by 3.6% and the next trading day by an additional 4.1%. On Saturday, August 6th, the Head of the Cyprus Securities and Exchange Commission made a public plea on national television that anyone having information that should be in the public domain must immediately disclose it. The following trading day in Cyprus (Monday, August 8th) coincided with a public holiday in London (Fitch covers Cyprus out of its London office), and the Cypriot stock market fell another 5.69%. Fitch downgraded Cypriot sovereign debt by two notches on Wednesday August 10th 2011, and the local stock market rose by 0.6% (and remained unchanged on August 9th). Figure 1 shows the economically significant cumulative drop in the Cyprus stock market index, reaching around 30% in the ten days before the announcement. One interpretation of this event is that the imminent downgrade was leaked during the consultation process between the CRA and local authorities before the public announcement.

The experience of the U.S. government debt rating downgrade by Standard and Poor's (S&P) in August 2011 further strengthens this motivation from an even more developed capital market. The ten-day cumulative drop in raw daily returns for the Dow Jones reached 11%, an economically significant drop. 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. In the SEC's September 30th 2011 summary report after examining ten CRAs 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.” 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 even more “concerns” in other less-regulated/monitored capital markets.

The natural question arises whether the case of Cyprus and the U.S. are isolated incidents, or examples that are more representative of international experience ahead of official sovereign debt rating announcements. To address this question empirically, we collect daily, local stock market index return data for every rated country. Using a 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 around changes in sovereign debt ratings, outlooks, and watch list inclusions. The data set comprises the universe of these changes by Fitch, Moody’s and S&P from February 1988 to March 2012. We focus on the three largest CRAs, because they hold a substantial fraction of the market, but also because they have recently come under intense scrutiny (SEC, 2003; Beaver et al., 2006; SEC, 2008; Cheng and Neamtiu, 2009).

To mitigate the problem arising from simultaneous rating actions across agencies, our preferred definition of an event takes into account the CRA 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 thereafter. We therefore use a “first mover” filter to construct our baseline case: the event stays in the sample if it is not preceded by a change in rating by the three CRAs in the twenty trading days prior to the event. To ensure that our results are not driven by announcements of changes in outlooks or watchlist inclusions, we create two additional samples that include changes in outlooks and watchlist inclusions.

For all three samples we find statistically and economically significant movements in local stock market returns for the periods before, at, and after the actual announcements of sovereign debt rating downgrades.[1] The pre-announcement negative abnormal returns are sizable and strongly statistically significant, followed by significant announcement effects. The negative abnormal returns appear to be partially reversed in the post-announcement period. We estimate standard errors using Kolari and Pynnonen's (2010) method, which accounts for event-induced variance and cross-sectional correlation of abnormal returns. Additionally, our results are robust to alternative abnormal return estimation methods, changes in event-window size, higher volatility in less developed markets and to excluding periods of high volatility in financial markets (for instance, the post-2008 global financial crisis period).

Motivated by the Cyprus example, where anecdotal evidence points to leakage of the forthcoming downgrade by informed local officials, we identify country-level institutional characteristics that are more likely to be associated with the documented abnormal stock market returns. Splitting our sample on a widely used measure of transparency (Transparency International Corruption Perception Index) and conducting event studies separately for those with a high and low transparency index, we find that results are largely driven by events in low-transparency countries. Results are robust to alternative measures of institutional quality. In addition, sorting on liquidity does not affect our results.

We next build a causal story. A positive correlation between stock returns and institutional quality does not imply causation. Error-in-variables problems can also affect our conclusions. For instance, using a proxy variable to measure institutional quality probably means that this proxy measures underlying quality with error. This is a classic errors-in-variables problem, generating biased estimates. To resolve endogeneity or error-in-variables problems, we identify appropriate instrumental variables for the variables proxying for institutional quality.

The instrumental variables for institutional quality we use are combinations of recently used variables in the literature. 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

[1] 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 (for example Holthausen and Leftwich, 1986; Hand et al., 1992).

(Easterly and Levine, 2003). The chosen instruments pass weak instrumental variable tests and the final regressions pass the over-identification Sargan/Hansen test statistic at the 5% level. Our results provide evidence for a causal relation between institutional quality and the pre-event stock market drop[2]: the coefficients in the regression are economically and statistically significant.

What might explain the pre-event stock market drop in low institutional quality events? One possibility is that information leaks to the market before the public announcement. CRAs communicate their intention to change the sovereign debt rating, and the justification of their action, to government officials of the rated country before the CRA's public announcement. Therefore, if there is leakage of information, it might be coming either from the CRA[3] or local government officials[4] over the period that information is shared between the two parties (IOSCO, 2004). Another possible explanation for the pre-event stock market drop could be the presence of news unrelated to the forthcoming downgrade in the pre-event window. We take the view that if the CRA is rumored to make a rating change, then this is similar to leakage of information. If, however, there are a lot of news stories that are unrelated to the possibility of a rating change, leakage is less likely.[5]

To make the distinction between news related and unrelated to the downgrade we use two sources for the creation of news-related variables. We first use Lexis Nexis to manually construct the variable sovereign downgrade news (SDN) to capture news stories with specific references to the forthcoming downgrade in the ten-day window before the announcement. We complement this measure using proxies recently developed by Thomson Reuters MarketPsych Indices (TRMIs). TRMIs capture all country-specific news, both related and unrelated to a sovereign downgrade. Our analysis of these variables shows evidence against the hypothesis that unrelated news may be driving the results. Specifically, we document

[2] By pre-event stock market drop we mean that there are statistically and economically significant negative abnormal stock returns before the official downgrade announcement.
[3] In July 2011 and January 2012 Italian prosecutors raided Moody's and Fitch offices respectively, and accused the two CRAs that there was leakage of the sovereign debt downgrades before their public announcements (Rossi, 2012).
[4] Even in well-regulated markets like the U.S. the idea of "soft corruption" is prevalent in the press as illustrated by the November 2011 CBS 60 Minutes "Insiders" Report (Kroft, 2012).
[5] We thank an anonymous referee for pointing us in this direction.

a negative abnormal stock market reaction in the pre-announcement window in the absence of both sovereign downgrade news and abnormal TRMI news variables.

Further empirical analysis of daily abnormal volume around an announcement of both upgrades and downgrades provides evidence consistent with the leakage explanation for downgrades in low institutional quality countries. Specifically, the public announcement of an event coincides with abnormal turnover in all cases except downgrades in low-institutional quality countries. As discussed in Bhattacharya et al. (2000), this finding is consistent with the interpretation of leakage in these countries, where leakage of information renders an event (the public announcement) a non-event.

Why should we care about these empirical findings? 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 rating changes. This evidence sends a message to capital market regulators around the world that the way information is relayed to capital markets through CRA consultations with government officials, should become more structured to avoid leakage of information.

European regulators seem to agree: a regulation set in place in November 2009 (EU, 2009) states that CRAs should give rated entities at least a 12-hour notice (the so-called "12-hour rule") when the sovereign rating (and/or outlook) is revised and an announcement is imminent. This proposal was amended to a 24-hour notice and was voted into law in June 2013. However, the upper bound of this communication window is still not specified. This "unbounded communication window" implies that the public announcement can be made several days after local government officials are informed of the CRA's intention to change the sovereign rating (Cyprus example). In December 2013, the European Securities and Markets Authority (ESMA) published the results of a sovereign ratings investigation and expressed concerns about the confidentiality of information related to rating actions and the timeliness of the CRA's publication of rating decisions.

Based on our empirical results we recommend uniform, global, regulatory guidelines be put in place, specifying in detail the procedure for the timing of sovereign debt rating announcements to guard the information confidentiality related to the rating action. We think that such a framework will mitigate the potential leakage of information and consequent stock market destabilization.[6]

The literature on the effects of sovereign debt downgrades on stock markets is relatively nascent and recent. Our result that leakage is more likely in lower institutional quality countries echoes findings for price manipulation in an emerging stock market (Khwaja and Mian, 2005). Brooks et al. (2004) also find a negative effect of rating downgrades on stock returns, but we differ by showing that in our empirical results 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 document a causal link between sovereign institutional quality and stock market reaction before downgrades, and we also conduct an extensive analysis of news prior to announcements to show that results are not driven by concurrent news unrelated to the downgrade.

Afonso et al. (2012) focus on sovereign yield responses to rating changes in European Union countries, and find evidence for bi-directional causality between yields and rating changes, consistent with event anticipation. Our results emphasize a large drop in the stock market before an official announcement in countries with a largely unsophisticated investor base, a finding that is hard to reconcile with the anticipation hypothesis in such countries. Gande and Parsley (2005) find evidence for contagion in government bond yields across countries following sovereign debt downgrades, building on Kaminsky and Schmukler (2002). We think that TRMIs would identify instances where one would expect spillovers from one country to another. We find that abnormal stock returns arise even in samples without any sovereign downgrade news related to the upcoming downgrade, or abnormal changes in TRMIs before the announcement. In addition, contagion is more likely to appear in crisis periods. Our results are qualitatively similar for crisis (i.e. the Asian, Russian and Euro-debt crisis) and non-crisis periods.

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[6] Interestingly, in the emerging field of household finance, a recent explanation of limited stock market participation is the low level of trust (Guiso, et al., 2008). To the extent that our results are rationalized by informational advantages from insiders, trust in the stock market should be lower in countries with weaker institutions, rationalizing limited stock market participation in such environments.

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 event study results and in section 4 our causality analysis. In Section 5 we provide potential explanations for our results and conduct subsample news analysis. Section 6 provides policy implications for our results and section 7 concludes.

2. Data and descriptive statistics

2.1. Sovereign ratings, outlooks and watchlist inclusions

We use 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 (i.e. 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 actions related to sovereign financial distress and default (i.e. ratings of D, RD, SD etc.) we assign the number 22.

We identify changes in (local and foreign currency) ratings and outlooks by comparing successive letter grades for each country. The samples for Fitch, Moody's and S&P begin in 1994, 1986 and 1983, with 318 (201), 336 (185) and 434 (350) changes in ratings (outlooks and watchlist inclusions)[7], 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 stock market index and also the World MSCI index from Datastream. Our analysis begins with the earliest date of the world MSCI index (January 1988) and ends one month after the last change in rating and outlook (March 2012). After removing duplicate events (i.e. changes in ratings happening on the same day) and events with no index return data, the sample of changes in ratings comprises 874 events (456 upgrades and 418

[7] For the remainder of the paper, references to outlooks imply also the use of watchlist inclusions in a sample.

downgrades) for 65 countries, and the sample for outlook changes is made up of 600 events (334 positive and 266 negative). Figure 2, Panel A reports the total number of changes in sovereign debt ratings for the three largest CRAs (Fitch, Moody's and S&P). 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.

Multiple ratings for the same sovereign around the same time are very unlikely to have the same impact on the local stock market 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 considers the CRA moving 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 use a "first mover" filter for our baseline case.[8]

We implement this idea as follows. We keep ratings for a sovereign that are not preceded by other changes in ratings of the same, or other, CRA in the previous twenty trading days. We call this, the "ratings FMR" sample. This generates 293 downgrade events (from an initial of 418) and 400 upgrade events (from an initial of 456) from 65 countries, which represent the core events that make up the baseline specification ("ratings FMR" sample). Figure 2, Panel B plots the time series distribution of the "ratings FMR" sample. Comparing Panel A and B we observe that the definition does matter since a substantial number of 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 number of days used in our definition of "first-mover", by altering the number of days required to have no other change in rating before the event chosen. Figure 3 plots the grade-level distribution of the sovereign debt "ratings FMR" sample after the rating change (downgrade

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

or upgrade). We report the frequency distribution separately for each CRA and also for our "ratings FMR" definition. The graphs show that rating changes are not clustered on specific grade-levels. Instead, changes generate a spectrum of resulting grades, both for upgrades and downgrades.

Outlook changes might also provide signals to stock markets related to future changes in ratings. For robustness purposes we therefore create two additional samples by considering changes in outlooks. The first robustness sample treats changes in ratings and outlooks equivalently. To construct it we create the union of changes in ratings and outlooks and apply the "first mover" filter. The event stays in the sample if it is not preceded by a change in rating or outlook by any CRA in the twenty trading days prior to the event. We call this sample "ratings and outlooks FMRO" (FMRO stands for First Mover using Ratings and Outlooks). Our second robustness sample comprises changes in ratings that are not preceded by changes in ratings and outlooks in the previous twenty trading days ("ratings FMRO" sample).

2.2. Daily stock market data

We collect daily, aggregate stock index data from Datastream. To maximize coverage we choose the widely used MSCI indices, which are available for 65 countries in our sample. We also require that each rating change has at least 60 daily observations in the estimation period (from day -270 to day -21), consistent with Low (2009). This filter removes two additional events from our dataset.

2.3. Institutional quality variables

From Section 3.3 onwards our analysis focuses on country institutional characteristics. These are: (a) the Corruption Perceptions Index from Transparency International, (b) the legal system (common vs. civil) from La Porta et al., (1998); (c) the country's classification by the World Bank (developed vs. emerging and frontier); (d) the corruption index from the Political Risk Services Group; (e) the Law & Order index from the Political Risk Services Group; and (f) the investor protection index from Djankov et al. (2008).

For each of these institutional characteristics, we identify appropriate instrumental variables to address potential endogeneity or errors-in-variables problems. 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).

2.4. Daily volume (turnover)

Given the unavailability of daily volume data for MSCI indices for all countries in our sample, we look for other broad market equity indices in the same country that also have daily volume data at the index level. Hence, we re-construct our sample of equity indices to match available daily volume data.[9] We calculate daily stock index turnover by dividing the index's daily "Volume by Value" by its daily "Market Capitalization". To address the non-normality features of turnover (skewness = 5.18; kurtosis = 50.82), we follow Chae (2005) and use the log of turnover (skewness = -1.27 and kurtosis = 4.55).

2.5. News analysis

To capture the frequency but also the content of news items before sovereign downgrade announcements, we implement a two-prong approach. First, we conduct a manual news search before each announcement to identify sovereign downgrade news (section 2.5.1) related to the forthcoming downgrade. Second, we use the country-level "Thomson Reuters Marketpsych Indices" (TRMI)[10] to capture the frequency and content of economic, political and other news that may affect general investor Sentiment (section 2.5.2).

2.5.1. Sovereign downgrade news (SDN)

We manually collect news stories in the ten days (-10, -1) prior to each downgrade announcement from Lexis Nexis to identify cases of sovereign debt downgrades that are rumored in the news. Specifically, we search for news stories with references to the word "downgrade" and also to the CRA announcing a downgrade at day 0. We use the following keywords for our search: "country name" and "downgrade(s)" and "name of CRA (including spelling variations)". For example, our search would capture news related only to a forthcoming downgrade. We provide an example of a relevant news item,

[9] Results hold when both MSCI and broad Datastream indices are used. For brevity, we only show MSCI results.
[10] TRMIs were introduced in 2012 and extend back to 1998. We thank Thomson Reuters for generously providing this dataset for academic analysis: http://thomsonreuters.com/products/financial-risk/01_255/TRMI_flyer_2012.pdf.

from Wall Street Journal on Friday, March 6, 1998 related to Russia's downgrade on Wednesday, March 11, 1998, (four trading days before the announcement) by Moody's: "…*A top Russian central bank official signals that Fitch IBCA and Moody's Investors Service might lower their ratings on Russia's foreign debt, but says foreign money is still pouring into Russian bond market.…*" .[11]

We record the number of news stories in Lexis Nexis over the event window (-10, -1). We then read each news story and classify it as "relevant" or "not relevant" to the forthcoming downgrade as described above. Then, for each event we calculate the ratio of the relevant to total news announcements over the event window (-10, -1). The mean and median of this ratio is 0, while only about 40% of downgrade announcements have at least one relevant news item. Hence, we create an indicator variable called SDN (Sovereign Downgrade News) which takes the value of 1 when a downgrade announcement is preceded by at least one relevant news item and 0 otherwise.

2.5.2. Thomson Reuters MarketPsych Indices (TRMIs)

TRMIs are available to us on a daily basis since 1998, using a proprietary algorithm that identifies news stories from Thomson Reuters News Feed Direct, Factiva News, and other third party news. For each country of interest, they construct a "frequency" TRMI called *Buzz* that counts the number of news items (positive integers) related to issues such as macroeconomic announcements (internal or external), political influence and other exogenous factors (i.e. natural catastrophes). This number is estimated using a twenty-four hour rolling-day window. We run normality tests on Buzz and conclude that the log of Buzz (skewness=0.18; kurtosis=1.14) is closer to normality than its absolute value (skewness=17.19; kurtosis=364.30) and thus more appropriate for our analysis.

To capture the content ("intensity") of news items relevant to each country, a similar proprietary algorithm is used over a twenty-four hour rolling-day window, to read, categorize and score the content of each story on a normalized scale to produce TRMI *Sentiment*. In the finance literature, researchers (for

[11] The news item is titled "WORLD WATCH -- EUROPE: RUSSIA DEBT RATING MAY BE LOWERED" and it is recorded in Section A; Page 11, Column 1.

example Tetlock et al., 2008) create proxies for sentiment using positive and negative references in the news. TRMI Sentiment builds on this approach by taking into account emotions derived from lexical analysis, modifier words and linguistic analysis (among others). Hence, TRMI Sentiment "transforms" news items based on their content, tone and choice of words into a multi-dimensional Sentiment index normalized between -1 to +1, which is positively correlated with positive market sentiment. This transformation is intended to capture not only macro-related content but also content that may affect several feelings like joy and fear (among others) that may affect stock market reactions according to several recent studies (for example, Stambaugh et al., 2012).

3. Event study analysis

3.1. Methodology

To measure the impact of announcements of sovereign rating changes on local stock markets, we use a short-horizon event-study methodology using daily return data on the stock market index 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 CRA's action on the local stock market.

We use the world CAPM to calculate abnormal and cumulative abnormal returns. Given the importance of standard errors in our analysis, we use the methodology of Kolari and Pynnonen (2010) for our baseline case, as it addresses both event-induced variance and cross-sectional correlation in abnormal returns.[12] The estimation period uses the window [-270, -21] and the event (testing) period uses the window [-20, +20]. Details of our methodology are provided in the Appendix.

To measure abnormal changes in (log) turnover, we use the same approach as with stock return data, but using two modifications following Chae (2005). First, we use an estimation period of [-40,-11] and a testing period of [-10, +10]. Second, to estimate daily abnormal turnover in the testing period, for each event we subtract the average value of (log) turnover in the estimation period from the actual daily values

[12] Our results also hold using the standard errors of Brown and Warner (1980) and Boehmer et al. (1991).

of (log) turnover in the testing period. Standard errors and p-values are estimated using the method of Kolari and Pynnonen (2010).

3.2. Stock return analysis

3.2.1. Main Results

Table 1 (Panel A) reports daily average abnormal returns, AAR_t, for the event window [-10, +10], along with their statistical significance following Kolari and Pynnonen (2010). Results are reported for both upgrades and downgrades using the "Ratings FMRO" sample.[13] An examination of the daily *AARs* shows several important conclusions regarding the period before, at and after the announcement.

First, the economic impact of downgrades appears to be significantly higher than that of upgrades. Specifically for downgrades, in the window [-6, +1], $AARs$ range from -0.34% to -0.17% (p-value < 0.05 and p-value < 0.10, respectively). For upgrades there is only one statistically significant reaction of 0.11% (p-value < 0.10). Second, for downgrades, there is a statistically significant abnormal market reaction prior to the announcement, with AAR_{-6}, AAR_{-5}, AAR_{-4}, AAR_{-3} and AAR_{-1} being negative and statistically significant (most of them at the 5% level). There is no significant reaction prior to upgrade announcements. Third, both upgrades and downgrades exhibit a market reaction in the expected direction at the announcement window of [0, 1]. For downgrades, both AAR_0 and AAR_1 are negative (-0.24% and -0.34%, respectively), and statistically significant (p-value < 0.05). Results for upgrades are weaker, since only AAR_1 is positive (0.11%) and statistically significant (p-value < 0.10).

Finally, for both upgrades and downgrades we observe a statistically significant market reaction starting two and four days respectively after the announcement, but in the opposite direction to the one found in the period up to and including the announcement. Specifically for downgrades, AAR_{+4} = 0.31% (p-value < 0.05), AAR_{+6} = 0.35% (p-value < 0.05) and AAR_{+7} = 0.31% (p-value < 0.10). For upgrades

[13] We have also experimented with separating changes in ratings beyond one notch, since changes above one notch might have a larger effect on the stock market than single notch changes. We did not find statistically different results relative to our baseline and we therefore report results without differentiating on the number of notches.

we document negative and statistically significant average abnormal returns (p-value < 0.05) for AAR_{+2} and AAR_{+6} (-0.22% and -0.12%, respectively).

Table 1 (Panel B) shows the Cumulative Average Abnormal Returns (CAAR) over different windows in the period before, at and after the announcement. For downgrades, we document an economically and statistically significant negative market reaction in the pre-announcement period (CAAR [-5,-3] = -0.81% with a p-value < 0.01; CAAR [-10,-3] = -1.64% with a p-value < 0.01), accompanied by an additional negative significant announcement effect (CAAR [0, +1] = -0.57% with a p-value < 0.01). In the post announcement period, we document a statistically significant positive reaction over the period [+2, +5] (+1.0% with a p-value < 0.05), which fades away in the next few days (CAAR [+2, +10] is not significant). The overall effect of downgrade announcements is negative and statistically significant with CAAR [-5, +5] = -0.63% (p-value < 0.05) and CAAR [-10, +10] = -1.21% (p-value < 0.05).

For upgrades, there is weaker evidence of positive abnormal returns in the pre-announcement period (CAAR[-5,-3]=0.262% with a p-value < 0.05; CAAR[-10,-3] is not significant), accompanied by a statistically significant announcement effect (CAAR[0,+1]=0.191% with a p-value < 0.05), and a statistically significant negative reaction in the post announcement period which remains significant over the entire post-event period (CAAR[+2,+5]= -0.427% with a p-value < 0.05; CAAR[+2,+10]= -0.886% with a p-value < 0.01). The overall effect of upgrade announcements is muted by the post-event negative reactions since both CAAR [-5, +5] and CAAR [-10, +10] are not statistically significant. We conclude that the economic significance of the market reaction to upgrades appears to be significantly muted relative to the market reaction to downgrades.

The larger economic significance of downgrades relative to upgrades is also evident in Figure 4. The stark difference in cumulative abnormal returns around rating downgrade announcements relative to upgrade announcements is obvious in Figure 4A. Specifically, the market-adjusted CAARs react more strongly throughout the pre-announcement period for downgrades rather than for upgrades. Moreover, the post-announcement effect seems also larger for downgrades than for upgrades and it goes in the opposite direction relative to the pre-announcement period. In Figure 4B, we also show that cumulative average raw returns for downgrades behave in a similar manner.

3.2.2. Robustness

Changes in outlooks and watchlist inclusions could affect our results as they provide warning signals to markets about upcoming changes in ratings. Therefore, we repeat our analysis with the two additional, robustness samples. For the "ratings and outlooks FMRO" sample the results are shown in Figure 5A and for the "ratings FMRO" sample in Figure 5B. In these two panels we show the market-adjusted, cumulative abnormal returns for each sample before and after the event. We observe similar results to the baseline "ratings FMR" sample.

A skeptic might also wonder whether our definition of "first mover" might be responsible for our findings. We repeat the same methodology using all CRA changes (that is, without the "first mover" filter) and the results are plotted in Figure 5C. Our conclusions remain unchanged as the graph remains very similar to the baseline scenario. Downgrades show substantial pre-announcement stock market effects, with partial reversal after the announcement, while that is not the case for upgrades. The results remain very similar when the baseline twenty-day filter is increased to thirty days and also when decreased to ten.

A potential concern might arise from the presence of higher stock market volatility during recessions, which may also be linked with an increased number of downgrades (as figure 2 suggests). For example, a particularly volatile time is the period of "The Great Recession" after 2008 (figure 2A shows that downgrades were the highest in October 2008). We therefore repeat the same analysis but exclude all events after December 31st 2007, focusing on the "ratings FMR" sample of rating changes during the period of "The Great Moderation" (1989-2007). Results (Figure 5D) are very similar to our baseline results (figure 4A), confirming that our conclusions are not driven by events after 2007.[14]

One issue typically discussed in the literature is the potential problem of illiquidity due to including frontier markets in the analysis. We follow Lesmond, et al., (1999) and Bekaert et al. (2007) in using the

[14] Results are also robust in the samples "Ratings and Outlooks FMRO" and "Ratings FMRO".

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 -20 to +20) and exclude events that have more than ten days of zero returns. Our results are not affected by this filter.

3.3. Conditional Stock Return Analysis

3.3.1. Main Results

To understand the determinants of the pre-event stock market drop for downgrades, we condition the calculated CAARs on measures of institutional quality widely used in the literature. Some of these measures can be thought of as exogenous variables because they were determined many decades before the actual rating change. The differential experience of common law versus civil law countries is one such example. Any differential results obtained from this dichotomy, can be interpreted as causal, given the exogeneity of legal origins to trading mechanisms post-1989. Other categorizations (developed versus non-developed countries) might suffer more from endogeneity issues. Nevertheless, such correlations can still be informative, while in the next subsection we disentangle cause and effect.

We focus on downgrades given the robust empirical result that they have a larger stock market impact than upgrades. We first condition on the corruption perception index from Transparency International (TI). We also condition on the emerging/frontier (non-developed) and developed countries based on the World Bank classification, 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), and the investor protection index from the World Bank's Doing Business website.[15]

In Figure 6 and in Table 2 we show the cumulative average abnormal returns around downgrades after sorting the countries in our dataset according to the six institutional quality variables. For countries that have a continuous index, we take a very conservative approach and separate countries above and below the "ratings FMR" sample's median value of that measure (results are naturally stronger if we compare

[15] For TI we use 1995 values for events before 1995. TI takes values from 0 to 10, PRS Law and Order from 0 to 6, Investor Protection from 0 to 10, and PRS Corruption from 0 to 6. Higher values imply higher Institutional Quality.

the top to the bottom percentiles). The main message from the results that follow is that the identified patterns in abnormal returns are more pronounced in countries with lower institutional quality.

The TI results for downgrades are reported in Figure 6, Panel A and in the first column of Table 2. The results are striking: countries with a higher corruption perception index react much more strongly before, at and after the downgrade. For both CAAR windows in the pre-event period there is a negative and statistically significant effect for high-corruption countries. Specifically, CAAR [-10, -3] = -2.91% (p-value < 0.01) and CAAR [-5, -3] = -1.59% (p-value < 0.01). During the announcement window, the reaction is -1.05% (p-value < 0.01). After the announcement window, it seems that there exists a short-term partial reversal in the first three days (CAAR [+2, +5] = 1.40% p-value < 0.01), but this fades away in the following five days (CAAR [+2, +10] is not statistically significant). The overall effect for high-corruption countries remains negative and statistically significant, that is, for CAAR [-5, +5] and CAAR [-10, +10] there is a negative reaction of -1.46% (p-value < 0.05) and -2.65% (p-value < 0.01) respectively. On the contrary, the pre-, at-, post- announcement and also the overall effects for low-corruption countries are not statistically significant.

Figure 6, Panel B shows CAARs for civil versus common law systems, and there is evidence that downgrades have a bigger impact on abnormal returns before the event in civil law countries, consistent with La Porta et al. (1998) who find that common law countries provide stronger legal protections for investors relative to civil law countries. Table 2 quantifies this impact: there is a pre-event negative effect for civil law countries in both pre-event windows (CAAR [-10,-3] =-1.86% with a p-value < 0.01 and CAAR [-5,-3] = -1.22% with a p-value < 0.01). For common law countries only CAAR [-10, -3] is negative and significant (-1.02% with p-value < 0.05). At the event, the difference in reactions is also evident as civil law countries have a -0.60% (p-value < 0.01) effect, while there are no significant abnormal returns in common law countries. After the event, we observe a mild reversal for civil law countries in the shortest window (CAAR [+2, +5] =1.16%, p-value < 0.10), which does not appear in the window CAAR [+2, +10]. There is an overall negative effect for civil law countries for CAAR [-5, +5] and CAAR [-10, +10], of -0.92% (p-value < 0.05) and -1.24% (p-value < 0.05) respectively, while no effect exists for common law counties.

Figure 6, Panel C plots the CAARs for non-developed relative to developed (advanced) economies. The graph illustrates that non-developed countries tend to exhibit larger CAARs than developed countries. Table 2 illustrates this statistically. For both CAAR windows in the pre-event window (CAAR [-10, -3] and CAAR [-5, -3]) for non-developed countries there is a negative statistically significant effect (p-value < 0.01) ranging from -1.00% to -1.99%. During the announcement window, the reaction is -0.80%, (p-value < 0.01), while a mild reversal exists during the window CAAR [+2, +5] =1.36% (p-value < 0.10), which disappears in the following five days (CAAR [+2, +10] is not statistically significant). The overall effect for non-developed countries remains negative statistically significant, that is, for CAAR [-5, +5] and CAAR [-10, +10] there is a negative reaction of -0.74% (p-value < 0.05) and -1.40% (p-value < 0.01) respectively. On the contrary, the pre-, at-, post- announcement and also the overall effects for developed countries are not statistically significant.

The next column in Table 2 (and graphically in Panel D, Figure 6) reports the results from splitting countries according to the PRS-law and order index. For countries with a low PRS-law and order index, both CAAR windows in the pre-event window (CAAR [-10, -3] and CAAR [-5, -3]) show a negative statistically significant effect (p-value < 0.01) ranging from -1.34% to -2.31%. During the announcement window, the reaction is -0.74%, (p-value < 0.05), without a significant reversal in the post-announcements windows. The overall effect for countries with a low PRS-law and order index remains negative significant (p-value < 0.05), that is, for CAAR [-5, +5] and CAAR [-10, +10] there is a negative reaction of -0.82% and -1.50% respectively. Countries with a high PRS-law and order index show a weak negative reaction before the announcement (CAAR [-10,-3] = -0.98% with p-value < 0.10), a stronger negative reaction at the event (CAAR [0,1] = -0.41% with p-value < 0.05), and a mild reversal after the announcement (CAAR [2,5] = 0.53% with p-value < 0.10), that essentially mutes the overall reaction in the windows around the event (CAAR[-5,+5] and CAAR[-10,+10] are not significant).

The final two columns report results from splitting countries according to the PRS-corruption index and the investor protection index, respectively. The graphical results in Panel E and F in Figure 6 illustrate that the differences across countries grouped according to these two variables might not be statistically different from each other. The last two columns of Table 2 confirm this impression. We observe statistically significant reactions before the downgrade using both measures, but the differences across the groupings are not as striking as when using the previous four variables.

We conclude that even with a very conservative split of country characteristics (above and below the median for continuous, imperfect measures of institutional quality), there is evidence for a statistically significant reaction in the stock market before the downgrade announcement. Moreover, this effect is mostly present in countries that tend to be associated with proxies of lower institutional quality frameworks. Furthermore, our results are robust to using the other two samples (that is, incorporating information from changes in outlooks and watchlist inclusions).

In the next section we describe several robustness tests conducted to check whether the difference in stock market reactions between the high and low institutional quality events remains robust. We focus on TI for brevity considerations, since results are similar for civil vs. common law, developed vs. emerging and frontier, and PRS Law & Order. Furthermore, TI incorporates characteristics of the remaining institutional quality variables as described on their website.[16]

3.3.2. Robustness

To address potential concerns that the assumption of Kolari and Pynnonen (2010) is violated (i.e. that the event changes residual correlation in the estimation period), we also conduct panel regressions on

[16] Our sample of downgrades is classified into high and low transparency by splitting at the median value of the annual transparency index. Countries consistently categorized as low Transparency are: Brazil, Bulgaria, China, Colombia, Egypt, Ghana, India, Indonesia, Jamaica, Kazakhstan, Kenya, Mexico, Morocco, Nigeria, Pakistan, Philippines, Poland, Romania, Russian Federation, Sri Lanka, Thailand, Trinidad & Tobago, Turkey, Ukraine and Vietnam. Countries consistently categorized as high Transparency are: Australia, Bahrain, Belgium, Canada, Chile, Cyprus, Estonia, Finland, Hong Kong, Hungary, Iceland, Ireland, Israel, Japan, Jordan, Korea, Latvia, Malaysia, New Zealand, Portugal, Slovenia, Spain, Sweden, Taiwan and USA. The following countries are classified as either high or low transparency depending on the year of downgrade, since their transparency score is close to the median: Argentina, Croatia, Czech Republic, Greece, Italy, Peru, South Africa and Tunisia. Source: www.transparency.org.

daily returns separately for high and low institutional quality events. First, we run a panel regression of daily stock returns on world returns and 21 dummy variables for each day in the event window (-10, +10) with robust (White) standard errors clustered at the event. Second, we add country fixed effects and third, we add country-day fixed effects. We find that the negative abnormal returns before and the partial reversal after the announcement remain both statistically and economically significant for low TI events.

Next, to address potential concerns that low institutional quality events may exhibit increased volatility, hence what we capture may be due to higher volatility, we control for volatility of stock returns in two ways. First, instead of using abnormal returns, we use information (Sharpe) ratios. We estimate Sharpe ratios by dividing returns with their standard deviation in the estimation period. We then run panel regressions as described above and find that results (section 3.3.1) remain robust to all specifications.[17]

Our daily estimates of betas could be noisy and could potentially add uncertainty to our results. To address this concern, we use several variations of the market model to estimate abnormal returns. We find that the results of the conditional stock return analysis remain robust to all specifications below. First, we set all country betas equal to one in the estimation period, and then we re-estimate abnormal returns in the event window. Second, we also use full-sample monthly betas in the estimation period market model. For example, the beta estimate is based on the entire time-series of data available for a rated sovereign instead of only the year before the testing period. Third, we use raw returns for our estimations. Specifically, we calculate average raw returns in the estimation period and subtract them from actual returns in the testing period to estimate abnormal raw returns. As a final robustness check to the beta estimation, we estimate abnormal returns for countries which are highly correlated with the U.S. market, on a variation of the World index that excludes the US, while for non-highly correlated sovereigns, we use the World index (both benchmark indices obtained from Datastream).

[17] Splitting the sample into broad rating groups (above and below investment grade) and controlling for volatility yields qualitatively similar results.

Cross-sectional differences in liquidity among countries could be associated with differences in stock market reactions. For example, illiquidity may be more likely in countries with lower institutional quality, potentially exacerbating negative CAAR magnitudes in the pre-event period. To address this concern, we estimate a proxy for liquidity and sort our sample on high vs. low liquidity. Specifically, we proxy for market liquidity using daily stock market turnover, that is, daily turnover is estimated as the total daily market volume traded, divided by daily market capitalization over the estimation and testing periods. Then, for each event we calculate the time-series average of daily turnover. We next estimate the median value across all upgrades and downgrades in our sample and classify an event as "low liquidity" if its time-series average turnover falls below the population median. Figure 7 shows that differences in liquidity do not affect our conclusions, since the effect is present in both high and low liquidity samples. Another view may be that illiquidity, may be a symptom of corruption rather than an alternative explanation. If this were true, in Figure 7 we would expect to see similar trends to the ones shown in Figure 6 as liquidity would be highly correlated to institutional quality.

3.4. Volume Analysis

To get a more complete picture of the market reaction to the announcement of changes in ratings we also conduct an extensive analysis of daily volume for each event. We estimate abnormal (Log) Turnover by subtracting from the actual daily values of (Log) Turnover in the period [-10, +10] the average value of (Log) Turnover estimated over the period [-40, -11]. Standard errors and p-values are estimated using the method of Kolari and Pynnonen (2010). In Table 3 we present daily abnormal volume for four subsamples that result from double sorting our sample into the type of change (downgrades and upgrades) and level of transparency index (TI), that is, high and low TI.

In Table 3 panel A we show the daily average abnormal turnover (AAT) and in panel B we show cumulative average abnormal turnover (CAAT) for several event windows around the event. What is particularly interesting and differentiates the subsample of downgrades in low transparency countries from all other subsamples is the behavior of abnormal trading volume at the announcement of the rating change. This is the only subsample for which the abnormal trading volume is not statistically significant on the event date. In all other subsamples (including the subsample of upgrades in low transparency countries) we document a statistically significant, positive abnormal volume on the event.

In Table 3 panel B, we observe that for high TI upgrades there is a statistically significant (p-value < 0.05) abnormal increase in volume for all event windows starting 5 days before the announcement. For high TI downgrades, we observe a statistically significant (p-value < 0.10) increase only for (-5,-1), which may be driven by the day before the event given that (-5,-2) and (-5,-3) are not statistically significant. We observe no abnormal change in volume for low TI upgrades and downgrades before the event. In the period after the announcement, we do not find any abnormal change in volume for the four subsamples.

4. Causal Evidence on Stock Return Reactions

Most, if not all, independent variables in subsection 3.3.1 (transparency index, law and order, corruption and investor protection indices) are likely to suffer from either endogeneity or errors-in-variables bias. A positive correlation between abnormal stock returns and institutional quality does not imply that institutional quality causally affects the documented abnormal stock returns. Error-in-variables problems can also affect our conclusions. Consider, for example, using a proxy variable to measure institutional quality and this proxy being an imperfect measure of the true institutional quality. Regressing cumulative abnormal returns on the proxy variable will suffer from a classic errors-in-variables problem, generating biased estimates depending on the degree of measurement error.

The classic solution to both problems is to search for suitable instrumental variables. In this section we therefore use instrumental variables techniques to give a causal interpretation to the uncovered correlations. 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: TI; Emerging/Frontier vs. Developed; 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). 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 (different measures of institutional quality) but not directly affect the dependent variable (cumulative stock returns), 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 et al. (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 4, most of the chosen instruments are valid (p-values < 0.01; Round 1). The procedure is repeated for each endogenous variable until no more redundant instruments appear (Round 2). For instance, for the endogenous variable TI, all but one IV (landlocked) is statistically significant at a p-value of 1% or lower, therefore in the second step, the redundant IV (landlocked) is not included. Therefore, in the 2SLS estimation, TI is proxied by the three non-redundant IVs (round 2 in Table 4): common/civil law, ethnic fractionalization and religion fractionalization.

Results of the 2SLS regressions for the pre-event period are shown in Table 5, Panel A, using CAAR [-5,-3] as the dependent variable for the baseline sample.[18] We expect that abnormal market reactions before the event will have a positive relation with measures of institutional quality (i.e. since CAARs are

[18] Results hold using CAAR [-10, -3] as dependent variable. Results also hold using the "ratings and outlooks FMRO" and the "ratings FMRO" samples.

negative, we expect that when institutional quality is better, CAARs will be less negative). We find both statistically and economically significant results for the five endogenous variables we use.

We find a positive and statistically significant coefficient for TI using the instruments obtained in Table 4 (common law, ethnic fractionalization and religion fractionalization). A one-standard deviation (2.1) decrease in the TI index gives a 1.25% (p-value < 0.01) decrease in the CAAR, where all identification tests are again satisfied. Emerging/Frontier countries (using common law, ethnic fractionalization and landlocked as instruments) generate CAARs of 2.40% (p-value < 0.05) lower than those of developed countries. The coefficient for PRS Law & Order (using common law and ethnic fractionalization as instruments) is also positive, indicating an overall decrease in CAAR of 0.86% (p-value < 0.05) when the index decreases by one standard deviation (1.23). For PRS Corruption (using common law and ethnic fractionalization as instruments) a one-standard deviation (1.25) decrease in the index gives a 1.37% (p-value < 0.05) decrease in the CAAR. Similarly, a one-standard deviation (1.43) decrease in the Investor Protection Index (using common law and landlocked as instruments) gives a 1.29% (p-value < 0.05) decrease in the CAAR.

The statistical tests strongly reject under-identification (UID) for all regressions, while in all models we reject the weak instrumental variables (WID) hypothesis. Both reported test statistics (Cragg-Donald for i.i.d. error disturbances and Kleibergen-Paap for non-i.i.d. errors) exceed the Staiger and Stock (1997) thresholds to reject the hypothesis of weak IVs. The Cragg-Donald F-test rejects the hypothesis in all cases in our baseline specification, when compared to the Stock and Yogo relative bias and relative size tests. The Kleibergen-Paap test also passes the Stock and Yogo (2005) critical values for 10% maximal IV relative bias and IV size, even though strictly speaking these values should be compared to the i.i.d.

case. We interpret these results as rejecting the weak IV hypothesis. Moreover, the Hansen J-statistic does not reject the over-identification (OID) hypothesis at the 5% level.[19]

We also report in Table 5B the 2SLS regressions on abnormal stock market returns after the event using CAAR [+2, +5]. The table serves to illustrate that there is only very weak to non-robust evidence for reversal after the event, in the opposite direction. From all the variables being considered, only TI is statistically significant (p-value < 0.10). We conclude that the pre-event response is the most robust of our empirical findings, once we control for institutional quality using our IV strategy.

5. What Drives the Results?

5.1. Is it Leakage?

We explicitly define possible reasons why the stock market might drop before the announcement in low institutional quality events. Leakage of the forthcoming downgrade from CRAs and/or local policy makers is one hypothesis. Specifically, around the time that the sovereign rating is being revised by the CRA, information leaks by the CRA or the informed local officials. This leakage might arise intentionally or unintentionally, and may result in legal or illegal insider trading (Bhattacharya 2013). We define leakage that has not reached newswires as "unobserved leakage" and the case where the leaked information has become a rumor and eventually has found its way to newswires as "observed leakage". In both cases, given that both the CRAs but also regulators are striving to maintain this information confidential until the public announcement, the pre-announcement diffusion of information to the markets might have destabilizing stock market consequences.[20]

Brunnermeier (2005) provides a theoretical basis for the leakage hypothesis through a market microstructure model on the effects of information leakage and trading behavior on stock returns. The stock price reflects unrelated, long run private information held by other traders as well as the early-

[19] The Hansen statistic is statistically significant at the 10% level in three of the five regressions. We interpret this as evidence of treatment effect heterogeneity given the plausible heterogeneity in results across the different countries in our sample (Angrist and Pischke, 2009, p. 146).

[20] CRAs have strict guidelines published on their websites highlighting the importance of maintaining confidentiality of the information discussed with government officials (S&P's 2013).

informed traders' short run, imprecise signal (possibly a rumor) on an upcoming news announcement. Brunnermeier (2005) shows that traders with access to non-public information can exploit this information twice: first, before the actual public announcement, and second, by taking the opposite position of their first trade after the public announcement.[21] More commonly, in the case of bad news, "SELL on the RUMOR, BUY on the NEWS." Furthermore, Brunnermeier (2005) shows that traders have incentives to trade more aggressively before the announcement, which might be costly in the short run, but can boost their overall profit with the partial reversal of the trade after the announcement. This trading behavior can be associated with an over-reaction of the market before the public announcement and a partial reversal after the public announcement.

Empirically, capital market regulators also worry about intentional or unintentional loss of confidentiality (leakage) and the consequent destabilizing effects ahead of official sovereign debt rating announcements. On December 2nd 2013, the European Securities and Markets Authority (ESMA) published the results of a sovereign ratings investigation assessing the governance, conflicts of interest, resourcing adequacy and, more importantly for our purposes, confidentiality controls and the timing of publication of rating actions (ESMA 2013). On confidentiality concerns, section 2.2 of the ESMA report explicitly states that it "…is concerned that confidential information has been passed on to third parties who should not be privy to it." On timeliness concerns, section 2.3 of the ESMA report explicitly states that it "… observed significant and frequent delays between the decision taken by the rating committee and the publication of sovereign ratings. In particular, there were instances of publication of ratings more than five days after the rating decision had been approved by the rating committee and, in at least one case even two weeks after the date of the committee."

The second main explanation of the pre-event drop in low institutional quality events is that the stock market reacts to other "unrelated news" to the forthcoming downgrade, such as macro-related, politically-

[21] Hirshleifer et al. (1994) also generate trade reversals, where risk-averse insider traders unwind part of their risky position as soon as their private information is revealed to other traders.

related or any other market-moving bad news in the pre-event window. We call this explanation "Unrelated News". For example, unrelated macro announcements are a possible explanation of the empirical findings in an interesting recent paper by Lucca and Moench (2013). They focus on the period before scheduled FOMC announcements, whose content is presumably not leaked, and they find a positive statistically significant drift leading up to the FOMC announcement. Cieslak, et al., (2013) extend the analysis of Lucca and Moench (2013) using a detailed news analysis and find that the pre-FOMC drift seems to be largely attributed to other macro news taking place on the same day.

In the following two sections we use both volume and news data analysis in the pre-event and event windows to differentiate between the two hypotheses: Leakage vs. "unrelated news".

5.2. What do volume data tell us?

Empirical and theoretical studies on insider trading offer conflicting evidence on trading volume patterns ahead of corporate announcements. The theoretical market microstructure literature typically characterizes trading volume as informed or uninformed (liquidity trading). With exogenous and price-inelastic liquidity trading (Kyle, 1985), informed traders exploit their private information and trading volume increases. If, however, traders have timing discretion, trading volume can decrease with information asymmetry (Admati and Pfleiderer, 1988; and Foster and Viswanathan, 1990).

Empirically, Bhattacharya et al. (2000) find no evidence of abnormal trading volume prior to corporate news announcements in Mexico even though they convincingly show that the pre-announcement period exhibits significant abnormal returns associated with rampant insider trading that render the public announcement a non-event, both in terms of abnormal return and abnormal volume. The empirical literature on insider trading ahead of corporate takeovers also provides evidence on the abnormal volume behavior ahead of the public announcement of takeovers. Sanders and Zdanowicz (1992) isolate the pre-announcement period over which informed trading by insiders can take place and find no evidence of abnormal pre-announcement trading volume even though they do document a pre-announcement stock price run-up associated with people that had knowledge of the specific bids. On the other hand, Jarrell and

Poulsen (1989) and Meulbroek (1992) find evidence of abnormal pre-announcement trading volume. At the first public announcement, Meulbroek (1992), Jarrell and Poulsen (1989), and Sanders and Zdanowicz (1992) find significant abnormal trading volume.

Our results on abnormal volume (section 3.4) show no significant abnormal volume in the pre-announcement period for all subsamples (upgrades and downgrades split by level of institutional quality). This suggests that the timing of the rating action is not publically anticipated since that would imply a decrease in trading volume. This is also consistent with our finding that the adverse effects of sovereign debt downgrades are more prevalent in low-institutional quality countries as it is difficult to envision market participants in countries with lower institutional quality being able to better anticipate not only the forthcoming downgrade, but its timing as well. The pre-announcement finding of no abnormal volume is also inconsistent with the "unrelated news" explanation as any unrelated price-moving news would most likely induce increased turnover.

What is particularly interesting and substantially differentiates the subsample of downgrades in low transparency events from all other subsamples is the behavior of abnormal turnover at the rating change announcement. This is the only subsample for which the abnormal turnover is not statistically significant on the event date. In all other subsamples (including the subsample of upgrades in low transparency countries) we document a statistically significant, positive abnormal turnover on the event. This finding seems consistent with the finding in Bhattacharya et al. (2000), where insider trading renders the public announcement of an event a non-event. Overall, the results on abnormal volume appear to be consistent with the leakage explanation even though they might not be conclusive on their own.

5.3. What does news analysis tell us?

The pre-event stock market drop might be driven by either leakage of information or news unrelated to the forthcoming downgrade. To distinguish between the two explanations, we would need to collect all unrelated news stories to the forthcoming downgrade in the pre-event window. Manually constructing an objective measure of "unrelated news" is a difficult task because defining, and finding, all news items that are unrelated to a downgrade might be an impossible task. We therefore use proxies provided by TRMI (section 5.3.2) that capture *all* country-specific news (related and unrelated to a sovereign downgrade), along with a manually constructed variable that captures rumors specific to the forthcoming sovereign downgrade (section 5.3.1). In the presence of abnormal news ahead of the public announcement as measured by the broad TRMI proxies we need to determine whether they are related to the forthcoming downgrade or not. If the CRA is rumored in the news to make a rating change, then this is similar to leakage of information. However, if there are a lot of news stories that are unrelated to the possibility of a rating change, leakage is less likely.

5.3.1. Sovereign Downgrade News (SDN)

For our analysis we conduct event studies on stock returns to measure the impact of low-institutional quality downgrades conditional on their SDN classification (SDN=1 if there are sovereign downgrade news related to the forthcoming downgrade in (-10, -1) and 0 otherwise). We present our results in Figure 8 and Table 6. In Figure 8 we show graphs of the cumulative average abnormal return (CAAR) [-10, +10] for the subsample of low institutional quality events with SDN=1 (n=57) and SDN=0 (n=92). In table 6 panel A we show the daily average abnormal stock returns and their statistical significance and in panel B we show CAARs before, at, and after the event. There are three important findings and an un-answered question in Figure 8 and Table 6.

First, we observe a statistically significant drop before the event when SDN=0 (on days -7, -6, -4, -3 and -1) and when SDN=1 (on days -7, -4 and -3). The significance carries over to CAARs. Specifically when SDN=0, CAAR [-10, -3] = -2.58% (p-value < 0.01) and CAAR [-5, -3] = -1.37% (p-value < 0.01). When SDN=1, CAAR [-10, -3] = -3.46% (p-value < 0.01) and CAAR [-5, -3] = -1.95% (p-value < 0.01). We conclude that a similar pre-event stock market drop exists regardless of the presence of rumors about an imminent downgrade (i.e. when both SDN=0 and SDN=1).

Second, at the event we observe a statistically significant effect only when SDN=0. Specifically, when SDN=0, CAAR [0, 1] = -1.54% (p-value < 0.01), while the respective CAAR when SDN=1 is not statistically significant. This finding implies that when there are sovereign downgrade news in the pre-event window (SDN=1), there seems to be full pricing of the forthcoming downgrade before the actual announcement. In the opposite case (SDN=0), the downgrade announcement surprises the stock market and is associated with the expected negative abnormal effect.

Third, focusing on CAARs after the event we observe that when SDN=1, the stock market reaction before the event seems to be reversed, while there is no reversal when SDN=0. Specifically, when SDN=0, CAAR [+2, +5] and CAAR [+2, +10] are not statistically significant. On the contrary, when SDN=1, CAAR [+2, +5] = +1.67% (p-value < 0.01) and CAAR [+2, +10] = +3.19% (p-value < 0.01). These results are consistent with an over-reaction to rumors in the news (SDN=1) in the pre-event window related to the forthcoming downgrade. Hence, in the case of SDN=1, we observe a stock market drop, which ends with the announcement of the anticipated downgrade and the market then starts to move upwards. When SDN=0, we observe a similar pre-event stock market drop, however, the downgrade announcement seems to surprise markets with an additional negative reaction and no significant reversal after the event. As a result, the overall effect before and after the event when SDN=0 remains negative and statistically significant, but when SDN=1, the overall effect is muted. Specifically, when SDN=1, CAAR [-5, +5] and CAAR [-10, +10] are not statistically significant, however, when SDN=0, CAAR [-5, +5] = -2.00% (p-value < 0.01) and CAAR [-10, +10] = -3.93% (p-value < 0.01).

The un-answered question in Figure 8 and Table 6 is what drives the pre-event stock market drop when SDN=0. We revert to our previous hypotheses to explain this drop: (a) the drop could be associated with "unrelated news" to the forthcoming downgrade (i.e. which would be consistent with the results of Cieslak et al. 2013), or (b) the drop could be associated with private (unobserved) leakage. To answer this question, in the next section we conduct event studies on the daily values of TRMI Buzz and Sentiment around the event. If the drop happens due to "unrelated news", then we would expect to find an abnormal increase in Buzz and/or an abnormal decrease in Sentiment. If private leakage is driving the result, we would not expect to find any abnormal increase (decrease) in Buzz (Sentiment) before the event.

5.3.2. SDN and Thomson Reuters MarketPsych Indices (TRMIs)

To measure the abnormal changes in the news variables (TRMI Buzz and Sentiment), we use the same approach as with daily volume (turnover) analysis. We use an estimation period of [-40, -11] and a testing period of [-10, +10]. To estimate abnormal (log) Buzz, we subtract from the daily (log) Buzz values in the testing period the average value of (log) Buzz over the estimation period.[22] To estimate abnormal Sentiment we follow the same methodology. Given that TRMI variables begin in 1998, the final number of events with SDN=0 (SDN=1) and available TRMIs is 46 (36). For completeness, we also repeat event studies on the stock returns of the two subsamples and report both average abnormal and cumulative average abnormal returns in Table 7 (panel A and B, respectively). Standard errors and p-values are estimated following Kolari and Pynnonen (2010).

Before the event, in the absence of news related to the forthcoming downgrade (SDN=0), we do not observe any statistically significant change for either Buzz or Sentiment, but we do observe the abnormal negative reaction in the stock market. Specifically, in panel A of Table 7, we observe no days with significant effects for Buzz and Sentiment, but several days of negative abnormal stock returns (-8, -7, -6 and -4). These results are also reflected in Panel B, where we show the Cumulative Average Abnormal Index (CAAI) for Buzz and Sentiment. We find no event windows with statistically significant CAAIs for Buzz and Sentiment but several statistically significant windows for CAARs (CAAR [-10,-3] = -3.36% (p-value < 0.01) and CAAR [-5,-3] = -1.46% (p-value < 0.05)). We can therefore, reject the "Unrelated News" hypothesis leaving private (unobserved) leakage being the only likely explanation for the pre-event negative abnormal returns, since we observe no sovereign downgrade news (SDN=0), no abnormal (log) Buzz and no abnormal Sentiment in the pre-event window.

In the presence of news related to the forthcoming downgrade (SDN=1), results are different. Stock returns, Buzz and Sentiment exhibit abnormal behavior in the expected direction. Specifically, in panel A of Table 7, we observe that returns are negative and statistically significant four and three days before the

[22] Thomson Reuters recommends using observations that have a corresponding Buzz value greater than 500.

event.[23] Buzz starts turning abnormally positive significant three days before the event, while Sentiment is abnormally negative and statistically significant four and one days before the event. In panel B we observe similar trends. In the presence of related news to the downgrade (SDN=1), stock returns and Sentiment (Buzz) are abnormally negative (positive) and statistically significant. Therefore, the existence of unrelated news to the downgrade cannot be ruled out, even though Buzz and Sentiment might just be picking up the sovereign downgrade rumors since SDN=1. Interestingly, Sentiment appears to be affected more than Buzz before the event, a result that possibly reflects the presence and impact of rumors related to the forthcoming downgrade on the Sentiment index and not other unrelated announcements that would most likely generate abnormal increase in Buzz as well.

At the event, we observe statistically significant changes in both Buzz and Sentiment regardless of the SDN classification, indicating that TRMI news variables clearly capture the event both using daily abnormal measures (panel A) and cumulative abnormal measures (panel B). Focusing on panel B of Table 7, we observe positive (negative) abnormal reactions for Buzz (Sentiment) at [0, +1] (p-value < 0.01). Stock return reactions in Table 7 show similar reactions to Table 6, since CAAR [0,+1] is abnormally negative statistically significant when SDN=0 (-1.68% with p-value < 0.01) and not significant when SDN=1, consistent with the interpretation that when SDN=1, the information is fully priced in the stock market before the announcement.

After the event, when SDN=0 we continue to observe an abnormal, statistically significant increase in Buzz for the few days after the event (CAAI [+2, +5] has p-value < 0.10) and a persistent, abnormal, statistically significant positive reaction over more days (CAAI [+2, +5] and CAAI [+2, +10] have p-value < 0.05). At the same time, stock returns do not seem to experience additional negative reaction after the event, indicating that the information present in the announcement is fully priced at the event. In contrast, when SDN=1, stock returns demonstrate a reversal to the pre-event, potential over-reaction

[23] Interestingly, the drop in the absence of relevant news (SDN=0) is smoother than in the presence of news, which is more consistent with insider trading slowly affecting prices rather than news reaching the market instantaneously.

(negative) before and at the event. At the same time, Buzz shows a positive abnormal reaction after the event (CAAI [+2, +5] and CAAI [+2, +10] have p-value < 0.05), while abnormal Sentiment is not statistically different from zero. Interestingly, the reversal in stock returns takes place over a period that Sentiment does not identify any additional negative content in the news.

5.3.3. Interpretation of news results

Our results show evidence against the hypothesis that unrelated news to the forthcoming downgrade may be driving the pre-event stock market drop in low institutional quality countries. We conclude this because when SDN=0 both Buzz and Sentiment show no abnormal changes before the announcements, while the documented negative abnormal returns still exist. At the announcement, Buzz (Sentiment) shows an abnormally high increase (decrease) that continues after the announcement. Hence, even though Buzz and Sentiment clearly identify the day of the announcement, they do not show any abnormal activity in terms of frequency and content in the days before the event, where also manually collected news related to the forthcoming downgrade are an empty set.

On the contrary, in the period before the announcement when SDN=1, Buzz (Sentiment) shows abnormal increase (decrease), which provides evidence that the pre-event stock market drop may be attributed to public rumors on the forthcoming downgrade (SDN=1) even though in this case the presence of unrelated news cannot be completely ruled out.

Are news items driving the causality of our results? To answer this question we repeat the regression analysis with cumulative abnormal returns as the dependent variable (similar to Table 5), but now controlling for the impact of abnormal Buzz and Sentiment. Specifically, we include cumulative abnormal indices of Buzz and Sentiment over two different windows ([-10, -3] and [-5, -3]) as additional explanatory variables (in isolation and also both variables together) in the 2SLS models of Table 5A. The economic and statistical significance of the institutional quality variables remain robust, while the news variables are not statistically significant. These results show further evidence that abnormal bad news preceding the event are not driving the results.

Finally, we think that the Buzz and Sentiment would identify instances where one would expect spillovers from one country to another. For example, a downgrade in one country might be perceived as a signal for a potential downgrade in a neighboring country. However, such a signal would also likely generate discussion in the news, hence it would be identified by TRMIs. Gande and Parsley (2005) and Afonso et al. (2012) both find evidence for contagion in government bond yields across countries following sovereign debt downgrades. Afonso et al. (2012), focusing on sovereign yield responses to rating changes in European Union countries, also offer evidence for bi-directional causality between yields and rating changes, consistent with event anticipation. Our results emphasize a large drop in the stock market before an official announcement in countries with a largely unsophisticated investor base, a finding that is hard to reconcile with the anticipation hypothesis in such countries. Furthermore, abnormal stock returns arise even in samples without any sovereign downgrade news related to the forthcoming downgrade, or abnormal changes in the frequency and market sentiment before the announcement (that presumably a spillover effect from a public downgrade of another country's sovereign debt would generate). As a last robustness check, we re-run our results separately for crisis (i.e. the Asian, Russian and Euro-debt crisis) and non-crisis periods and our results are qualitatively similar.

6. Policy Implications

Our results indicate that pre-announcement CAAR reactions tend to take place mostly in countries with lower institutional quality. These results are consistent with leakage of information about the content and timing of the pending announcement. Where might the potential leakage of information be coming from? The IOSCO Code of Conduct Document (IOSCO, 2004) describes in detail the process through which CRAs should be releasing their reports. Specifically, Section 3.1 states that "The CRA should distribute in a timely manner its ratings decisions regarding the entities and securities it rates," while Section 3.7 states that: "Where feasible and appropriate, prior to issuing or revising a rating, the CRA should inform the issuer of the critical information and principal considerations upon which a rating will be based and afford the issuer an opportunity to clarify any likely factual misperceptions or other matters that the CRA would wish to be made aware of in order to produce an accurate rating. The CRA will duly evaluate the response."[24] If the CRA is considering a potential downgrade, given that a number of government officials see the original report before its public release by the CRA, anyone of these officials might leak (either intentionally or unintentionally) this information to local market participants, journalists or politicians. Therefore, the leakage of information could be coming from the CRA itself, but might also be coming from local government bodies.

This interpretation is consistent with the concerns European Union policymakers express about potential leakage of information in the period between the notification of the rated entity and the public release of the rating action. Specifically the 2011 Roundtable on CRAs by the European Commission mentions that: "There was opposition to the possible measure included in the consultation to request 3 days' notice to be given for sovereign rating changes, mainly because of market abuse risks." These concerns also exist in the 2009 European Union regulations (EU, 2009) on CRAs which state that: "The credit rating agency shall inform the rated entity at least 12 hours before publication of the credit rating and of the principal grounds on which the rating is based in order to give the entity an opportunity to draw attention of the credit rating agency to any factual errors." The 2011 regulation proposal (EU, 2011) rejects the requirement for a 3-day notice to be given for sovereign rating changes and it "...requires CRAs to inform issuers during the working hours of the rated entity and at least a full working day before publication." In December 2013 ESMA again publicly expresses concern about information confidentiality related to the rating action.

The most recent legal change (June 2013) came in the EU, where a new law requires CRAs to publish changes in ratings on pre-announced dates (Fridays after market close) thus changing the nature of the announcements from an unscheduled to a scheduled event. We suggest that similar changes are adopted

[24] For example, in the case of the U.S. downgrade S&P reportedly made a calculation error which was rectified by Treasury officials before the downgrade announcement, even though S&P still proceeded with publishing the downgrade: http://www.treasury.gov/connect/blog/Pages/Just-the-Facts-SPs-2-Trillion-Mistake.aspx.

worldwide so that there is uniform, global framework for announcing changes in sovereign ratings and outlooks and thus preventing the de-stabilizing effects documented in this paper.

Our last suggestion is to impose an upper bound on the length of period between the notification of the rated entity and the CRA's public announcement. At the moment, in the EU, the "24-hour" rule requires CRAs to give a 24-hour notice to government officials about their intention to alter a rating or outlook. However, CRAs can publish their decision days or even weeks after consulting with local government officials. We suggest that the consultation process is constrained to be (for example) *up to* 48 hours so that the probability of leakage is minimized through a shorter consultation period.

7. Conclusion

We find evidence that the local stock market moves before the public announcement of a sovereign rating downgrade, resulting in a significant market reaction prior to the event. Including information from outlook changes and watchlist inclusions to control for potential anticipation effects does not alter our findings. Moreover, we document a link between different measures of institutional quality and the pre-downgrade negative abnormal returns. Specifically, we find empirical evidence that this result is mostly present in countries that rank lower on the Transparency International index, are less developed, tend to be more corrupt, have weaker law enforcement, have a civil (rather than common) law system and offer less investor protection.

We also conduct a detailed analysis of news items before downgrade announcements using manually collected data, but also recently developed variables (Thomson Reuters MarketPsych Indices) measuring the frequency and content of news. Our analysis shows that stock markets in low-institutional quality countries experience negative abnormal stock returns in the absence of both related and unrelated news to the forthcoming downgrade, thus lending support to the explanation that leakage to a select group of individuals is responsible for the pre-downgrade stock market drop. Our results are consistent with recent investigations related to the de-stabilizing effects of official announcements of sovereign ratings in the US and EU, and also recent regulations in EU that require CRAs to publish their decisions in pre-announced dates. Our results indicate that capital market regulators should pay attention to how information is communicated between CRAs and local governments, and specifically the time lag between consultation and final release of sovereign debt downgrades.

Appendix

Econometrics (Event Study and Standard Error Estimation)

We use the world CAPM to calculate abnormal returns as follows. For every event, the following time series regression is estimated using daily data in the window [-270, -21]:

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

where R_{it} is the observation 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 ARs over the event window:

$$CAR_i[t_1, t_2] = AR_{it_1} + \cdots + AR_{it_2} \tag{3}$$

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. Using s_t as an estimator for σ (N = number of events) we can define the test statistic based on the average abnormal return (AAR_t):

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

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

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

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).

Boehmer et al. (1991) proposes another way to account for event-induced variance based on standardized abnormal returns. 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:

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

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

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

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

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

Kolari and Pynnonen (2010) improve equation (13) to also account for cross-sectional correlation of abnormal returns ($\bar{r}$ is the average of the sample cross-correlations of the estimation period residuals):

$$T_{KP} = T_{BMP}\sqrt{\frac{1-\bar{r}}{1+(N-1)\bar{r}}} \quad . \tag{16}$$

As a robustness check, 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]:

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

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:

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

We use the Kolari and Pynnonen (2010) as defined in (16) as the baseline case for our results.

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Figures and Tables

Figure 1: Cyprus Stock Index (Raw Returns) around Sovereign Debt Downgrades
Cumulative Raw Returns in the twenty days before and after the sovereign debt rating downgrade of Cyprus by Fitch on August 10th, 2011.

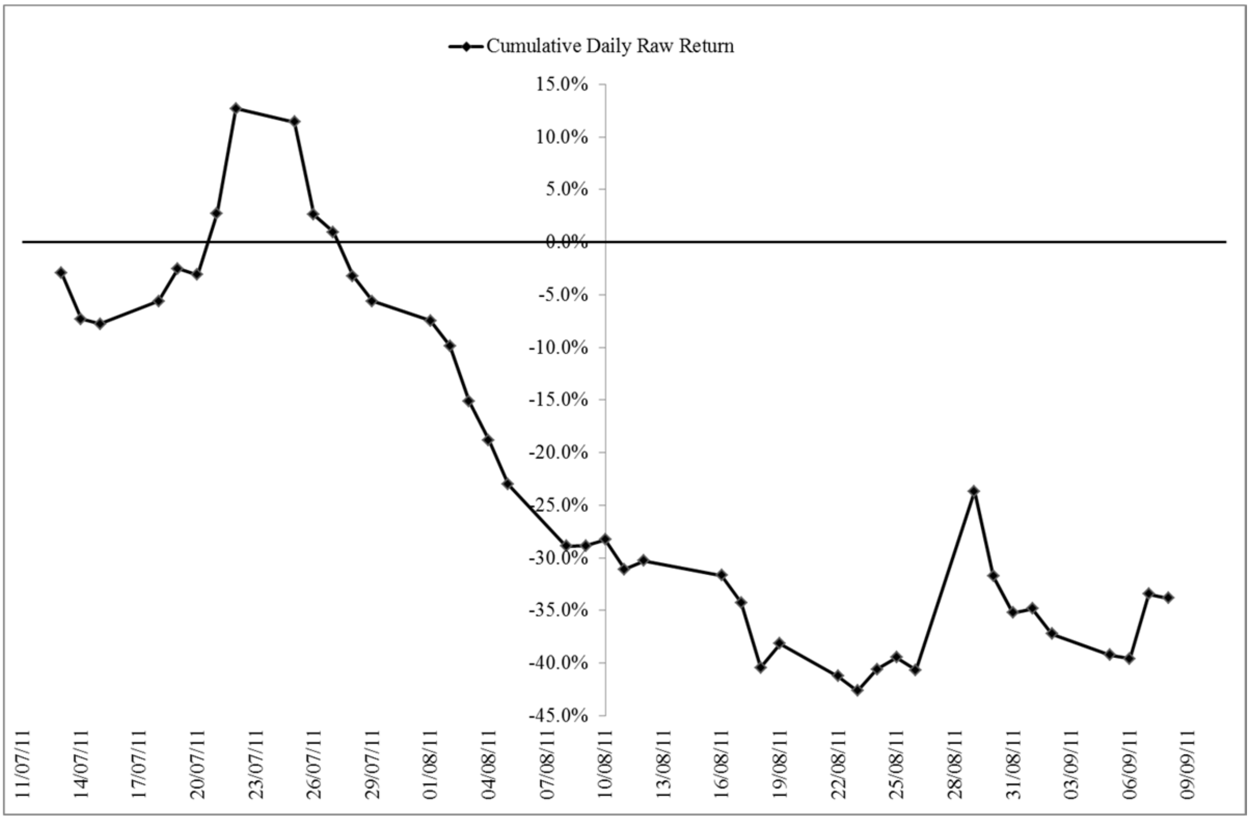

Figure 2: Time Series Distribution of Changes in Sovereign Ratings.
Figure 2A shows all changes in ratings by Fitch, Moody's and S&P, over time. The sample comprises 456 upgrades and 418 downgrades for 65 countries. Figure 2B, shows the changes in ratings that are free from other changes in ratings in the previous twenty days from the same or another rating agency ("First Mover" Rating (FMR) agency). These comprise 400 upgrades and 293 downgrades from 65 countries.

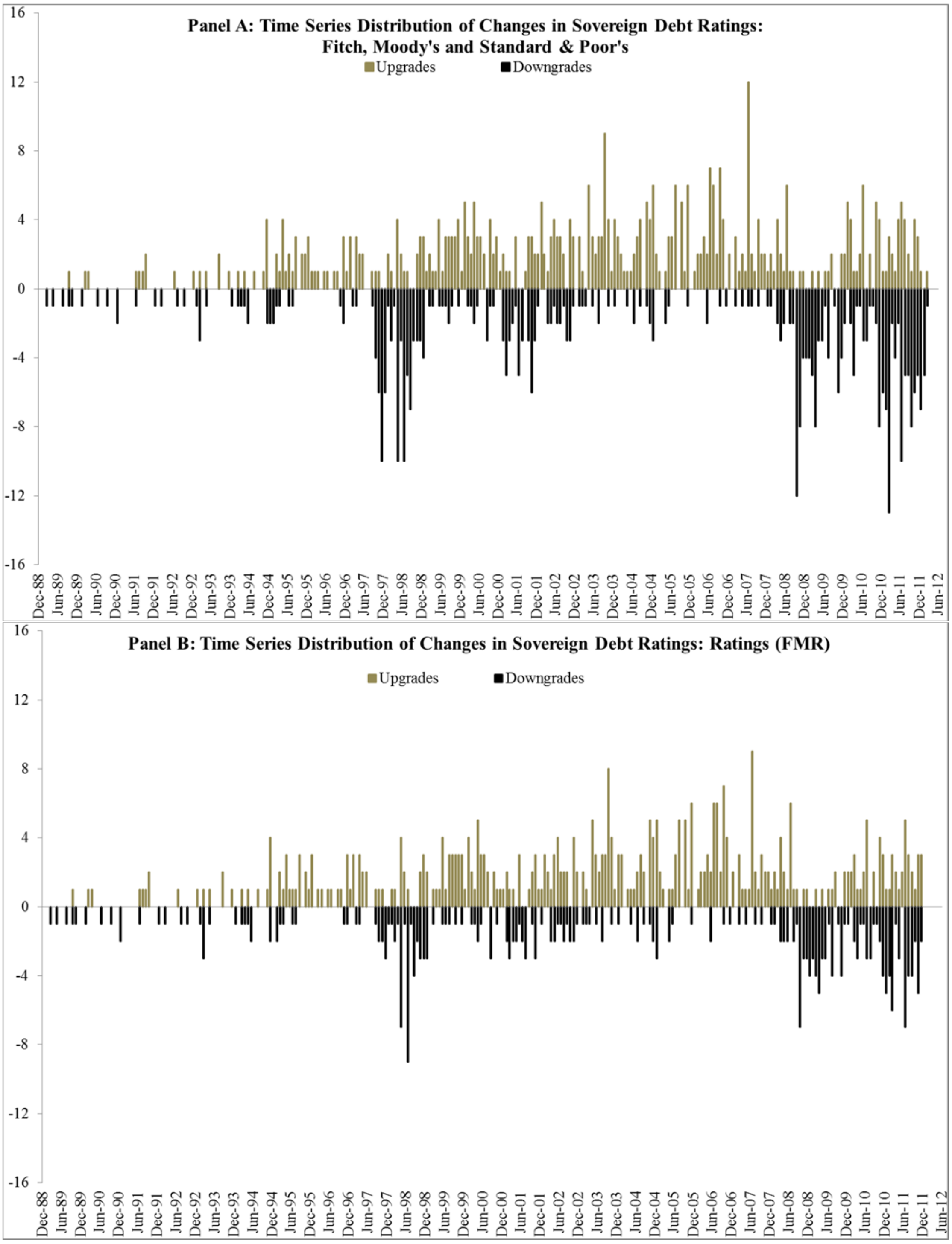

Figure 3: Grade-Level Distribution of Changes in Sovereign Ratings.
A change in rating is defined by either a change in the Local or Foreign Currency Rating. The sample shown is called "Ratings FMR" and it comprises changes in ratings by all rating agencies (changes in outlooks are excluded), which are not preceded by other changes in ratings by the same or other rating agencies in the previous twenty trading days (FMR stands for First Mover using Ratings). In Figure 3A we plot the 117 upgrades and 86 downgrades by Fitch Ratings; In Figure 3B we plot the 133 upgrades and 70 downgrades by Moody's Ratings; In Figure 3C we plot the 150 upgrades and 137 downgrades by S&P. In Figure 3D we plot the 400 upgrades and 293 downgrades for the Ratings (FMR) sample. The horizontal axis shows the categories of ratings (higher numbers indicate lower debt quality).

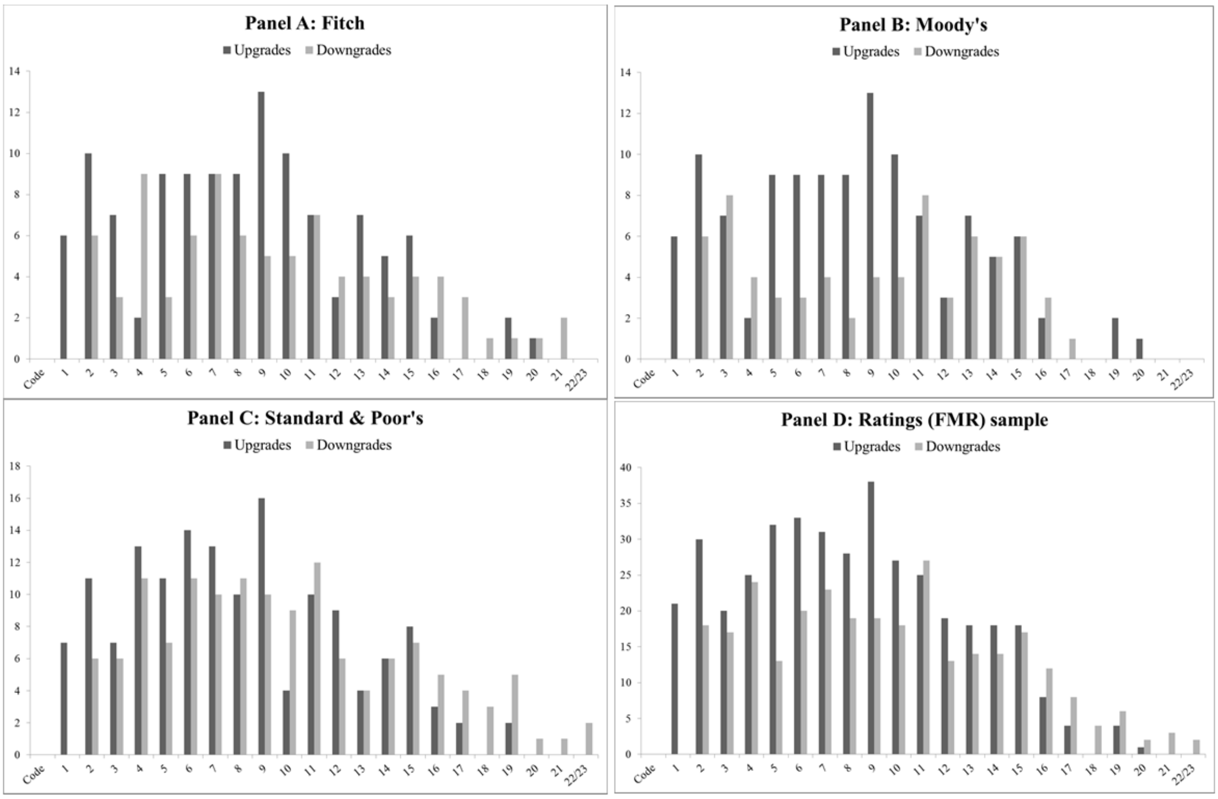

Figure 4: Cumulative Abnormal and Raw Returns for Changes in Sovereign Ratings.
Panel A shows market-adjusted cumulative average abnormal returns (CAARs) for the "ratings FMR" sample: 397 upgrades and 290 downgrades. Changes in ratings are free from noise from other rating changes ("First Mover" using ratings; FMR), as all rating changes in the preceding twenty days from the same or other rating agencies are removed ("Ratings FMR" sample). Panel 4B shows cumulative raw returns around the time of upgrades and downgrades respectively.

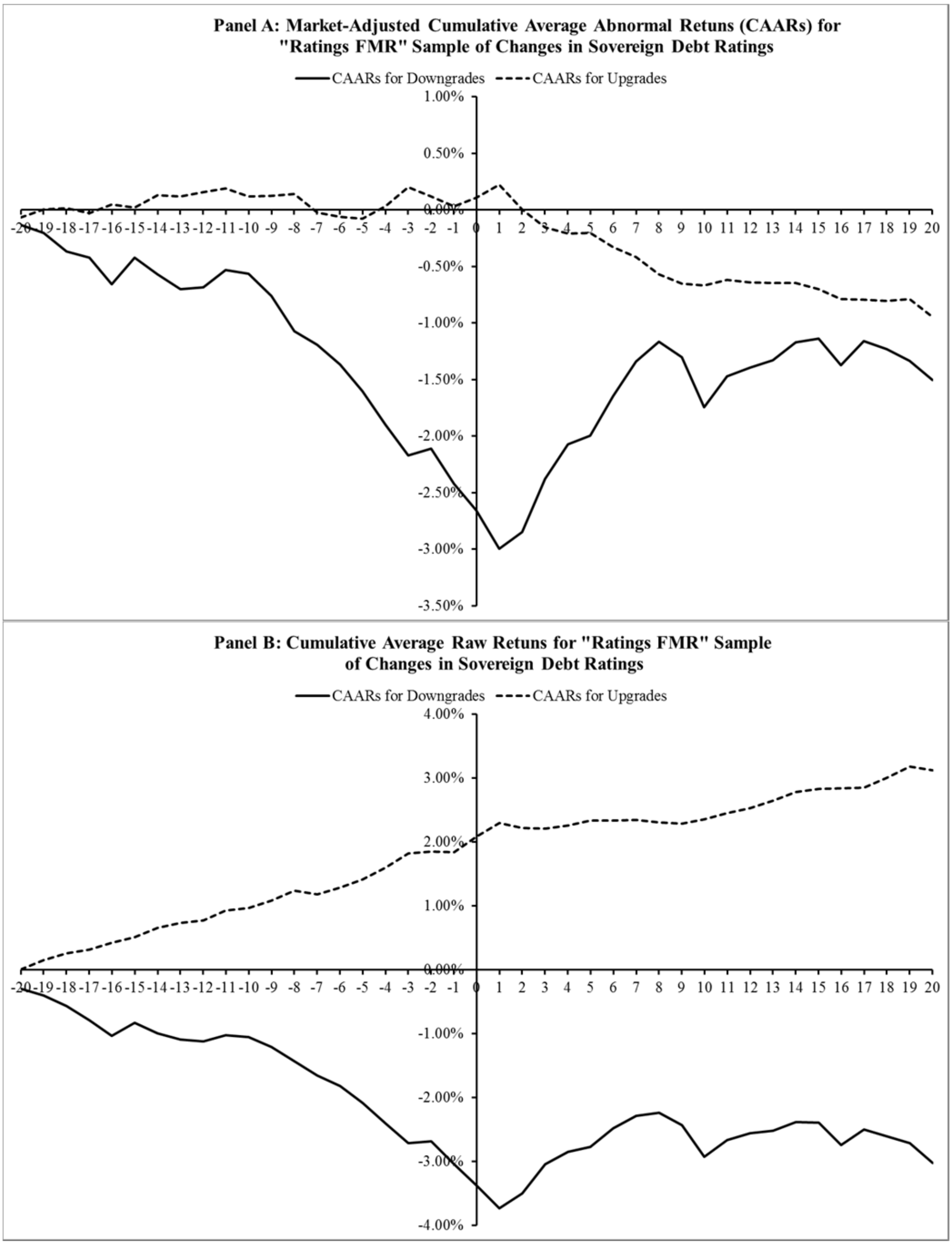

Figure 5: Cumulative Abnormal Returns for Changes in Sovereign Ratings: Robustness.
This figure presents robustness tests of Cumulative Average Abnormal Returns (CAARs) of the baseline case of “Ratings FMR” sample. FMR means that all events preceded by changes in ratings by the same or other rating agency (Fitch, Moody's and S&P) in the previous twenty trading days are deleted. Panel 5A shows CAARs for the “Ratings and Outlooks FMRO” sample (667 upgrades and 483 downgrades). FMRO is a first mover filter using ratings and outlooks in the previous twenty days. Panel 5B shows the “Ratings FMRO” sample (378 upgrades and 255 downgrades), which is the union of ratings filtered using the ratings and outlooks filter (FMRO). Panel 5C shows CAARs for the union of ratings but without the “First Mover” filter (453 upgrades and 415 downgrades). Panel 5D shows the same sample as 5A, but excluding the recent financial crisis (315 upgrades and 161 downgrades).

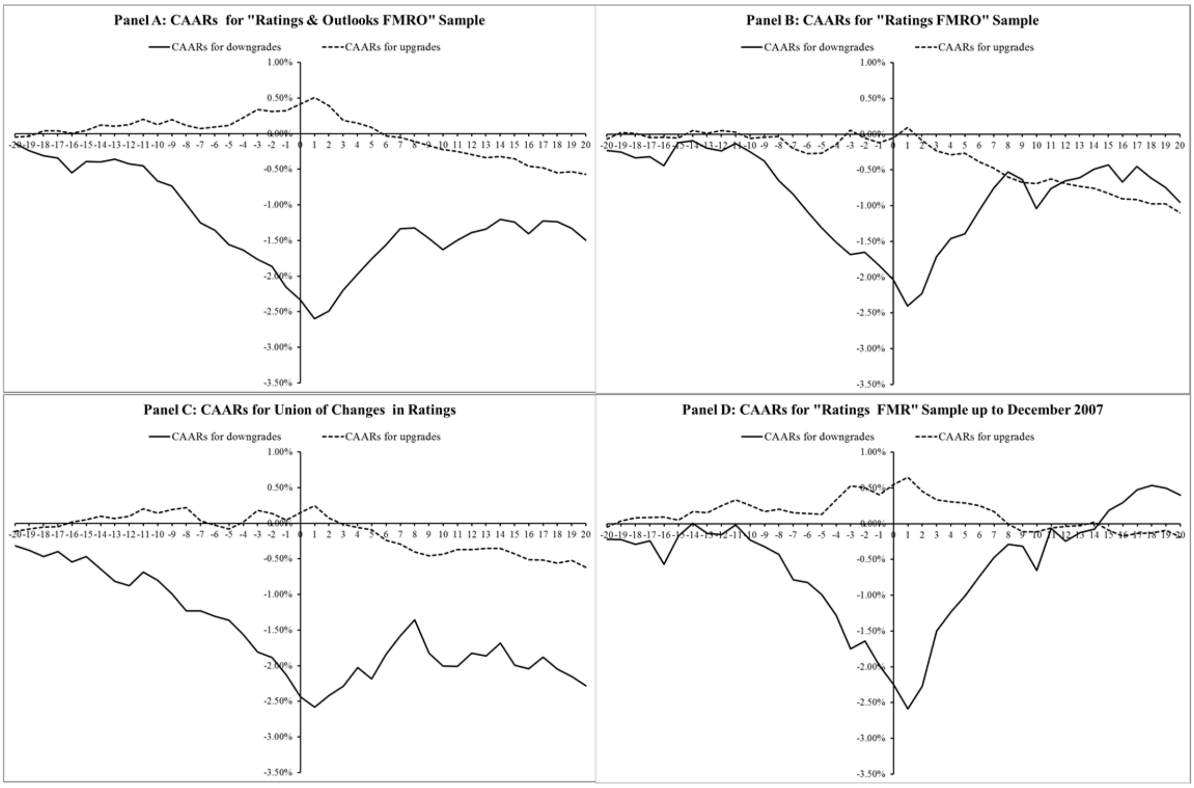

Figure 6: Cumulative Abnormal Returns (Downgrades) by Institutional Quality.

All Panels show the cumulative average abnormal returns (CAARs) for downgrades in sovereign ratings, according to individual country characteristics ("Ratings FMR" sample). Panel 6A shows the breakdown according to the Transparency International (TI) Index. There are a total of 149 and 141 events with low and high TI score, respectively. Panel 6B shows the breakdown according to the legal system law. There are a total of 213 events with Civil law and 77 with Common Legal System. Panel 6C shows the breakdown based on the World Bank's classification of Developed vs. Emerging and Frontier countries. There are a total of 199 events classified as Emerging & Frontier, and 91 as developed countries. Panel 6D shows the breakdown according to the Law and Order Index (low vs. high score has 144 vs. 146 events, respectively; Low score means low institutional quality (IQ)). Panel 6E shows the breakdown according to the PRS Corruption Index (low corruption score vs. high corruption score has 133 vs. 157 events respectively; Low score means low institutional quality). Panel 6F shows the breakdown according to the Investor Protection Index (low vs. high has 168 vs. 122 events, respectively). The separation of each category is made at the median value of the "Ratings FMR" sample.

Figure 7: Cumulative Abnormal Returns (Downgrades) by Institutional Quality and Turnover.
The graph shows the cumulative average abnormal returns (CAARs) for sovereign rating downgrades, according to the level Liquidity ("Ratings FMR" sample). We proxy for liquidity by estimating daily turnover in the estimation and testing periods, and then taking its time-series average around each event. Turnover is the ratio of total market volume traded divided by market capitalization. High liquidity comprises downgrades with above median liquidity levels (n=169). Low liquidity comprises downgrades with below median liquidity levels (n=121).

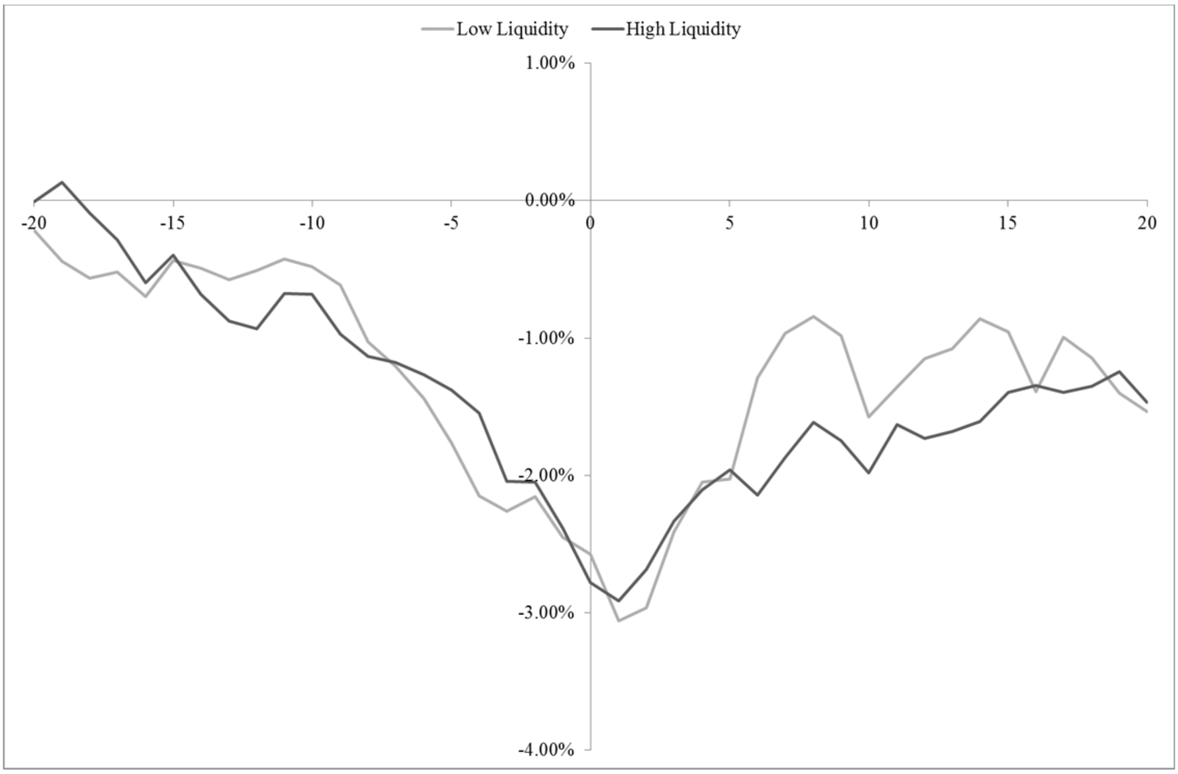

Figure 8: Cumulative Abnormal Returns (Low TI Downgrades) Conditional on News.
The graph shows the cumulative average abnormal returns (CAARs) for downgrades in sovereign ratings, for Low Institutional Quality, by the amount of Sovereign Downgrade News (SDN). We proxy institutional quality using the Transparency International (TI) Index. SDN is assigned the value of 1 when there is at least one new item relevant to the forthcoming downgrade and 0 otherwise. CAARs for the "Ratings FMR" sample (low TI downgrades) are shown separately for SDN=0 (n=92) and SDN=1 (n=57).

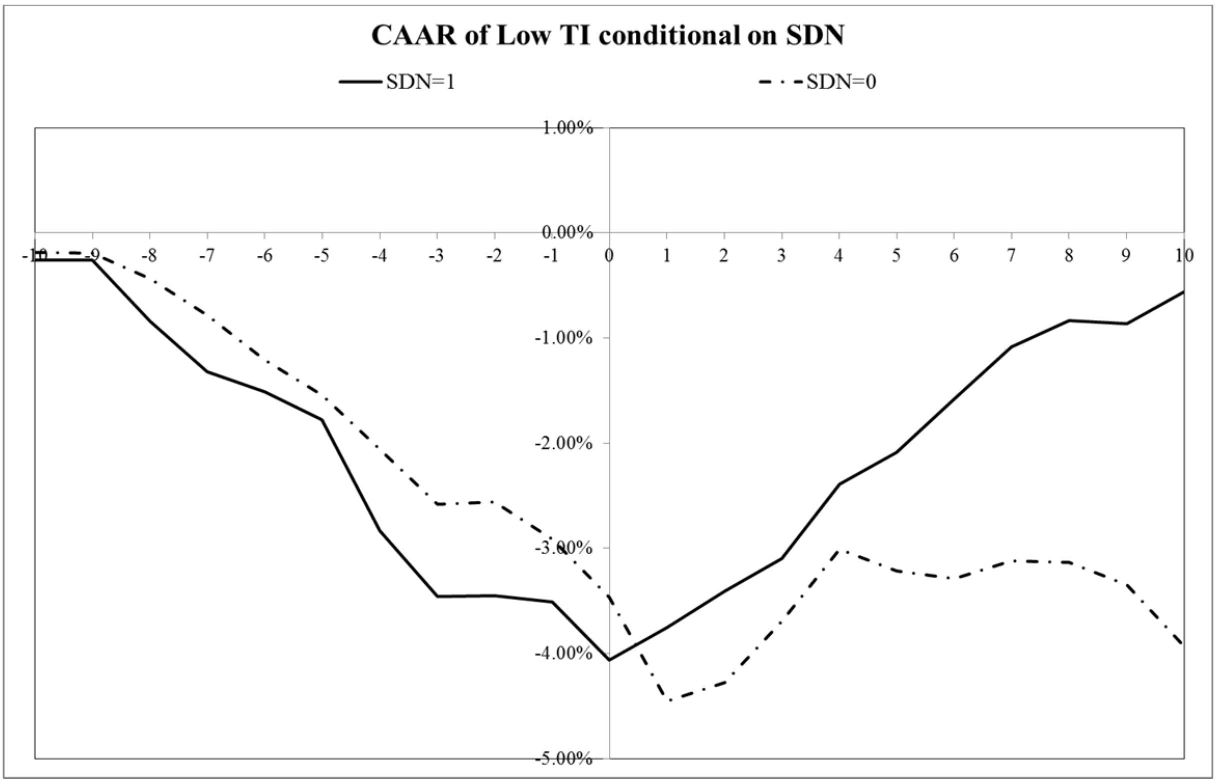

Table 1

Event Study of Changes in Sovereign Ratings on Local Stock Market Indices

This table presents event-study results of how changes in sovereign debt ratings affect the respective sovereign daily, stock market return. Results are reported separately for upgrades (n=397) and downgrades (n=290). The sample comprises the union of changes in ratings, from Fitch, Moody's and S&P's, filtered using FMR. FMR means that all events preceded by changes in ratings by the same or other rating agency in the previous twenty trading days are deleted, thus giving the "Ratings FMR" sample. Panel A shows daily average abnormal returns, AAR (t)for all events on each day t. Panel B shows the cumulative average abnormal return, CAAR[t_1,t_2], for the period starting on t_1 and ending at t_2 relative to event day (day 0) . P-values are based on Kolari and Pynnonen (2010). ***,**, and * denote statistical significance at the 1, 5, and 10 percent level.

Panel A: Average Abnormal Returns (AARs)

Relative Day	Upgrades			Downgrades		
	AAR (%)	P-value	SS	AAR (%)	P-value	SS
-10	-0.070	0.328		-0.033	0.808	
-9	0.005	0.694		-0.197	0.189	
-8	0.018	0.637		-0.310	0.143	
-7	-0.165	0.211		-0.123	0.179	
-6	-0.039	0.549		-0.172	0.096	*
-5	-0.016	0.267		-0.236	0.039	**
-4	0.106	0.239		-0.294	0.016	**
-3	0.172	0.116		-0.275	0.077	*
-2	-0.085	0.170		0.062	0.199	
-1	-0.087	0.238		-0.313	0.016	**
0	0.079	0.173		-0.236	0.035	**
1	0.112	0.097	*	-0.338	0.019	**
2	-0.217	0.032	**	0.150	0.491	
3	-0.157	0.194		0.469	0.159	
4	-0.055	0.525		0.306	0.041	**
5	0.002	0.786		0.074	0.768	
6	-0.121	0.044	**	0.352	0.014	**
7	-0.090	0.261		0.305	0.081	*
8	-0.150	0.119		0.177	0.206	
9	-0.083	0.719		-0.138	0.144	
10	-0.015	0.807		-0.441	0.168	

Panel B: Cumulative Average Abnormal Returns (CAARs)

Event Window	Upgrades			Downgrades		
	CAAR (%)	P-value	SS	CAAR (%)	P-value	SS
(-10,-3)	0.011	0.471		-1.641	0.000	***
(-5,-3)	0.262	0.024	**	-0.806	0.001	***
(0,+1)	0.191	0.030	**	-0.574	0.002	***
(+2,+5)	-0.427	0.026	**	1.000	0.046	**
(+2,+10)	-0.886	0.003	***	1.254	0.402	
(-5,+5)	-0.145	0.992		-0.631	0.028	**
(-10,+10)	-0.856	0.207		-1.212	0.014	**

Table 2

Cumulative Abnormal Returns (Downgrades) by Institutional Quality

This table presents cumulative average abnormal returns in the sovereign stock market index, in the period of twenty days before and after downgrades in sovereign debt ratings. We show results for the downgrades in the "Ratings FMR" sample: the union of all changes in ratings by Fitch, Moody's and Standard & Poor's, filtered using other changes in ratings by the same or different rating agency, in the previous twenty trading days. $CAAR[t_1,t_2]$ is the cumulative average abnormal return for the period starting on t_1 and ending at t_2 relative to event day (day 0). We examine *CAARs* separately for each of the six categories: Transparency International (TI) Index (Low vs. High; low score - first row - implies low institutional quality); Civil Law (vs. Common Law) is shown on the first (second) row; Emerging & Frontier (vs. Developed) is shown on the first (second) row; PRS Law & Order (Low vs. High; low score - first row - implies low institutional quality); PRS Corruption (Low vs. High; low score - first row - implies low institutional quality); Investor Protection (Low vs. High; low score - first row - implies low institutional quality). The separation of each category is made at the median value of the "Ratings FMR" sample. N is the number of observations in each subcategory. P-values are based on the Kolari and Pynnonen (2010) approach. ***,**, and * denote statistical significance at the 1, 5, and 10 percent level, respectively.

	TI (Low/High)				Civil Law vs. Common Law				Emerging & Frontier vs. Developed				PRS Law & Order (Low/High)				PRS Corruption (Low/High)				Investor Protection (Low/High)			
Event Window	N	CAAR (%)	P-Val	SS	N	CAAR (%)	P-Val	SS	N	CAAR (%)	P-Val	SS	N	CAAR (%)	P-Val	SS	N	CAAR (%)	P-Val	SS	N	CAAR (%)	P-Val	SS
(-10,-3)	149	-2.91	0.000	***	213	-1.86	0.000	***	199	-1.99	0.000	***	144	-2.31	0.000	***	133	-1.96	0.000	***	168	-1.82	0.008	***
	141	-0.29	0.522		77	-1.02	0.038	**	91	-0.87	0.289		146	-0.98	0.092	*	157	-1.38	0.028	**	122	-1.39	0.001	***
(-5,-3)	149	-1.59	0.000	***	213	-1.22	0.000	***	199	-1.00	0.002	***	144	-1.34	0.000	***	133	-0.97	0.003	***	168	-1.02	0.008	***
	141	0.03	0.894		77	0.34	0.645		91	-0.38	0.256		146	-0.27	0.303		157	-0.67	0.069	*	122	-0.51	0.034	**
(0,+1)	149	-1.05	0.001	***	213	-0.60	0.006	***	199	-0.80	0.001	***	144	-0.74	0.019	**	133	-0.57	0.073	*	168	-0.77	0.002	***
	141	-0.07	0.202		77	-0.50	0.135		91	-0.08	0.411		146	-0.41	0.031	**	157	-0.58	0.010	***	122	-0.30	0.311	
(+2,+5)	149	1.40	0.010	***	213	1.16	0.090	*	199	1.36	0.053	*	144	1.48	0.195		133	1.23	0.058	*	168	1.06	0.310	
	141	0.57	0.767		77	0.56	0.250		91	0.20	0.536		146	0.53	0.089	*	157	0.81	0.289		122	0.91	0.018	**
(+2,+10)	149	1.54	0.103		213	1.48	0.410		199	1.70	0.118		144	1.76	0.251		133	1.35	0.152		168	1.74	0.482	
	141	0.95	0.931		77	0.62	0.838		91	0.28	0.816		146	0.75	0.807		157	1.17	0.869		122	0.59	0.607	
(-5,+5)	149	-1.46	0.018	**	213	-0.92	0.012	**	199	-0.74	0.027	**	144	-0.82	0.019	**	133	-0.59	0.126		168	-1.05	0.021	**
	141	0.25	0.427		77	0.18	0.895		91	-0.38	0.601		146	-0.44	0.371		157	-0.66	0.104		122	-0.06	0.589	
(-10,+10)	149	-2.65	0.004	***	213	-1.24	0.043	**	199	-1.40	0.008	***	144	-1.50	0.013	**	133	-1.46	0.049	**	168	-1.18	0.087	*
	141	0.32	0.392		77	-1.12	0.122		91	-0.80	0.473		146	-0.92	0.209		157	-1.00	0.094	*	122	-1.26	0.039	**

Table 3

Abnormal Volume for Changes in Sovereign Ratings by level of Transparency Index (TI)

This table presents the event-study results of how changes in sovereign debt ratings affect the respective sovereign daily, stock market turnover. Turnover is calculated as the log of the ratio of the stock market trading volume value divided by its market value. Results are reported separately for upgrades and downgrades, split by high and low transparency index (TI). The sample comprises the union of changes in ratings, from Fitch, Moody's and Standard & Poor's, filtered by a first mover filter using "Ratings FMR". FMR means that all events preceded by changes in ratings by the same or other rating agency in the previous twenty trading days are deleted. In Panel A we show the average abnormal turnover, AAT(t),for all events on each day t, over and above the estimation period's average Turnover. In Panel B we show the cumulative average abnormal turnover, CAAT. For upgrades, there are 176 and 173 events in high and low TI, respectively. For downgrades there are 120 events for both high and low TI. P-values are based on the Kolari and Pynnonen (2010) approach. ***,**, and * denote statistical significance at the 1, 5, and 10 percent level.

Panel A: Average Abnormal Turnover (AAT)

Relative Day	Upgrades						Downgrades					
	High TI			Low TI			High TI			Low TI		
	AAT	P-value	SS	AAT	P-value	SS	AAT	P-value	SS	AAT	P-value	SS
-10	0.011	0.900		0.019	0.229		0.010	0.882		0.051	0.690	
-9	-0.013	0.657		0.050	0.529		-0.063	0.625		0.057	0.715	
-8	0.014	0.832		0.014	0.882		-0.002	0.715		0.021	0.761	
-7	-0.025	0.773		-0.002	0.574		-0.043	0.547		0.054	0.557	
-6	0.031	0.231		-0.047	0.114		0.009	0.253		0.011	0.407	
-5	0.026	0.398		-0.007	0.528		0.011	0.445		-0.054	0.249	
-4	0.045	0.185		0.042	0.959		0.027	0.263		-0.071	0.278	
-3	0.049	0.268		-0.004	0.256		0.070	0.131		-0.066	0.448	
-2	0.026	0.575		-0.009	0.266		0.029	0.434		0.040	0.282	
-1	0.004	0.919		0.033	0.980		0.074	0.101		0.010	0.500	
0	0.055	0.065	*	0.138	0.013	**	0.122	0.007	***	-0.117	0.544	
1	0.090	0.041	**	0.095	0.122		0.014	0.320		-0.134	0.117	
2	0.036	0.362		0.000	0.200		-0.001	0.517		-0.138	0.101	
3	-0.040	0.387		0.024	0.340		0.051	0.103		-0.098	0.329	
4	-0.090	0.044	**	0.018	0.895		0.009	0.295		-0.010	0.983	
5	0.004	0.652		0.118	0.252		-0.025	0.576		-0.028	0.994	
6	-0.050	0.257		0.087	0.944		-0.021	0.778		-0.043	0.573	
7	-0.001	0.922		0.002	0.117		0.044	0.128		-0.066	0.305	
8	-0.014	0.727		0.005	0.094	*	0.009	0.485		-0.093	0.176	
9	-0.009	0.683		0.061	0.610		0.014	0.333		-0.099	0.341	
10	-0.045	0.309		0.089	0.657		-0.003	0.365		-0.104	0.257	

Panel B: Cumulative Average Abnormal Turnover (CAAT)

Event Window	Upgrades						Downgrades					
	High TI			Low TI			High TI			Low TI		
	CAAT	P-value	SS	CAAT	P-value	SS	CAAT	P-value	SS	CAAT	P-value	SS
(-10,-3)	0.131	0.220		0.060	0.551		0.019	0.278		0.006	0.649	
(-5,-3)	0.115	0.008	***	0.030	0.400		0.106	0.103		-0.178	0.190	
(-5,-2)	0.139	0.011	**	0.022	0.346		0.135	0.118		-0.140	0.447	
(-5,-1)	0.143	0.026	**	0.053	0.463		0.208	0.088	*	-0.131	0.713	
(0,+1)	0.141	0.000	***	0.228	0.071	*	0.136	0.035	**	-0.243	0.260	
(+2,+5)	-0.087	0.823		0.154	0.775		0.032	0.924		-0.264	0.437	
(+2,+10)	-0.201	0.415		0.384	0.489		0.071	0.676		-0.650	0.301	
(-5,+5)	0.197	0.067	*	0.430	0.964		0.375	0.287		-0.628	0.384	
(-10,+10)	0.100	0.462		0.692	0.683		0.328	0.237		-0.828	0.381	

Table 4
Instrument Selection for Institutional Quality Variables

Results of the selection of most appropriate instrumental variables for the endogenous regressors approximating institutional quality. The four 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 total number of observations is 291). The procedure begins with the four 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. Statistical significance (SS) at the 1, 5, and 10 percent level is denoted by ***,**, and * respectively.

Endogenous (down)	Common/Civil Law			Ethnicity			Religion			Landlocked		
Instruments (across)	Test Stat	P-Value	SS	Test Stat	P-Value	SS	Test Stat	P-Value	SS	Test Stat	P-Value	SS
Round 1												
TI	17.992	0.000	***	63.342	0.000	***	12.294	0.001	***	6.100	0.014	**
Emerging/Frontier	13.292	0.000	***	38.781	0.000	***	3.776	0.052	*	16.930	0.000	***
PRS Law & Order	16.192	0.000	***	62.079	0.000	***	1.191	0.275		0.230	0.632	
PRS Corruption	13.830	0.000	***	37.755	0.000	***	2.083	0.149		0.482	0.488	
Investor Protection	35.753	0.000	***	3.803	0.051	*	0.601	0.438		6.774	0.009	***
Round 2												
TI	21.844	0.000	***	63.822	0.000	***	11.624	0.001	***	-	-	
Emerging/Frontier	18.258	0.000	***	38.571	0.000	***	-	-		14.636	0.000	***
PRS Law & Order	19.862	0.000	***	63.205	0.000	***	-	-		-	-	
PRS Corruption	13.839	0.000	***	35.388	0.000	***	-	-		-	-	
Investor Protection	67.847	0.000	***	-	-		-	-		4.666	0.031	**

Table 5

Regressions of Cumulative Abnormal Returns on Institutional Quality

This table presents two-stage least square (2SLS) regressions on the cumulative abnormal returns in the local stock market index, in the period before (Panel A using CAAR [-5, -3]) and after (Panel B using CAAR [+2, +5]) sovereign debt downgrades. We show downgrades from the "Ratings FMR" sample. Instruments used for "TI" are Common/Civil Law, Ethnic fractionalization and Religion fractionalization. Instruments used for "Emerging & Frontier" are Common/Civil Law, Ethnic fractionalization and landlocked. Instruments used for "PRS Law and Order" are Common/Civil Law and Ethnic fractionalization. Instruments used for "PRS Corruption" are Common/Civil Law and Ethnic fractionalization. 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. WID is the weak-identification test reports both the Cragg-Donald Wald F-statistic and also the Kleibergen-Paap rk Wald F statistic. In the last two rows we report the Stock-Yogo weak ID test critical values (10% maximal) for IV relative bias (Rel. Bias) and Size, respectively. Statistical significance (SS) at the 1, 5, and 10 percent level is denoted by ***,**, and * respectively.

Panel A: Two Stage Least Squares Regression of *Pre-Event* Stock Market Reaction (CAAR[-5, -3]) on Institutional Quality

"Pre-Event Period"	N	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			-0.036	-4.010	0.000	***	0.008	1.100	0.272		-0.036	-2.600	0.009	***	-0.041	-2.870	0.004	***	-0.058	-2.490	0.013	**
TI	291	+	0.006	3.310	0.001	***																
Emerging/Frontier	291	-					-0.024	-2.290	0.022	**												
PRS Law & Order	291	+									0.007	2.100	0.036	**								
PRS Corruption	291	+													0.011	2.380	0.017	**				
Investor Protection	291	+																	0.009	2.120	0.034	**
				Stat	**P-val**			**Stat**	**P-val**			**Stat**	**P-val**			**Stat**	**P-val**			**Stat**	**P-val**	
UID (Kleibergen-Paap rk LM)				66.62	0.000	***		48.87	0.000	***		62.86	0.000	***		42.49	0.000	***		52.78	0.000	***
OID (Hansen J)				2.55	0.279			5.11	0.078	*		3.70	0.054	*		2.97	0.085	*		2.17	0.141	
WID (Kleibergen-Paap rk Wald F)				61.14				48.26				72.66				40.84				52.56		
WID (Cragg-Donald Wald F)				40.09				23.43				68.26				27.19				50.28		
Stock-Yogo WID 10% Rel. Bias				9.08				9.08				na				na				na		
Stock-Yogo WID 10% Size				22.30				22.30				19.93				19.93				19.93		

Panel B: Two Stage Least Squares Regression of *Post-Event* Stock Market Reaction (CAAR[+2, +5]) on Institutional Quality

"Post-Event Period"	N	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		0.030	2.240	0.025	**	0.000	-0.030	0.975		0.027	1.560	0.118		0.029	1.610	0.107		0.031	1.180	0.238	
TI	291	-0.004	-1.650	0.098	*																
Emerging/Frontier	291					0.015	1.100	0.271													
PRS Law & Order	291									-0.004	-1.020	0.306									
PRS Corruption	291													-0.006	-1.100	0.270					
Investor Protection	291																	-0.004	-0.850	0.394	
			Stat	**P-val**			**Stat**	**P-val**			**Stat**	**P-val**			**Stat**	**P-val**			**Stat**	**P-val**	
UID (Kleibergen-Paap rk LM)			66.62	0.000	***		48.87	0.000	***		62.86	0.000	***		42.49	0.000	***		52.78	0.000	***
OID (Hansen J)			2.30	0.316			0.25	0.883			0.44	0.505			0.35	0.557			0.03	0.865	
WID (Kleibergen-Paap rk Wald F)			61.14				48.26				72.66				40.84				52.56		
WID (Cragg-Donald Wald F)			40.09				23.43				68.26				27.19				50.28		
Stock-Yogo WID 10% Rel. Bias			9.08				9.08				na				na				na		
Stock-Yogo WID 10% Size			22.30				22.30				19.93				19.93				19.93		

Table 6
Abnormal Returns (Low TI Downgrades)
Conditional on Sovereign Downgrade News (SDN)

This table presents daily abnormal index returns around the announcement of sovereign debt rating downgrades (low TI "Ratings FMR" sample) conditional on SDN. The SDN variable (Sovereign Downgrade News) takes the value of 1 if in the 10 trading days before the downgrade announcement, there is at least one news item referring directly to the forthcoming downgrade, and 0 otherwise. Panel A shows daily average abnormal return *AAR (t)* for all events on each day t, using a world-CAPM model. Panel B shows the cumulative average abnormal returns (*CAAR*) for the event windows specified. Results are shown separately for SDN=0 (n=92) and SDN=1 (n=57). "Ratings FMR" sample results from the union of changes in ratings, from Fitch, Moody's and Standard & Poor's, filtered using FMR. FMR means that all events preceded by changes in ratings by the same or other rating agency in the previous twenty trading days are deleted. Relative Day is the trading day relative to the day 0. P-values are based on the Kolari and Pynnonen (2010) approach. ***,**, and * denote statistical significance at the 1, 5, and 10 percent level.

Panel A: Average Abnormal Returns (AARs)

Relative Day	SDN=0			SDN=1		
	AAR (%)	P-value	SS	AAR (%)	P-value	SS
-10	-0.188	0.619		-0.260	0.352	
-9	-0.003	0.861		0.005	0.656	
-8	-0.242	0.597		-0.583	0.202	
-7	-0.351	0.076	*	-0.486	0.026	**
-6	-0.426	0.024	**	-0.189	0.351	
-5	-0.331	0.102		-0.262	0.197	
-4	-0.514	0.009	***	-1.055	0.002	***
-3	-0.525	0.085	*	-0.629	0.093	*
-2	0.023	0.549		0.010	0.407	
-1	-0.356	0.059	*	-0.062	0.968	
0	-0.551	0.047	**	-0.549	0.076	*
1	-0.989	0.000	***	0.304	0.568	
2	0.177	0.736		0.347	0.304	
3	0.579	0.192		0.308	0.674	
4	0.685	0.020	**	0.710	0.013	**
5	-0.201	0.210		0.307	0.385	
6	-0.080	0.717		0.508	0.019	**
7	0.170	0.325		0.494	0.469	
8	-0.013	0.861		0.251	0.316	
9	-0.213	0.132		-0.031	0.818	
10	-0.584	0.004	***	0.297	0.393	

Panel B: Cumulative Average Abnormal Returns (CAARs)

Event Window	SDN=0			SDN=1		
	CAAR %	P-value	SS	CAAR %	P-value	SS
(-10,-3)	-2.581	0.002	***	-3.459	0.000	***
(-5,-3)	-1.370	0.003	***	-1.946	0.001	***
(0,+1)	-1.539	0.000	***	-0.244	0.549	
(+2,+5)	1.240	0.151		1.672	0.010	***
(+2,+10)	0.521	0.897		3.193	0.002	***
(-5,+5)	-2.002	0.009	***	-0.571	0.603	
(-10,+10)	-3.932	0.001	***	-0.563	0.669	

Table 7

Abnormal Returns, Buzz and Sentiment (Low TI Downgrades) conditional on News

This table presents event studies of sovereign debt rating downgrades on three daily variables: stock returns, TRMI Buzz (log) and TRMI Sentiment. TRMI stands for Thomson Reuters MarketPsych Indices. Buzz measures the frequency of news related to the country of interest. Sentiment is a multi-dimensional, normalized index capturing macro-related, political and other news that affect Sentiment. The SDN variable (Sovereign Downgrade News) takes the value of 1 if in the 10 trading days before the downgrade announcement, there is at least one news item referring directly to the forthcoming downgrade, and 0 otherwise. Results are shown for low TI (Transparency Index) events split in subsamples with SDN=0 and SDN=1. The sample comprises the union of downgrades, from Fitch, Moody's and Standard & Poor's, filtered by first mover filter using "Ratings FMR" that also have matching TRMI data and stock return data. FMR means that all events preceded by changes in ratings by the same or other rating agency in the previous twenty trading days are deleted. Relative Day is the trading day relative to the event day (day 0). Panel A shows the average abnormal return for all events on each day t, AAR (t). There are 48 (38) events with stock returns and with SDN=0 (SDN=1). AAI is the average abnormal index for TRMI events (Buzz and Sentiment). There are 46 (36) events with stock returns and SDN=0 (SDN=1).Panel B shows the cumulative average abnormal returns, CAAR and the cumulative average abnormal index for the TRMI variables, CAAI. P-values are based on the Kolari and Pynnonen (2010) approach. ***, **, and * denote statistical significance (SS) at the 1, 5, and 10 percent level respectively.

Panel A: Average Abnormal Returns (AAR) and Average Abnormal TRMIs (AAI)

	SDN = 0									SDN = 1								
Relative Day	Stock Returns			TRMI Buzz			TRMI Sentiment			Stock Returns			TRMI Buzz			TRMI Sentiment		
	AAR %	P-value	SS	AAI	P-value	SS	AAI	P-value	SS	AAR %	P-value	SS	AAI	P-value	SS	AAI	P-value	SS
-10	-0.214	0.877		-0.008	0.842		0.007	0.482		-0.578	0.144		0.070	0.456		0.019	0.427	
-9	-0.113	0.744		0.014	0.932		-0.006	0.446		-0.170	0.309		0.061	0.728		0.004	0.801	
-8	-0.678	0.024	**	-0.019	0.743		-0.007	0.624		-0.995	0.119		0.005	0.929		0.006	0.522	
-7	-0.482	0.018	**	0.050	0.459		-0.004	0.873		-0.024	0.717		0.139	0.120		-0.002	0.524	
-6	-0.436	0.012	**	0.035	0.759		0.005	0.971		-0.377	0.202		0.051	0.612		-0.001	0.255	
-5	-0.341	0.181		0.030	0.622		-0.006	0.478		-0.143	0.353		0.244	0.130		-0.007	0.268	
-4	-0.656	0.003	***	0.107	0.295		-0.005	0.528		-1.528	0.001	***	0.186	0.489		-0.023	0.005	***
-3	-0.438	0.490		0.135	0.184		0.008	0.553		-1.016	0.049	**	0.309	0.056	*	-0.029	0.129	
-2	0.135	0.430		0.179	0.201		-0.016	0.103		-0.204	0.863		0.499	0.002	***	-0.036	0.116	
-1	-0.326	0.326		0.022	0.966		-0.009	0.193		-0.475	0.218		0.711	0.000	***	-0.042	0.065	*
0	-0.514	0.057	*	0.313	0.026	**	-0.033	0.003	***	-0.651	0.090	*	0.866	0.000	***	-0.152	0.000	***
1	-1.161	0.005	***	0.300	0.038	**	-0.041	0.000	***	0.489	0.536		0.925	0.000	***	-0.130	0.000	***
2	0.355	0.684		0.203	0.090	*	-0.032	0.007	***	0.283	0.787		0.631	0.000	***	-0.055	0.030	**
3	1.033	0.077	*	0.153	0.460		-0.037	0.000	***	0.397	0.634		0.539	0.001	***	-0.020	0.360	
4	1.091	0.015	**	0.038	0.748		-0.012	0.205		1.062	0.011	**	0.533	0.001	***	-0.013	0.658	
5	-0.155	0.236		0.140	0.236		-0.012	0.379		0.442	0.349		0.407	0.016	**	-0.017	0.860	
6	0.175	0.789		0.169	0.197		-0.017	0.112		0.586	0.009	***	0.455	0.008	***	-0.023	0.588	
7	0.557	0.053	*	0.075	0.654		-0.015	0.149		0.702	0.375		0.373	0.025	**	-0.028	0.980	
8	0.120	0.573		-0.015	0.950		-0.014	0.673		0.385	0.176		0.384	0.011	**	-0.041	0.922	
9	0.000	0.020	**	-0.040	0.641		-0.018	0.426		-0.014	0.962		0.305	0.056	*	-0.024	0.322	
10	-0.813	0.015	**	-0.025	0.969		-0.024	0.161		0.582	0.203		0.293	0.094	*	-0.021	0.678	

Panel B: Cumulative Average Abnormal Returns (CAAR) and Cumulative Average Abnormal TRMIs (CAAI)																		
Event Window	SDN = 0									SDN = 1								
	Stock Returns			TRMI Buzz			TRMI Sentiment			Stock Returns			TRMI Buzz			TRMI Sentiment		
	CAAR %	P-value	SS	CAAI	P-value	SS	CAAI	P-value	SS	CAAR %	P-value	SS	CAAI	P-value	SS	CAAI	P-value	SS
(-10,-3)	-3.357	0.001	***	34.341	0.315		-0.710	0.798		-4.831	0.000	***	106.573	0.270		-8.542	0.105	
(-5,-3)	-1.435	0.031	**	27.178	0.139		-0.224	0.844		-2.687	0.001	***	73.966	0.237		-6.524	0.007	***
(-5,-2)	-1.300	0.147		45.088	0.125		-1.860	0.454		-2.891	0.003	***	123.858	0.104		-9.238	0.008	***
(-5,-1)	-1.626	0.113		47.314	0.253		-2.767	0.366		-3.366	0.001	***	194.983	0.028	**	-12.542	0.004	***
(0,+1)	-1.675	0.001	***	61.285	0.005	***	-7.412	0.001	***	-0.162	0.629		179.125	0.000	***	-13.839	0.000	***
(+2,+5)	2.324	0.102		53.424	0.100	*	-9.332	0.029	**	2.185	0.018	**	211.013	0.011	**	-4.011	0.286	
(+2,+10)	1.685	0.624		69.918	0.260		-18.214	0.035	**	4.426	0.002	***	392.121	0.019	**	-7.031	0.350	
(-5,+5)	-0.978	0.118		162.023	0.059	*	-19.511	0.011	**	-1.344	0.111		585.121	0.005	***	-30.392	0.000	***
(-10,+10)	-3.538	0.007	***	185.679	0.161		-28.879	0.026	**	-1.246	0.247		798.835	0.010	**	-35.430	0.001	***