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Kuntara Pukthuanthong-Le, Fayez A. Elayan, Lawrence Rose

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Equity and Debt Market Responses to Sovereign Credit Ratings Announcement

Kuntara Pukthuanthong-Le*
San Diego State University

Fayez A. Elayan
Brock University

Lawrence Rose
Massey University

Abstract

We study the impact of changes in sovereign ratings and outlooks on international capital markets using a comprehensive database of 34 countries, covering the major regions in the world over the period 1990-2000. We find the rating agencies provide financial markets with new tradable information. Specifically, they affect not only the instrument being rated (bonds) but also stocks. Interestingly, bond markets react differently than stock markets in many respects. We find, only for bond market returns, a positive impact is significant when the economic outlook is upgraded and outlook changes appear to be at least as important as rating changes. In addition, downgraded ratings and economic outlooks occur mainly during bond market downturns, raising a possibility that rating agencies may exacerbate a bond bear market. Only downgrade has a discernible impact on equity and bond returns and the effects of rating announcement are significantly asymmetric. On *equity* returns, the market responses of downgrade are more pronounced in the cases of high inflation, low fiscal balance, and local currency debt; in contrast, the market responses of downgrade *across class* are more pronounced in the cases of low current account and foreign currency debt. On *bond* returns, the market responses of downgrade are more pronounced in the cases of a relatively ailing economy as proxied by emerging market, high inflation, and low current account; on the other hand, the market responses of downgrade *across class* are more pronounced in the cases of a relatively healthy economy as proxied by low inflation, high liquidity, and during non-crisis period. This study has important implications for investors' international asset allocation and for regulatory agents such as the Basel Committee increasingly depending on credit rating agencies such as Moody's and S&P's in their regulatory deliberations.

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Contact author: Kuntara Pukthuanthong-Le; Address: Department of Finance College of Business Administration San Diego State University 5500 Campanile Drive San Diego CA 92182; Tel No: 619-594-5690; Fax No: 629-594-3272; Email: kpukthua@mail.sdsu.edu.

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1. Introduction

Credit ratings have been widely studied in the context of financial market information processing. But the literature has left several issues still outstanding, including the efficiency of international information assimilation. Sovereign credit risk is a particularly important subject in this general area. Frequent debt crises, defaults, and renegotiations point to the importance of assessing sovereign risk. Sovereign ratings are supposed to indicate the likelihood that a debtor central government will fail to fully discharge its obligations, so the accuracy of such ratings are extremely important to investors.

The information used by rating agencies to assess sovereign risk ranges over macro-economic data, government fiscal policies, balance of payments, and the level and historical experience of the country's external debt. The same information is normally available to the public. Consequently, one could ask: "Does a sovereign credit rating simply mirror the international market's assessment of a country's risk, or does it provide additional insights?" Prior research has not fully answered this question.

Kaminsky and Schmuckler (2002) examine whether changes in ratings of one type of security affect other asset. News about one type of security can affect yields of other securities through various channels. They explain a downgrade of sovereign bonds might have negative impact on stock markets due to the expectation of an increase in tax rate on firms to offset negative budgetary impact of higher interest rate caused by a downgrade.¹ The present paper extends this study by investigating the reactions of global **bond and stock** markets to sovereign credit rating

¹ Additionally, they explain the effects of sovereign credit rating changes are not limited only to the parties acquiring such sovereign debts but also to all involved parties who acquire the other debt instruments that are more likely to be downgraded. Any financial institutions in a country rated below investment grade may have difficulty to issue financial products internationally and any corporations in such country may have difficulty to raise debt internationally due to damaged credibility of their country.

changes and also the difference of such reactions under macroeconomics and rating characteristics (hereafter, country characteristics).

Unlike previous research, this study also examines announced changes in the economic outlook provided by rating agencies. Rating agencies typically issue periodic outlook, often termed a “watchlist” containing implicit information about prospective short-term changes in ratings. Outlooks forecast the likely direction of an issuer’s credit quality over the medium term, typically over a 12- to 18-month horizon. Outlooks are modified when a change in an issuer’s risk profile has been observed but it is not yet regarded as permanent enough to warrant a new credit rating. Kaminsky and Schmuckler (2002) find a large proportion of changes in outlook are followed by changes in rating.² This implies the rating changes are not often complete surprises and the accompanying movements in prices do not fully reflect the valuation impact of the rating. Using a daily data set consisting of all publicly traded U.S. dollar denominated sovereign debt, we investigate several related issues. We tabulate the size of price reactions in both the bond and stock markets to changes in the sovereign credit rating and in the economic outlook. We study whether the market’s reaction to a change in economic outlook differs from its reaction to a change in the sovereign credit rating. We look for asymmetries; i.e., do negative announcements have a quantitatively different impact than positive announcements? Do the rating agencies tend to downgrade when the market is falling and/or upgrade when the market is rallying? Do changes in sovereign debt ratings and outlook contribute to market instability? Are there differences in market reactions to rating changes across and within classes (e.g., from B to A (across) and AA to AA+ (within))? In contrast to other literature in this field, we investigate the impact of historical country characteristics including macroeconomics factors, such as inflation, current account, and fiscal

² Kaminsky and Schmuckler (2002) examine sovereign credit rating announcements of emerging market countries between 1990 and 2000 and find that 78 percent of changes in S&P’s outlook were followed by changes in ratings. Rating changes by Moody’s followed outlook changes 69 percent of the time and by Fitch-IBCA 50 percent of the time.

balance and rating factors, such as currency of debt and change in outlook or rating on market reactions to sovereign credit rating changes. Does a downgrade (upgrade) have a negative (positive) impact on bond and stock returns of emerging countries more than developed countries or high inflation countries more than low inflation countries? Thus far, the impact of sovereign credit rating changes under selected country characteristics on bond and stock returns has not been studied. We believe this is an important parameter to understand the information content of sovereign credit rating and, therefore, this issue is the main focus of our study.

Our study differs from the existing sovereign credit rating literature in several ways: we consider a larger set of 34 countries, which includes both developed and emerging markets, our sample extends 11 years from 1990 to 2000, we examine the financial market impact of imminent rating changes, such as outlooks and the Credit Watch list, as well as implemented rating changes and, we estimate the impact of changes in ratings of one type of security on other assets.³ This cross-asset effects can be large and through various channels, heightening financial instability. We also investigate which country characteristics affect market reactions to changes in credit rating announcements. Finally, we study the impact of the interactions between rating change and selected country characteristics on bond and stock returns. To date little is known about the interaction between the information contained in rating changes and country characteristics and its impact on market prices. There is no reason to expect country characteristics affecting international bond

³ “Credit watch” terminology is employed to be consistent with previous research. In 1981, S&P’s instituted CreditWatch, a weekly listing of firms under special surveillance, to provide more timely information to the market. Ratings are placed on CreditWatch when events or deviations from expected trends occur and additional information is required to evaluate the current rating. A “positive” (“negative”) designation means that S&P’s a priori expectation is that a rating may be raised (lowered), while the classification of “developing” means the rating may be raised, lowered, or affirmed (left unchanged). See

http://www.standardandpoors.com/emarketing/structuredfinance/copyof052202_creditwatch.html#CreditWatch%20When's,%20Why's,%20and%20How's

markets are the same ones affecting equity markets and two different countries will have the same market reactions to sovereign credit rating changes. Therefore, this study should be of interest to international investors and sovereign governments who wish to forecast changes in both the bond market and the equity market.

We find rating agencies provide capital markets with new tradable information unavailable in the public domain; a negative and significant market reaction in the bonds and equity markets is associated with rating and outlook downgrade, while a positive and significant market reaction is associated with upgraded outlook in the bond market only. Second, a downgraded ratings and economic outlooks occur mainly during bond market downturns, raising a possibility that rating agencies may exacerbate a bond bear market. Third, in cross-sectional analysis, only a downgrade rating events have discernable negative impact on the bond and stock returns. Fourth, such a significant and negative impact of downgrade on *stocks* returns is more pronounced in the cases of high inflation, low fiscal balance, and local sovereign debt; in contrast, downgrade across classes has more negative impact in the cases of low current account and foreign currency debt. Fifth, downgrade has more negative impact on *bond* returns in the cases of a relatively ailing economy as proxied by emerging country, high inflation, and low current account; whereas, downgrade across class has more negative impact in the cases of a relatively healthy economy as proxied by low inflation, high liquidity, and during non crisis period. This study has important implications for investors' international asset allocation and for regulatory agents like the Basel Committee increasingly depending on credit rating agencies such as Moody's and S&P's in their regulatory deliberations.

2. Sovereign credit ratings

Credit ratings may be classified according to four different debtors: corporate, sub-national, sovereign, and supranational. As the name suggests, a sovereign rating involves a sovereign government, and summarizes the results of assessing its likelihood to default on its obligations. The

rating's objective is to determine a country's overall risk or creditworthiness based on the government's willingness and ability to meet its obligations in accordance with the debt issue terms.

Since the early 1990s the demand for sovereign credit ratings has been increasing rapidly due to increasing levels of national government borrowing in the international capital markets. The bonds issued by sovereigns can be denominated in either foreign or domestic currency and typically offerings are placed with international investors. Many investors, particularly U.S. investors, generally prefer rated to non-rated securities when both have similar default risk (Cantor and Packer, 1995). Sovereign ratings, including domestic and foreign currency ratings, serve two functions, one to increase access to foreign capital, and second to affect the capital raising ability of firms using domestic capital markets.

Among those agencies assigning sovereign ratings, the best known include Standard and Poor's Corporation (hereafter, S&P's) and Moody's Investors Service (hereafter, Moody's). S&P's offers an unmatched combination of credit, political, financial and economic analysis providing comprehensive assessments of nearly 90 governments in developed and emerging markets worldwide. Moody's provides similar assessments for more than 100 nations, nearly every country participating in the world's capital markets. For each nation, Moody's publishes several types of ratings to capture divergent risks. When assessing a country's willingness and ability to service its debt, rating agencies will generally take into consideration a country's political risk and economic risk. Political risk assessment evaluates a country's underlying political and social stability, which impacts the central government's willingness to meet its debt obligations. The main criteria used include the characteristics of a political system, executive leadership, government institutions, social coalitions, social indicators, and external relations. Economic risk assessment involves the analysis of economic characteristics affecting a country's ability to support its current and anticipated level of external debt. For this purpose, a rating agency will look at factors like

demographic characteristics, structure of the economy, recent economic trends, and economic policy (see, for example, S&P's, 1982).

Sovereign ratings are affected by many of the variables listed above; however, there are a large number of non quantifiable sub-criteria contained in the ratings. Even when the rating agencies provide information concerning the variables used to determine sovereign ratings, they provide little information concerning the weights they assign to each criterion. Thus, it is difficult to identify the relationship between the variables used and announced ratings. Given this uncertainty, it is left to researcher to quantify the relationship between variables and published ratings by searching for the relative significance of variables, and to determine which variable(s) will bring new information to financial markets causing market participants to change their decisions.

3. Review of literature

In contrast to the number of studies considering informational efficiency of stock markets when corporate ratings change, there have been relatively few considering the market impact of sovereign rating changes. Sovereign ratings, which seek to assess sovereign default risk, are affected by a borrowing country's macro-factors including economic, political and social variables. One of the first works to directly test the relation between sovereign risk assessments and Euro-credit pricing appear in Feder and Ross (1982), who use the Institutional Investors' 1979 creditworthiness ranking as a measure of lenders' perceived default probabilities and find the risk premiums (Euro-spreads) in the market fully reflect such perceptions. This result suggests anticipated events have systematically been incorporated in Euro-credit pricing, and the authors conclude the Euro-credit market functioned efficiently. Doukas (1989) extends the literature by arguing if the Euro-credit market is efficient, then *changes* in the credit spreads (i.e., in the risk premiums or prices of Euro-syndicate credit) should only be caused by "news" or unanticipated events which will induce *changes* in lenders' perceptions of sovereign borrower's risk, not

anticipated events. Doukas (1989), following work conducted by Saunders (1986) and Doukas and Jalilvand (1986), argues a macro-factor like a borrowing countries' economic growth potential (proxied by the ratio of exports to international reserves) may be used to evaluate the likelihood of sovereign default because "new information" in such a macro-factor may not be anticipated. Doukas (1989) reports Euro-spread movements occur immediately after the announcements of the macro-factor. This result suggests announcements concerning sovereign borrowers' future growth (or creditworthiness) contain new information, and the Euro-credit market can be considered efficient because changes in the prices of international loans quickly respond to unanticipated events signaling changes in a borrowing country's' default risk.

Cantor and Packer (1996) investigate the relationship between sovereign ratings announcements and sovereign yields on Eurodollar bonds, and the impact of sovereign ratings announcements on US-dollar bond spreads. Their analysis indicates sovereign ratings provide the international bond markets with both public and private information and are strongly associated with changes in sovereign bond spreads. They also report six macroeconomic indicators are important sovereign ratings determinants. The literature has not answered two questions. First, why does the impact of rating announcements on spreads appear stronger for below-investment-grade than for investment-grade sovereigns? Second, do more fully anticipated rating announcements have a larger impact than less anticipated ones?

There have also been several studies examining the relationship between stock markets and macroeconomic variables that do not fall into the category of debt finance. These studies have established changes in macroeconomic variables contain important information for stock market participants (See, for example, Chen et al., 1986; Pearce and Roley, 1983; Kim and Wu, 1987; and Mookerjee and Yu, 1997). It is hypothesized investors incorporate the information into their estimates of the appropriate discount rate and the expected flow of dividend from stocks, which in turn affects stock returns. Hardouvelis (1987) analyses the response of stock prices to the announcements of 15 representative economic variables, and finds stock prices respond primarily

to announcements of monetary variables. Not surprisingly, stocks of financial companies are the most sensitive to monetary news.

Our selective literature survey identifies two major issues requiring further attention. First, the link between changes in sovereign ratings and the stock market of the rated nation has not been fully established. It is not clear whether sovereign rating will affect the individual stock price of the rated entity or the index of the national stock market. We conjecture in this research that returns on the national stock index will respond to changes in sovereign risk as assessed by sovereign credit ratings for three reasons. First, companies owned or supported by national governments are typically large, often dominating their share market's aggregate stock index. Thus, sovereign ratings serve as a proxy for bond ratings of companies. Therefore, changes in sovereign ratings are expected to induce a response from a large number of stockholders and a movement of stock returns at the aggregate level. Second, sovereign ratings tend to dominate corporate ratings in many cases. As noted by Cantor and Packer (1996), agencies seldom assign a credit rating to a corporate higher than its home country or national government rating. So, changes in the sovereign rating must induce changes in corporate ratings. This would be expected to change most, if not all, stock prices of the entities domiciled in that country. As a result, aggregate stock return movements would be observed. Gande and Parsley (2003) and Kaminsky and Schmukler (2002) also find news on one particular market can affect yields of other securities and the channels of spillover may be various. These cross-asset effects can become quite dramatic, as it was the case of the default of the state of Minas Gerais on the Brazilian real. Again, rating agencies may contribute to heighten financial instability.

The second issue considered in this research focuses on the differences in the impacts of sovereign ratings information on stock markets. There are two strands of arguments emerging from the literature. In short term markets like Euro-credit market, the unpredictable component ("news") plays a predominant role in Euro-spread changes, while the anticipated component is fully reflected in the Euro-credit pricing (Doukas, 1989). Both of these findings point to the conclusion that the

Euro-credit market is informationally efficient. The long term markets like the international bond market react differently to rating changes. Here, the more fully anticipated are the rating announcements, the greater will be their impact on spread *changes* (Cantor and Packer, 1996). In the context of the market efficiency literature, this suggests the international bond markets do not operate efficiently as sovereign risk considerations have not been fully incorporated in sovereign bond pricing. As a result one will expect sovereign ratings to bring “news” unanticipated to the stock market which in turn will react to both public and private information concerning a country’s creditworthiness.

Sovereign ratings are based on a number of publicly available macro-factors. However, publicly available information may be hard to use at times, be noisy, and may be costly to assemble. So there is no guarantee public information *will be* known by all investors prior to the announcement of rating changes. A sovereign rating change under this scenario will convey some new information to the capital markets. In addition, rating agencies’ sovereign risk opinions are likely to be partially based on information not publicly available. So, market participants may anticipate rating announcements to varying degrees. Accordingly, we expect markets are efficient processors of information, anticipated announcements of sovereign ratings should be reflected in the pre-announcement stock prices, and the unanticipated announcements will cause post-announcement movements of stock returns.

Research on the effects of changes in sovereign ratings has flourished in the 1990s. This work has mostly focused on the effects of ratings on the instruments being rated. For example, Cantor and Packer (1996), Larrain et al. (1997) and Reisen and Von Maltzan (1999) examine the effects of rating changes of sovereign debt and find a significant effect on bond yield spreads. Similarly, Hand et al. (1992) show rating announcements directly affect corporate securities. Richards and Deddouche (1999), using emerging market bank-level data, examine the impact of rating changes on bank stock prices, but do not find statistically significant effects.

Closer in spirit to the present paper, Kaminsky and Schmukler (2002) focus on emerging markets, and ask whether changes in sovereign debt ratings and outlooks contribute to market instability. They find that ratings changes directly impact stock and bond markets of the countries being rated. Our study differs from theirs in several ways. First, we consider a larger set of 34 countries that includes both developed and emerging markets. Second, our sample covers the longer time period. Finally, we study how rating and macroeconomics variables affect market reactions of changes in sovereign credit rating and outlook. To date little is known about the process where information contained in rating and macroeconomic variables is transferred to market prices by announcements of sovereign rating changes. To our knowledge, only Cantor and Packer (1996) attempt to identify economic factors embedded in sovereign ratings. There is also no reason to expect economic variables affecting international bond markets to be the same ones that affect equity markets. Therefore, this study should be of interest to international investors and sovereign governments who wish to forecast changes in both the bond market and the equity market.

4. Data description

Sovereign credit rating announcements of changes in ratings, outlooks, and the placements on credit watch list are collected for the period from January 1, 1990 to June 30, 2000. A list of sovereign credit rating announcements is compiled from Standard and Poor's Credit Week and from Reuters Business Briefing.

Daily price indexes for each country and the daily world index around the announcement date are measured in U.S. dollars and are collected from *DataStream's* Global Indices Section. If any global indices are not available from *DataStream*, we collect them from the Financial Statistics Yearbook. We obtain daily market-closing observations of the interest rate for sovereign debt and the interest rate of the closest (maturity) matched U.S. government bond for all countries with (currently) publicly traded U.S. dollar denominated sovereign debt from *Bloomberg L.P.* We use

daily return and interest rate data in order to maximize the power of hypothesis tests. We use ratings on sovereign debt issued in domestic and foreign currency and in long- and short-terms.⁴ We work with ratings from two major international rating agencies: Moody's and S&P's. Appendix 1 lists sources and definition of economic variables used. The final sample satisfies the following data filters: (1) the announcement date of sovereign credit rating must be found in the Credit Week or Reuters Business Briefing. (2) The country subject to the announcement has index data available on DataStream. (3) The country's daily return index and the world daily return index are available from DataStream for the period from 250 days before to 45 days after the announcement date and (4) no major confounding events like wars, major conflicts, currency valuation or devaluation, national disasters, etc. occurring within 21 days window surrounding the announcement day.

Table 1 Panel A (B) reports the frequency distribution by countries (years) of the final sample of 687 announcements for changes in sovereign credit ratings and economic outlooks from 34 countries from 1990 to 2000. During our sample period, there are two apparent features. First, the frequency of rating changes appears to be increasing over the sample period. A factor attributing to the increase in rating activity is the number of sovereigns accessing international capital markets and being rated has increased over time. Second, the rating changes tend to cluster in time especially during the crisis periods, such as Asian Crisis from August 1997 to March 1998, Russian Crisis from August 1998 to December 1998, and Brazilian Crisis from January 1999 to March 1999. For example, Table 1 Panel C shows the frequency distribution of the changes in sovereign credit ratings and economic outlooks, 3% of total downgraded rating announcements in 1995 coinciding with Mexican crisis, 30% in 1997 coinciding with Asian crisis, 43% in 1998 coinciding with Russian crisis, and 20% in 1999 coinciding with Brazilian crisis. The announcements of changes in sovereign credit rating and economic outlook cluster in 1996 to 1999

⁴ A local (foreign) currency rating reflects rating agency's opinion of an obligor's willingness and ability to service commercial financial obligations denominated in local (foreign) currency on a timely basis.

especially in (1998) 1999 that had (downgraded) upgraded rating and outlook for over 40% of all samples.

The temporal clustering highlighted above can be problematic for empirical analyses of rating change announcements because it may bias estimates of the announcement effect. Such a bias will arise if the event window is contaminated by the effect of previous rating events. To avoid such a problem and to ensure we only study the impact of one rating event at each point in time, we work with upgrades and downgrades that do not overlap during a 21-day window covering ten days before to ten days after the announcement date.⁵ Moreover, our sample excludes major confounding events related to the country taking place in this 21-day window.⁶ As a result, a clean sample is obtained, which includes 133 sovereign credit rating changes announcements, 104 outlook changes announcement, which have effects on *equity* market returns, and 87 sovereign credit rating changes announcements and 79 economic outlook changes announcement affecting *bond* market returns. This sample is used in the event studies shown in Table 2 and 3.

5. Methodologies

5.1 Event studies

The event study technique provides an estimate of the market's reaction to a sovereign credit rating announcement and captures the dynamic effects around the time of changes in outlooks or ratings.⁷ An event study can provide evidence on whether rating agencies act procyclically, downgrading countries during bad times and upgrading them during good times. In addition, it can help determine whether the actions of rating agencies have sustained or transitory effects on financial markets.

⁵ This methodology is also employed by Kaminsky and Schmukler (2002) and Gande and Parsley (2003).

⁶ Following Brown & Warner (1985) any contaminating announcement made in the within ± 10 days of the contract announcement disqualifies the announcement from our sample.

⁷ See Fama et al. (1969) and, for more recent techniques in event studies, see Aktas et al. (2004).

5.1.1 We also use cumulative average abnormal returns (CAARs) over event window as dependent variables in regressions against selected possible determinants of the market's reaction announcement.

5.1.2 To capture the reaction to the announcement of stock and bond markets of the rated country, we construct abnormal returns of stocks and bonds around announcement dates using the simple market model with the value-weighted world stock index. The abnormal return based on the market model for country j on event day t is:

$$AR_{j,t} = R_{j,t} - \hat{\mathbf{a}}_j - \hat{\mathbf{b}}_j R_{M,t} \quad (1)$$

For stocks, $R_{j,t}$ is the rate of return on country j 's stock indexes for period t and $R_{m,t}$ is the rate of return on the value-weighted world stock indexes for period t . For bonds, $R_{j,t}$ is the rate of return on a country j 's bond index for period $t-1$ to t and $R_{m,t}$ is the return of U.S. Treasury bond of comparable maturity. Abnormal returns of bonds mostly reflect changes in the yield differences between a country's sovereign bond and benchmark instruments from developed countries. When the probability of a sovereign default increases vis-à-vis the U.S., bond prices decrease, yields increase, and bond returns decrease. For robustness, we also examine the basis point spread, measured as the interest rate differential in basis points (i.e., 1/100th of a percentage point) over a U.S. Treasury of comparable maturity. When we have multiple sovereign bonds issued by the same country issued at different times, we choose one representative bond with the most time-series observations to insure greater consistency throughout the sample.

$\hat{\mathbf{a}}_j$ and $\hat{\mathbf{b}}_j$ are the estimated intercept and slope, respectively, from a regression of asset returns on index returns over a 130 trading day period from day $t = -250$ through day $t = -121$ relative to the announcement date, $t=0$. One hundred twenty trading days immediately preceding the announcement are excluded since they might be contaminated by information leakage. Ninety-one trading days centered on the announcement date constitute our event window.

An average abnormal return for event date t is calculated as a simple cross-sectional average over N firms in the sample,

$$AAR_t = \frac{1}{N} \sum_{j=1}^N AR_{j,t}, \quad (2)$$

where $AR_{j,t}$ is the abnormal return of firm j on day t for each procedure. A t -statistic can be calculated for the average abnormal return by assuming cross-sectional independence.

A cumulative average abnormal return ($CAAR_{T_1, T_2}$) is computed as a sum over several event days; i.e., accumulating from days T_1 to T_2 inclusive, we have

$$CAAR_{T_1, T_2} = \frac{1}{N} \sum_{t=T_1}^{T_2} \sum_{j=1}^N AR_{j,t} \quad (3)$$

We also compute a cumulative average raw return in the same way, using the total return instead of the abnormal return in (3).⁸

5.2 Multivariate regression

To examine the determinants of abnormal returns of the global stock and bond markets around the announcements of changes in sovereign credit ratings and outlook, we estimate a cross-sectional regression model where the dependent variable is the three-day $CAAR$.⁹ We control for country characteristics typically reported on a monthly or quarterly basis.

⁸ We follow the standardized abnormal return approach used to generate test statistics (see Patell, 1976, Linn and McConnell, 1983, and Schipper and Smith, 1983.)

⁹ We included day -1 because typically there is a 1-day lag between the publication date of the rating change announcement in the news and the actual announcement date. For example, if the announcement was made on December 15, 2001, the Wall Street Journal typically published the news on the following day (Dec 16). Thus, the market reaction occurred one day before (Dec 15, 2001, which is day -1 in the event window) the announcement dates (day 0). We consider day +1 because some announcement reached the market via wire transfer after closing and then it will be reflected in day +1. In some cases, the wire reach the market before closing, hence the

Since rating agencies report both explicit credit ratings and imminent rating actions (outlooks), it would be too limiting omitting important information regarding the potential future direction of ratings if we focus purely on explicit rating changes. To include the information from both types of rating actions, we combine the level of both the explicit rating and the outlook to form an overall rating. Rating changes are represented as changes in this overall rating. A rating event is defined as a change in either explicit credit rating or a change in the imminent rating action or outlook. A positive rating event refers to an upgraded credit rating or outlook and a negative rating event refers to a downgraded credit rating or outlook. We estimate different specifications for both bond and stock cumulative abnormal returns in the following regression.

$$\begin{aligned}
 CAAR_{i,t} = & \mathbf{a}_0 + \mathbf{a}_1 Economic\ Development_{i,t} + \mathbf{a}_2 Inflation_{i,t} + \mathbf{a}_3 Current\ Account_{i,t} + \\
 & \mathbf{a}_4 Fiscal\ Balance_{i,t} + \mathbf{a}_5 Currency_{i,t} + \mathbf{a}_{6i,t} Common\ Law_{i,t} + \mathbf{a}_7 Crisis_{i,t} + \\
 & \mathbf{a}_8 Liquidity_{i,t} + \mathbf{a}_9 Change\ in\ Outlook_{i,t} + \mathbf{a}_{10} Upgrade_{i,t} + \mathbf{a}_{11} Downgrade_{i,t} + \\
 & \mathbf{a}_{12} Rating\ Change\ across\ Class_{i,t} + \mathbf{a}_{13} Size\ of\ Rating\ Change_{i,t} + \mathbf{e}_{i,t}
 \end{aligned} \tag{4}$$

where i and t stands for the index of rated countries $1, \dots, N$ and announcing time respectively; $CAAR_{i,t}$ is cumulative abnormal returns of both bond and stock markets of country i computed from equation (1) during the three day window. The error term $\mathbf{e}_{i,t}$ can be characterized by an independently distributed random variable with mean zero and variance \mathbf{s}_i^2 . Standard errors are White's heteroscedasticity-adjusted (White, 1980).

5.2.1 Determinants of bond and stock abnormal returns

Assessing the reaction of stock and bond markets to the announcements of changes in sovereign credit ratings and outlooks is not an easy task. One must take into account both solvency facts and aspects like the stability of the political system, social cohesion and the degree of interdependence

information is reflected in day zero. In addition, MacKinlay (1997) suggests that the power of event study can be increased by shortening the event window.

with the international economic and financial system.¹⁰ It is also worthwhile noticing sovereigns, unlike corporate issuers, are less likely to face claims from creditors if the circumstance of a default arises. This is true even if governments have an incentive to make payments, resulting from the possibility of capital market autarky (see Afonso, 2003).

Among the factors, which may influence the attribution of a higher or lower rating for each sovereign issue may include the political stability of a country, the level of external debt, the evidence on previous issuances and eventual defaults, indicators of economic performance, the degree of a country's development, and information about public accounts.¹¹

Economic development is a dummy variable indicating whether a country is classified by the International Monetary Fund as industrialized. Even though the level of economic development can be measured by per capita GDP, most rating agencies take the relationship between economic development and risk into consideration. As a result, a country that is classified as industrialized is less likely to default because it surpasses an income or development level threshold utilized by these rating agencies. We expect an emerging market country will surprise the market by receiving a more positive response from the financial markets and thus its bond and equity returns should be associated with rating changes when its credit rating improves while a developed country may have a smaller association.

The inflation rate has two opposing affects on the existing stock of government debt. On one hand, an increase of inflation improves the public debt dynamic by reducing the real value of government debt. On the other hand, a rise in inflation contributes negatively to the debt dynamics because it makes it necessary for the government to pay a higher nominal interest rate. Moreover,

¹⁰ See Bulow and Rogoff (1989) and also Bulow (1992) for the differences between corporate and sovereign default.

¹¹ The rationale of including these variables is discussed by Edwards (1984), Haque et al. (1998), and Cantor and Packer (1996). Haque et al. (1998), assess the importance of political factors. We can also see the criteria definition used in Moody's (2001).

high inflation may signal excess demand or labor market distortions and imply a lack of capacity for a country to finance its public expenditures using only public revenues and debt. Economic history has already several episodes when countries resorted to printing money in order to meet their borrowing requirements. Furthermore, a high rate of inflation causes political stability when a government appears unable to have enough budgets to pay expenses through taxes or issuing debt and thus has to depend on inflationary money finance. This event can cause turmoil and public dissatisfaction in the country. Hence, we expect there will be a relatively stronger positive on the returns of a country with high inflation when its announced credit rating is upgraded.

The current account is a section in a country's balance of payments (BOP) recording a country's current transactions. A current account deficit occurs when a country has an excess of one or more of the four factors making up the account. When a current transaction enters the account, it is recorded as a credit, and when a value leaves the account, it is marked as a debit. Basically, a current account deficit occurs when more money is being paid out than brought into a country. When the country's credit rating is downgraded, a country with a current account surplus surprises the markets and may experience a more negative impact on both the bond and stock returns than a country with a current account deficit.

A large federal deficit or negative fiscal balance often causes an increase in tax imposed by the government on its citizen in order to compensate for absorbed private domestic savings to pay country debt. Therefore, countries with large federal deficit will surprise the market and may receive a relatively positive impact on the bond and equity return when its credit rating is upgraded.

Additionally, we also distinguish if the currency of debt is domestic or foreign. We expect bond and stock returns of countries with foreign currency debt will be more positively associated with a change in credit rating than countries with domestic currency debt. History shows a significantly lower incidence of sovereign default on local currency debt than on foreign currency

debt.¹² (See “Sovereign Defaults: Heading Lower Into 2004,” published Sept 18, 2003, on Ratings Direct.) The credit ratings on a sovereign’s foreign currency bonds at present never exceed and are often lower than the ratings on its domestic currency obligations (Cantor and Packer, 1995.)

In addition, we control change in debt rating whether it is changed within or across classes. For example, an upgraded rating from C to B is a change across classes but from a change from A- to A+ is considered within class. We hypothesize a country, which has a rating change across classes should have bond and stock returns more highly associated with a change in rating than a country which has a rating change within a class. On the other hand, a country with a downgrade across classes should experience more negative reaction from the markets than a country with downgrade within a class.

We separate the impact of implemented rating changes from that of imminent rating changes (outlooks and Credit Watches). Kaminsky and Schmukler (2002) show implemented rating changes tend to be preceded by a change in outlook. In this case, actual rating changes may be partially anticipated by financial markets. They also find the coefficient on outlooks is significantly larger than the coefficient on ratings, suggesting investors may anticipate rating changes, perhaps because countries are put on a watchlist before being downgraded.

Furthermore, we added the origin of the legal systems (common law and civil law systems) to control for the legal basis among different countries. The importance of these variables has been documented in financial market integration literatures (La Porta et al., 1997, 1998, and 1999). Finally, we control for the liquidity of equities market (see Henry, 2000). If ratings are informative, it will be instructive to analyze whether sovereign ratings are more informative for countries with lower liquidity than for countries with higher liquidity. Gande and Parsley (2005) find countries with high liquidity experience smaller outflows around downgrades suggesting an increase in

¹² A higher local currency rating reflects the sovereign’s greater willingness and ability to service local currency debt and is based upon the unique powers a sovereign enjoys within its own borders, particularly in its control of domestic financial and monetary systems .

liquidity could mitigate some of the perceived negative effects associated with global capital flows. Therefore, we hypothesize a change in sovereign rating should have less impact on bond and stock returns of financial markets in the presence of high liquidity.

Finally, we control for events during crises by adding dummy variable equal to one if the event occurred during the crises. The finding financial markets are more sensitive to rating announcements during crisis periods is consistent with the models of multiple equilibriums, whereby jumps between equilibriums are triggered by extraneous events (Masson, 1999). Along these lines, the herding literature has shown, in the presence of asymmetric information, a new signal shifting market sentiment from optimism to pessimism can bring about a cascade of sell orders and thus a large movement in price (Bikchandani et al., 1992). Indeed, traders are likely to be particularly sensitive to macroeconomic news events like sovereign rating changes during crisis periods because the likelihood of market panic is greater. The findings here are also consistent with Radelet and Sachs (1998), who argue severe downgrades during crisis periods can cause a country to become isolated from the international economy if it is commercial banks become rated below investment grade, thereby amplifying the impact of the rating changes. Since our data span five crisis periods, we are concerned results may be driven by a sub-sample of events. The crisis dummy identifies the EMS crisis, the Asian financial crisis, the Brazilian crisis, the Mexican peso crisis, and the Russian crisis.

5.2.2 Modelling the impact of credit rating changes under country characteristics on bond and stock returns

Prior literatures on both corporate and sovereign credit ratings have shown they have an asymmetry impact on financial markets. But, the exact country characteristics where sovereign credit rating changes convey new information to the markets is uncertain. Our objective is to consider the impact of the sovereign credit rating change under selected country characteristics on bond and

stock returns.¹³ To achieve this goal, we disaggregate the rating change variable according to selected country characteristics. However, it is difficult to identify what causes the significant rating impact. For instance, we find a downgrade has a relatively larger significant impact than an upgrade or downgrade is more informative than upgrade. Moreover, we show the impact of downgrade is more significantly amplified for a country with high inflation than a low inflation country and for an emerging country relative to a developed country. It is still difficult to draw a conclusion that a high inflation emerging country receives significant impact on stock and bond returns from a downgrade. Hooper et al. (2005) argue ideally we can test such conclusion by partitioning the sample into finer and finer groups. Nevertheless due to the recent emerging of sovereign credit rating market, the sample size may not be large enough for such an experiment.

To model the impact of interactions between a rating change and selected country characteristics on national index returns, we pool the rating change data for every country and estimate a regression for each k characteristics. The benefits of pooling all data into one regression and using interaction terms are twofold: first, we do not lose any observations. By analyzing downgrading separately from upgrading, we lose observations of affirm rating and have problem of insufficient degrees of freedom. Second, by applying the interaction terms between a rating change and selected characteristics, we are able to examine the differences in the impact of rating change under selected country characteristics on bond and stock returns. To study such impact, we estimate the following regression:

$$\begin{aligned}
 CAAR_{i,t}^k = & \mathbf{a}_0 + \mathbf{a}_1 H_{i,t}^k * Upgrade_{i,t} + \mathbf{a}_2 L_{i,t}^k * Upgrade_{i,t} + \mathbf{a}_3 H_{i,t}^k * Downgrade_{i,t} + \mathbf{a}_4 L_{i,t}^k * Downgrade_{i,t} \\
 & + \mathbf{a}_5 H_{i,t}^k * Upgrade\ across\ class_{i,t} + \mathbf{a}_6 L_{i,t}^k * Upgrade\ across\ class_{i,t} + \mathbf{a}_7 H_{i,t}^k * Downgrade\ across\ class_{i,t} \\
 & + \mathbf{a}_8 L_{i,t}^k * Downgrade\ across\ class_{i,t} + \sum_k \mathbf{b}_k Characteristics_{i,t}^k + \mathbf{e}_{i,t}^k
 \end{aligned} \quad (5)$$

where i and t stands for the index of rated countries ($i=1, \dots, N$), and announcing time respectively; k stands for the index of characteristic ($k=1, \dots, 9$); therefore, there are 9 regressions in this analysis

¹³ We thank for the referee's suggestions to use interaction terms in this analysis.

reported in Tables 7 and 8. $CAAR_{i,t}$ is the three-day cumulative abnormal returns of both bond and stock markets of a country i computed from equation (1).

$$\sum \mathbf{b}_k \text{Characteristics}_{i,t}^k = \mathbf{b}_1 \text{Economic Development}_{i,t} + \mathbf{b}_2 \text{Inflation}_{i,t} + \mathbf{b}_3 \text{Current Account}_{i,t} + \quad (6)$$

$$\mathbf{b}_4 \text{Fiscal Balance}_{i,t} + \mathbf{b}_5 \text{Currency}_{i,t} + \mathbf{b}_6 \text{Common Law}_{i,t} + \mathbf{b}_7 \text{Crisis}_{i,t} + \mathbf{b}_8 \text{Liquidity}_{i,t} + \mathbf{b}_9 \text{Change in Outlook}_{i,t}$$

The error term $\mathbf{e}_{i,t}$ can be characterized by an independently distributed random variable with mean zero and variance \mathbf{S}_i^2 . Standard errors are White's heteroscedasticity-adjusted (White, 1980).

$H_{i,t}^k$ is equal to one for the value above the median of characteristic k and $L_{i,t}^k$ is equal to one for the value below the median of characteristic k . $Upgrade_{i,t}$ is equal to one for an upgraded outlook or credit rating and $Downgrade_{i,t}$ is equal to one for a downgraded outlook or credit rating. To capture the impact of changes in rating across class, we include $Upgrade\ across\ class_{i,t}$ ($Downgrade\ across\ class_{i,t}$), which equals to one for an upgrade (a downgrade) across classes. $Characteristics_{i,t}^k$ is a vector of control variables which controls for k country characteristics including inflation, current account, fiscal balance, liquidity, developed vs. emerging countries, crisis vs. non-crisis, common vs. civil law, local vs. foreign currency, and outlook vs. assignment rating change. $H_{i,t}^k$ vs. $L_{i,t}^k$ included in our study are developed vs. emerging countries, high vs. low inflation, high vs. low current account, high vs. low fiscal balance, local vs. foreign currency, common and civil law, non-crisis vs. crisis, high vs. low liquidity, and outlook vs. assignment rating change. For instance, Column (1) in Table 6 is estimated from the following:

$$\begin{aligned}
CAAR_{i,t} = & \mathbf{a}_0 + \mathbf{a}_1 \text{Developed country}_{i,t} * \text{Upgrade}_{i,t} + \mathbf{a}_2 \text{Emerging country}_{i,t} * \text{Upgrade}_{i,t} + \\
& \mathbf{a}_3 \text{Developed country}_{i,t} * \text{Downgrade}_{i,t} + \mathbf{a}_4 \text{Emerging country}_{i,t} * \text{Downgrade}_{i,t} + \\
& \mathbf{a}_5 \text{Developed country}_{i,t} * \text{Upgrade across class}_{i,t} + \mathbf{a}_6 \text{Emerging country}_{i,t} * \text{Upgrade across class}_{i,t} \\
& + \mathbf{a}_7 \text{Developed country}_{i,t} * \text{Downgrade across class}_{i,t} + \mathbf{a}_8 \text{Emerging country}_{i,t} * \text{Downgrade across class}_{i,t} \\
& + \sum_k \mathbf{b}_k \text{Characteristics}_{i,t}^k + \mathbf{e}_{i,t}
\end{aligned} \tag{7}$$

where $\text{Characteristics}_{i,t}^k$ are the same control variables i, \dots, k as those used in equation (6) and the same set of control variables is employed across all regressions in Tables (7) and (8). We change developed country vs. emerging country to the other rating and other characteristics as shown in Columns (2) to (9). The results for stock returns and bond returns are shown in Tables 7 Panel A and Panel B respectively.

6. Empirical results

6.1 Event study results

6.1.1 Announcement effect of changes in sovereign credit rating

Table 2 Panel A reports the announcement effect of a downgrade. The CAARs during three-, five-, and eleven-day windows are -5.29%, -6.04%, and -5.98% respectively and are negatively significant at the 0.1% level. In contrast, upgrade and affirm ratings do not have a significant effect on stock market returns (see Panel B and C). Table 2 Panel D to F reports the announcement effect of rating changes on bond market returns. The results imply bond market reacts negatively only to a downgrade announcement. The CAAR during three-day window is -2.43% and it is significant at 1%. So, the bond market reacts to a downgrade during five- and eleven-day windows and from day forty-five to two day before the event at 5% significance level. The negative reaction of the stock market is stronger than the bond market reaction. This may be evidence of information leakage, which occurs earlier in the bond market (45 days before the announcement) than in the equity market (5 days before the announcement). This leakage may arise as astute investors develop their own predictions about future results at the same time rating agencies are developing theirs.

6.1.2 The announcement effect of changes in economic outlooks

Table 3 Panel A, B, and C reports a downgrade of economic outlook results in significant and negative equity abnormal returns of -1.23% during a three-day window. On the other hand, the upgrade and affirm of economic outlook do not result in significant abnormal returns in any event window. This result is consistent with the announcement effect of rating downgrade. So far, the results of this study have shown a significant price reaction of stock market to a downgrade but not to an upgrade, which is consistent with the results of Goh and Ederington (1993). Table 3 Panel D to F reports the announcement effect of economic outlook change on bond returns. The three-day CAAR is negative -2.28% for negative announcements and 0.63% for positive announcements. In contrast to the stock market, which reacts only to outlook downgrade, bond market reacts positively to an upgraded outlook at a 5% significance level and negatively to outlook downgrade at a 10% level. Furthermore, the CAAR is negatively (positively) significant during forty five to two days before the announcement of downgrading (upgrading). This evidence also occurs for bond market when the rating is downgrade. This may not just be evidence of information leakage but could arise as astute investors develop their own predictions about future results at the same time as rating agencies are developing theirs.

Kaminsky and Schmukler (2002) show implemented rating changes tended to be preceded by a change in outlook. In this study, the results show actual rating changes may be partially anticipated by financial markets. Overall, we find both actual rating changes and outlook changes have a significant impact on financial markets. In the bond market, outlook downgrade produces a *higher* change in the market index than rating downgrade during two and five days before and after the announcement. In contrast, outlook downgrade has *less* negative impact on equity returns than rating downgrade during one, two, and five days before and after the announcement. This provides evidence where actual changes in rating are, to some extent, anticipated only in the bond market because investors are warned of the rating outlook in advance. However, the changes in rating are

unanticipated in the equity market. Outlook changes appear to be at least as important as rating changes only in bond markets.

We also investigate alternative event windows around the announcement of rating changes to test two hypotheses. First, we can test for a potential delay in response from the financial market following rating changes. Second, Kaminsky and Schmukler (2002) find rating agencies may have exacerbated the boom-bust pattern in emerging markets. We find rating downgrade in bond markets results in negative abnormal returns *every single day* from twenty five days before the announcement until five days after the announcement. Downgrade tends to occur when markets are collapsing; however, the result does not support the evidence upgrade tends to occur when markets are rallying. Furthermore, the results raise a possibility that rating agencies may exacerbate a bond bear market.¹⁴

Our evidence shows a positive response to rating upgrade in the bond market and negative responses to rating downgrade in bond and equity markets during 45 to 2 days *before* the announcement. In contrast, there is no market response from 2 to 45 five days *after* the announcement. This suggests that there is no delay in market response to sovereign credit rating announcement. Our result supports Kaminsky and Schmukler (2002), who find market movements as early as 10 days before announcement and conclude the credit rating agencies behave procyclically.

6.2 Multivariate regression results

To examine the determinants of abnormal returns, we estimate a regression model where the dependent variable is the three-day CAARs on country variables as described in Section 5.2.1. A summary statistics of the explanatory variables are shown in Table 4, and these statistics are

¹⁴ We only present summaries of the results to save space. Full analyses of the results including the relevant tables are available from the authors.

reported on the bases of whether the rating change is upgrade, downgrade, or affirmation of previous rating. Table 5 reports the correlation matrix among these explanatory variables for equity above diagonal and bond markets below diagonal.

6.2.1 Basic model: The impact of country characteristics on equity and bond returns

Table 6 reports the results of cross-sectional analysis with CAARs for stocks in Panel A and for bonds in Panel B during a three-day window [-1,+1] as a dependent variable. The results show that the stock market reacts negatively to downgrade rating and rating change across class; whereas, it reacts positively to current account. The coefficients are strongly significant at 5% level and adjusted R-squared is about 30%. Consistent with the results of stock market, bond market reacts positively to country with high current account. In contrast to stock market, bond market reacts positively to upgrade rating change *across class* and size of rating change at 10% significance level. Adjusted R-squared for bond returns is 15%, which is lower than that for stock returns.¹⁵ This analysis, however, does not show the impact of sovereign credit rating change under selected country characteristics on financial markets.

6.2.2 The impact of up(down)grade under country characteristics on equity returns

Table 7 Panel A show the results of the interaction effect between country characteristics and changes in credit rating or outlook on *stock* returns over the three-day window. The results shows a rating and outlook downgrade has a significant and negative impact on equity returns of emerging countries and downgrade *across class* has more negative impact on stock returns of emerging countries than developed countries. Moreover, a downgrade has negative impact on equity returns of countries with high inflation than countries with low inflation. Likewise, a downgrade has a

¹⁵ We replicate the analyses in section 6.2.1, 6.2.2, 6.2.3 using CAARs of bonds and stocks during *five-day* event window [-2,+2] as a dependent variable; nevertheless, we do not report the results due to the limited space but they are available upon request.

negative impact on equity returns of countries having low fiscal balance and sovereign debt denominated in local currency. On the other hand, a downgrade across class has more negative impact on equity returns of countries with low current account and foreign currency debt.

In contrast to the case of inflation, fiscal balance, and currency of debt, a downgrade has a significant and negative impact on countries with any level of current account but a downgrade across class has a negative impact only to countries with low current account.

Both downgrade and downgrade across classes have negative impact on equity returns of a country having: less development, common law or civil law infrastructure, credit rating changes during a crisis or non-crisis period, any level of liquidity, and a change in outlook or assignment. No impact of the interaction between upgrade and any of country's characteristics, consistent with the results from event study in the previous section that upgrade announcement has no impact on returns over any event window.

6.2.3 *The impact of up(down)grade under country characteristics on bond returns*

Table 7 Panel B reports the results of multivariate regressions where the dependent variable is the cumulative average ***bond*** abnormal returns. A downgrade has a significant negative impact on bond returns of countries with a relatively weak economy as proxied by less development, high inflation, and low current account. On the other hand, downgrade across class has a significant negative impact on countries with a relatively healthy economy as proxied by low inflation, high liquidity, and during non-crisis period. This is consistent with our hypothesis that countries with a relatively healthy economy surprises the market by having rating downgrade ***across classes***, which has more negative impact on their bond returns than on bond returns of countries with a relatively weak economy. This result is inconsistent with Gande and Parsley (2003), who find having high liquidity alleviates the capital outflow from rating downgrade.

Both downgrade and downgrade across classes have more negative impact on countries with common law, local currency debt, low fiscal balance, and a change in rating assignment than

vice versa. The latter can be explained by the fact that outlook is just a forecast of the likely direction of an issuer's credit quality over the medium term. Although our results of event study shows the impact of imminent rating changes for outlook downgrade is higher than the impact of a change in explicit rating, the results of multivariate regression show that *imminent* rating changes have *no* impact on bond returns controlling for particular characteristics. Finally, consistent with the results of stock returns, an upgrade has no significant impact on any country with extenuating circumstances.

6.2.4 Robustness test

6.2.4.1 The impact of size of rating changes under country characteristics on stock and bond returns

In addition to applying a dummy variable to capture the direction of change in credit rating and outlook in section 6.2.2 and 6.2.3, we employ the level of changes in credit rating and outlook as follows:

$$\begin{aligned}
 CAAR_{i,t}^k = & \mathbf{a}_0 + \mathbf{a}_1 H_{i,t}^k * Size\ of\ rating\ change_{i,t} + \mathbf{a}_2 L_{i,t}^k * Size\ of\ rating\ change_{i,t} + \\
 & \mathbf{a}_3 H_{i,t}^k * Upgrade\ across\ class_{i,t} + \mathbf{a}_4 L_{i,t}^k * Upgrade\ across\ class_{i,t} + \\
 & \mathbf{a}_5 H_{i,t}^k * Downgrade\ across\ class_{i,t} + \mathbf{a}_6 L_{i,t}^k * Downgrade\ across\ class_{i,t} + \sum_k \mathbf{b}_k characteristics_{i,t}^k + \mathbf{e}_{i,t}^k
 \end{aligned} \tag{8}$$

where *Size of rating change*_{*i,t*} represents a change in credit rating or outlook in the country of analysis by any rating agency. It is equal to 1 if there is a one-notch upgraded rating or outlook and equal to -1 if there is a downgrade. A two-notch upgrade (downgrade) is represented as a 2 (-2) and so on. This definition is applied to all types of rating changes. $H_{i,t}^k$ and $L_{i,t}^k$ are applied in the same way as those in equation (5). Each pair of selected country characteristics is applied in the interaction terms from Columns (1) to (9) of Table 8. $Characteristics_{i,t}^k$ are the same control variables as those in equation (6) and we use the same set of control variables across all regressions

in Tables (7) and (8). The results of this analysis are presented in Table 8 Panel A for equity returns and in Panel B for bond returns. We describe the results of this section together with those of the next section below.

6.2.4.2 *The impact of level of rating changes under country characteristics on stock and bond returns: 2SLS analysis*

Cantor and Packer (1996) show a sovereign credit rating is a function of country characteristics. A more recent study by Mora (2006) also presents sovereign credit rating changes as a function of first lags of country characteristics. Therefore, we apply 2SLS (two-stage least squares) by running the first-stage regression of change in sovereign credit rating and outlook (*Size of change in rating_{i,t}*) on selected country characteristics. In addition to including some country characteristics in Eq. (8) that are not related to disturbances, we adopt transparency, rule of law, first lags of GDP per capita, first lag of GDP growth rate, first lag of external balance, and first lag of net foreign debt as instrument variables (Cantor and Packer, 1996). See the definition of these variables in Appendix 1.¹⁶

For stock return analysis, the result of first-stage regression of rating change is:

¹⁶ In order to calculate 2SLS estimates, our specification must satisfy the order condition for identification, which says that there must be at least as many instruments as there are coefficients in the equation specification, which is CAAR regression in Eq. 8. See Davidson and MacKinnon (1994) and Johnston and DiNardo (1997) for additional discussion. Moreover, any right-hand side variables of CAAR regression in Eq. (8) uncorrelated with the disturbances should be included as instruments. Our specification satisfies the order condition for identification, which requires that there are at least as many instruments (sixteen independent variables in Eq. 9 and 10) as there are coefficients (sixteen independent variables in Eq. 8) in the equation specification. Furthermore, all of the variables in the CAAR equation believed to be uncorrelated with the disturbances (economic development, outlook, currency, common law, and crisis) appear both in the equation specification and in the instrument list.

$$\begin{aligned}
\text{Size of rating change}_t = & -0.57 + 0.0001 \text{First lag of GDP per capita} + 0.017 \text{First lag of GDP growth} \\
& (0.085) \qquad (0.233) \qquad (0.001) \\
& + 0.0000001 \text{First lag of current account} - 0.00002 \text{First lag of fiscal balance} - 0.00005 \text{First lag of net foreign debt} \\
& (0.434) \qquad (0.146) \qquad (0.247) \\
& - 0.000003 \text{First lag of external balance} - 0.44 \text{Economic development} + 0.004 \text{First lag of liquidity} \\
& (0.106) \qquad (0.211) \qquad (0.074) \\
& - 0.10 \text{Outlook} - 0.02 \text{Currency} + 0.49 \text{Common Law} - 0.77 \text{Crisis} + 0.06 \text{Rule of Law} \\
& (0.752) \qquad (0.953) \qquad (0.077) \qquad (0.002) \qquad (0.732) \\
& + 0.001 \text{First lag of Inflation} + 0.65 \text{Transparency} \\
& (0.001) \qquad (0.002) \\
\text{AdjR-squared} = & 9.14\%
\end{aligned} \tag{9}$$

For bond return analysis, the result of first-stage regression of rating change is:

$$\begin{aligned}
\text{Size of change in rating}_t = & 0.60 + 0.00005 \text{First lag of GDP per capita} + 0.001 \text{First lag of GDP growth} \\
& (0.469) \qquad (0.1302) \qquad (0.008) \\
& - 0.0001 \text{First lag of current account} + 0.01 \text{First lag of fiscal balance} + 0.009 \text{First lag of net foreign debt} \\
& (0.175) \qquad (0.365) \qquad (0.677) \\
& - 0.002 \text{First lag of external balance} + 0.41 \text{Economic development} + 0.003 \text{First lag of liquidity} \\
& (0.247) \qquad (0.613) \qquad (0.693) \\
& + 0.17 \text{Outlook} + 0.16 \text{Currency} + 0.56 \text{Common Law} - 0.67 \text{Crisis} - 0.21 \text{Rule of Law} \\
& (0.589) \qquad (0.491) \qquad (0.278) \qquad (0.007) \qquad (0.296) \\
& + 0.04 \text{First lag of Inflation} - 0.041 \text{Transparency} \\
& (0.100) \qquad (0.727) \\
\text{AdjR-squared} = & 3.07\%
\end{aligned} \tag{10}$$

where the number in parenthesis under each variable is P-value under hypothesis that each coefficient is equal to zero.

According to the results of equations (9) and (10) above, a rating is positively associated with first lag of GDP growth, liquidity, common law, inflation and transparency but has an inverse relation with crisis. The results of the impact of a rating change under selected characteristics over the window (-1, +1) based on OLS and 2SLS are reported in Tables 8 Panel A and B respectively for equity returns and in Panel C and D respectively for bond returns.

According to OLS and 2SLS results, the impact of the interaction between *size of rating change* and country characteristics on equity and bond return is not significantly different from the results obtained in sections 6.2.2 and 6.2.3. First, countries with relatively weak economy (proxied

by less development, high inflation, low current account, and low liquidity) and with common law, rating assignment change, and during the non-crisis period, have *equity* returns positively associated with size of rating change. The same results also apply for *bond* returns except for countries with rating change during crisis period or with local currency debt having bond return significantly affected.

Second, *downgrade across class* has a negative impact on the *equity* returns of both developed and emerging countries; however, such an impact is more negative and significant for emerging country. In a similar vein, downgrade across class has an impact on all country characteristics; nevertheless, such an impact is more negative for countries with a relatively healthy economy (as proxied by low inflation, high fiscal balance, high liquidity) and with foreign currency debt, common law, and during non-crisis. Countries with a relatively healthy economy surprise the market by having their ratings downgraded across class and thus receive more significant and negative impact on equity returns than countries with an ailing economy. Consistent with the results of bond returns in section 6.2.3, downgrade across class has significant impact on *bond* returns of countries with a relatively strong economy (as proxied by high current account, high fiscal balance, foreign currency debt, common law, during non-crisis, and high liquidity) with rating assignment changed.

By treating a size of rating change as an endogenous variable and applying 2SLS, the overall results are consistent with the OLS results. Nevertheless, Table 8 Panel B reports that *upgrade across class* has a significant impact on *equity* returns of countries with low development, low current account, and during crisis, which is consistent with our hypothesis that countries with a relatively ailing economy surprise the market when their rating is upgraded across class, which has a significant and positive impact on their equity returns. Table 8 Panel D reports that upgrade across class does not have any significant impact on *bond* returns.

7. Conclusion

This study addresses the questions, “Does a change in sovereign rating simply mirror the existing international market’s assessment of country’s risk?” and “Does a change in sovereign credit rating provide financial markets with new information?” We try to answer these questions by investigating the reactions of global bond **and** stock markets to sovereign credit rating changes under macroeconomics and rating characteristics. The issues are investigated by measuring the pre- and post announcement of sovereign credit rating as well as contemporaneous responses of financial markets to rating changes.

We find rating agencies do provide financial markets with new tradable information and changes in ratings and outlook significantly affect both the bond and stock markets. Further, we find four specific reactions of bond markets different from stock markets. First, only bond market reacts positively and significantly when economic outlook is upgraded. Such a pattern is consistent with a reduction in default risk and little increase in economic growth. Second, the impact of outlook changes is larger than the impact of rating changes only for bond markets, suggesting

investors most likely anticipate the later rating change from the outlook. Default risk reduction helps bonds, but not necessarily stocks. Third, downgraded rating assignments and economic outlooks occur only in bond markets during a market downturn. The abnormal return is negative every single day from twenty five days before the announcement to five days after the announcement suggesting rating agencies announcements may exacerbate bear bond markets. This artifact of bond markets might be explained by an increase in default probability. This could also affect stocks, but may not be significant because stock returns are noisier and it is harder to find any significant effect. Fourth, the cumulative abnormal bond return during forty-five days before to two days after the announcement date is negatively significant when the rating is downgraded and it is negatively (positively) significant when the economic outlook is downgraded (upgraded). Fifth, controlled by selected country characteristics, upgrade rating events have no discernable impact on both bond and stock returns. Only downgrade rating events have. Sixth, a

downgrade has a significant negative impact on bond and stock returns countries with less development and high inflation. A downgrade *across class* has a significant and negative impact on *bond* returns of countries with a relatively healthy economy as proxied by low inflation, high liquidity, and during non-crisis. Presumably, countries with a relatively strong economy surprise the market by having their ratings downgraded *across class*; thus, they receive a significant and negative impact on their bond returns. We also confirm the results by applying the level of rating change instead of dummy variables of downgrade vs. upgrade and by employing 2SLS with sovereign rating change level as an endogenous variable.

To conclude, we find market reacts to unexpected events and such reactions are different under country characteristics. Specifically, we extend the literature on this subject and provide important policy implications for investors' international asset allocation and for regulatory agents such as the Basel Committees depending on credit rating agencies such as Moody's and S&P's for their regulatory deliberations.

Future research might examine other ratings beyond sovereign debt rating. One could work with corporate ratings to investigate whether ratings convey different information for different groups of firms. For example, perhaps firms issuing ADRs with more transparent accounting standards and for which more information is available, would be less affected by rating changes than less transparent firms. Rating agencies also take exchange rate risk into consideration when they assign grade; therefore, whether these ratings differently impact countries and companies with different foreign exchange rate exposure or interest rate exposure is an interesting issue to explore.

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Appendix 1

Definitions of Variables

| Variables | Definition | Unit of Measurement | Data Sources |
|----------------------|---|--|--|
| GDP per capita | GDP is generally presented as the sum of final expenditures including household consumption expenditure, government consumption expenditure, gross fixed capital formation, changes in inventories, exports of goods and services, and imports of goods and services. GDP per capital in the year before the announcement date | Thousands of dollars | World Bank, Moody's, and Federal Reserve Bank of New York estimates |
| GDP | Average annual real GDP | Billion | World Bank, Moody's, and Federal Reserve Bank of New York estimates |
| Inflation | The percentage change in consumer price index between the year before and two years before the announcement date. | Percent | World Bank, Moody's, and Federal Reserve Bank of New York estimates |
| Exports | Exports data applied here is Merchandise Exports FOB. It is customs statistics reported under the general trade system according to the recommendations of the UN International Merchandise Trade Statistics: Concepts and Definitions, 1998; it is measured relative to GDP in the year before announcement date. | Percent | World Bank, Moody's, and Federal Reserve Bank of New York estimates |
| Current account | The credit lines minus the debit lines of goods, services, income, and current transfers; it is measured relative to GDP in the year before the announcement date | Percent | World Bank, Moody's, and Federal Reserve Bank of New York estimates |
| Net foreign debt | The net change in government liabilities representing mainly foreign lenders' direct loans or advances to government or their holding of government securities acquired from the government itself or in transactions with others; it is measured relative to GDP in the year before announcement date. | Percent | World Bank, Moody's, and Federal Reserve Bank of New York estimates |
| Fiscal balance | The difference between Revenue and, if applicable, Grants Received on the one hand and Expenditure and Lending Minus Repayments on the other. It is also equal to (with opposite sign) the sum of the net borrowing by the government plus the net decrease in government cash, deposits, and securities held for liquidity purpose. It is average annual central government budget surplus relative to GDP in the year before the announcement date. | Percent | World Bank, Moody's, IMF, and Federal Reserve Bank of New York estimates |
| External balance | It is average annual current account surplus relative to GDP in the year before the announcement date | Percent | World Bank, Moody's, and Federal Reserve Bank of New York estimates |
| Common law | An indicator variable that takes a value of one if the legal origin of a country is identified as having an English common law system as tabulated in Appendix B of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999). | Indicator variable: 1= common law; 0 = civil law | La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997 and 1998) |
| Rule of law | A variable that takes a value from 0 to 6, where higher values indicate a higher tradition for law and order. The primary source for this variable is the rule of law variable from the La Porta, Lopez-de-Silanes, and Shleifer (2002) dataset (http://www.som.yale.edu/Faculty/fl69/datasets/gbk_allvar.xls). | Indicator variable | La Porta, Lopez-de-Silanes, and Shleifer (2002) |
| Crisis | A code for events that occurred during the EMS, Mexican, Asian, Russian, and Brazilian crises. EMS crisis from September 1 st , 1992 to August 31 st , 1993; Mexican Crisis from December, 1 st 1994 to December 31 st , 1995; Asian Crisis from August 1 st , 1997 to March 31 st , 1998; Russian Crisis from August 1 st , 1998 to December 31 st , 1998; Brazilian Crisis from January 1 st , 1999 to March 31 st , 1999 | Indicator variable | Banco Central do Brazil |
| Economic development | Classification as an industrialized country as of September 1995 | Indicator variable: 1=industrialized; 0=not industrialized | IMF (2001) |
| Currency code | A code for the currency being rated | Indicator variable: 1= foreign; 0=domestic | The announcements from Standard and Poor's Credit Week and from Reuters |

| | | | |
|----------------------------|--|--|---|
| | | | Business Briefing |
| Rating change across class | A code for whether the rating changes cross the class or within class. for example: a change from AA to A is across class, while a change from A- to A+ is within class. | Indicator variable: 1=across; 0=within class | The announcements from Standard and Poor's Credit Week and from Reuters Business Briefing |
| Upgrade | A code for whether the rating or outlook is upgraded | Indicator variable: 1=upgrade; 0=not upgrade | The announcements from Standard and Poor's Credit Week and from Reuters Business Briefing |
| Downgrade | A code for whether the rating or outlook is downgraded | Indicator variable: 1=downgrade; 0=not downgrade | The announcements from Standard and Poor's Credit Week and from Reuters Business Briefing |
| Investment grade | A code for whether the rating is in the range in the BBB or above (Investment grade) or zero if the rating below investment grade (BB and below) | Indicator variable: 1=investment grade; 0=not investment grade | The announcements from Standard and Poor's Credit Week and from Reuters Business Briefing |
| Size of rating change | The size of change in credit rating or outlook in the country of analysis by any rating agency | This variable equal to 1 if there is a one-notch upgrade in rating or outlook and equal to -1 if there is a downgrade. A two-notch upgrade (downgrade) is represented as 2 (-2) and so on. | The announcements from Standard and Poor's Credit Week and from Reuters Business Briefing |
| Outlook change | A code for whether the rating is the change in outlook or rating. | Indicator variable: 1=change in outlook; 0=rating change | The announcements from Standard and Poor's Credit Week and from Reuters Business Briefing |
| Transparency | A score of 0-10 of Corruption Perception Index (CPI) 2001. The least transparency has a score of 0 and the most transparency has a score of 10. Perception Index is produced by Transparency International data (http://www.transparency.org). | Score 0-10 | Transparency International data |
| Liquidity | Total value of stocks traded as a percentage of GDP. Average for the period 1996-2000. Source: World Development Indicators at http://devdata.worldbank.org/dataonline/ . | Percent | Standard & Poor's Global Stock Market Fact book |

Table 1

Frequency Distribution of the Announcements of Changes in Sovereign Credit Rating and Economic Outlooks

This table reports frequency distribution of the 687 announcements of credit rating and outlook changes for both local vs. foreign and short vs. long-term sovereign debt. Affirm stands for no rating change; up means upgrade; down means downgrade. Panel A (B) reports the frequency distribution by country (year of announcement) and Panel C reports the statistics of Panel B.

Panel A

| Country | Local Currency Rating | | | | | | | | | Foreign Currency Rating | | | | | | | | | Total | | |
|--------------|-----------------------|-----------|-----------|------------|----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|------------|----------|-----------|-----------|-----------|-----------|------------|---|----|
| | Ratings | | | | | | Outlook | | | Ratings | | | | | | Outlook | | | | | |
| | Long Term | | | Short Term | | | | | | Long Term | | | Short Term | | | | | | | | |
| | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down | | | |
| Argentina | 5 | | | 3 | | | 2 | | 1 | | | 4 | 1 | | 3 | | | 2 | | 2 | 23 |
| Australia | 3 | | | 3 | | | 2 | | | | | 3 | 1 | | 2 | | | 2 | 2 | | 18 |
| Austria | 1 | | | 1 | | | | | | | | 1 | | | 1 | | | 1 | | | 5 |
| Belgium | | | 1 | 1 | | | 1 | | | | | 1 | | | 1 | | | 1 | | | 6 |
| Brazil | 3 | 1 | 1 | 5 | | | 3 | 2 | 1 | | | 4 | 1 | 1 | 5 | | | 2 | 2 | 2 | 33 |
| Canada | 3 | | | 3 | | | 2 | | | | | 3 | | 1 | 3 | | | 2 | 1 | | 18 |
| Chile | 2 | | | 2 | | | 2 | | | | | 2 | 1 | | 2 | | | 2 | | | 13 |
| China | | | | | | | | | | | | 3 | | | 2 | | 1 | 1 | 1 | 1 | 9 |
| Columbia | 3 | | 3 | | | 1 | 4 | 1 | 1 | | | 5 | 1 | | 1 | | 1 | 3 | 1 | 2 | 27 |
| Denmark | 2 | | | 1 | | | 2 | | | | | 2 | | | 2 | | | 1 | 1 | | 11 |
| Finland | 1 | 1 | 1 | 3 | | | 1 | 1 | 1 | | | 1 | 1 | | 2 | | | 1 | 1 | 1 | 15 |
| Greece | 1 | | | 1 | | | 1 | | | | | | 1 | | | 1 | | 1 | | | 6 |
| Hong Kong | 5 | 1 | | 5 | | 1 | 4 | 1 | | | | 5 | | 2 | 5 | | 1 | 5 | 1 | | 36 |
| India | 4 | | 1 | 1 | | | 2 | 1 | 2 | | | 6 | | 1 | 4 | | | 2 | 1 | 4 | 29 |
| Indonesia | 2 | | 5 | 6 | | | 6 | | | | | 3 | | 7 | | | 7 | | | | 30 |
| Ireland | 2 | 1 | | 1 | | | 1 | | | | | 2 | 2 | | 2 | 1 | | 2 | | | 14 |
| Italy | 2 | | 1 | 2 | | | 3 | | | | | 2 | 1 | | 2 | | | 2 | 1 | | 16 |
| Japan | 4 | | | 3 | | | 2 | | | | | 5 | | 2 | 4 | | | 3 | | | 23 |
| Korea | 2 | 3 | 4 | 4 | 2 | 3 | 7 | 2 | | | | 4 | 4 | 3 | 5 | 2 | 4 | 8 | 2 | 1 | 60 |
| Luxembourg | | | | | | | | | | | | 1 | | | 1 | | | 1 | | | 3 |
| Malaysia | 5 | 1 | 3 | 6 | 2 | 3 | 3 | 1 | 3 | | | 5 | 2 | 6 | 5 | 2 | 3 | 4 | 3 | 3 | 57 |
| Mexican | 3 | | 1 | 3 | 1 | | 1 | 2 | | | | 3 | | 1 | 1 | | 1 | 1 | 2 | | 20 |
| New Zealand | 4 | | | 3 | | | 4 | | | | | 5 | 1 | | 4 | | | 4 | | 1 | 26 |
| Philippines | 3 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 2 | | | 4 | 1 | | 3 | | | 3 | 1 | 2 | 28 |
| Poland | | 1 | | 1 | | | 1 | | | | | | 1 | | 1 | | | 1 | | | 6 |
| Portugal | 2 | 1 | 1 | 3 | | | 2 | 1 | 1 | | | 2 | | | 1 | | | 1 | 1 | | 16 |
| South Africa | 4 | | | 2 | | | 3 | | 1 | | | 4 | | | 2 | | | 3 | | 2 | 21 |
| South Korea | 2 | 2 | | | 1 | | 1 | | | | | 1 | 3 | 4 | | 1 | | 2 | | | 17 |
| Spain | 1 | | 1 | 2 | | | | 1 | 1 | | | 2 | 1 | | 3 | | | | 1 | 2 | 15 |
| Sweden | 2 | | | 2 | | | 2 | | | | | 2 | | | 2 | | | 1 | 1 | | 12 |
| Taiwan | 2 | | | 2 | | | 2 | | | | | 3 | | | 3 | | | 3 | | | 15 |
| Thailand | 5 | 1 | 1 | 1 | | 2 | 4 | 1 | 1 | | | 4 | | 5 | 4 | | 3 | 4 | 2 | 1 | 39 |
| Turkey | | | | | | | | | | | | 5 | | 1 | 6 | | | 2 | 3 | 2 | 19 |
| UK | | | | | | | | | | | | 1 | | | | | | | | | 1 |
| Total | 78 | 14 | 25 | 73 | 4 | 11 | 63 | 15 | 15 | 98 | 23 | 34 | 82 | 7 | 14 | 77 | 28 | 26 | 687 | | |

Panel B

| Year | Local Currency Rating | | | | | | | | | Foreign Currency Rating | | | | | | | | |
|--------------|-----------------------|-----------|-----------|------------|----------|-----------|-----------|-----------|-----------|-------------------------|-----------|-----------|------------|----------|-----------|-----------|-----------|-----------|
| | Ratings | | | | | | Outlook | | | Ratings | | | | | | Outlook | | |
| | Long Term | | | Short Term | | | | | | Long Term | | | Short Term | | | | | |
| | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down | Affirm | Up | Down |
| 1990 | | | | | | | | | | 1 | | | | | | | | |
| 1992 | | | | | | | | | | 2 | | | 1 | | | | 1 | |
| 1993 | | | | | | | | | | 1 | | | | | | | 1 | |
| 1994 | | | | | | | | | | | | 1 | | | | | | |
| 1995 | | | 1 | | | 1 | | | | 1 | 1 | 1 | | | 1 | | 1 | |
| 1996 | 18 | | | 11 | | | 13 | | 1 | 16 | 2 | 1 | 9 | | | 13 | 3 | 2 |
| 1997 | 16 | 3 | 5 | 13 | 1 | 4 | 12 | 1 | 6 | 17 | 4 | 10 | 15 | 2 | 5 | 12 | 4 | 9 |
| 1998 | 14 | 5 | 16 | 21 | 1 | 5 | 18 | 6 | 5 | 25 | 3 | 15 | 23 | 2 | 3 | 22 | 7 | 9 |
| 1999 | 30 | 6 | 3 | 28 | 2 | 1 | 20 | 8 | 3 | 34 | 13 | 6 | 34 | 3 | 5 | 28 | 13 | 6 |
| 2000 | | | | | | | | | | 1 | | | | | | | | |
| Total | 78 | 14 | 25 | 73 | 4 | 11 | 63 | 15 | 15 | 98 | 23 | 34 | 82 | 7 | 14 | 77 | 28 | 26 |

Panel C

| Announcing Year | Total Affirm | % of Affirm | Total Up | % of Up | Total Down | % of Down | Total Announcements | % of Total Announcements |
|-----------------|--------------|---------------|-----------|---------|------------|-----------|---------------------|--------------------------|
| 1990 | 1 | 0.21% | 0 | 0.00% | 0 | 0.00% | 1 | 0.15% |
| 1992 | 4 | 0.85% | 0 | 0.00% | 0 | 0.00% | 4 | 0.58% |
| 1993 | 2 | 0.42% | 0 | 0.00% | 0 | 0.00% | 2 | 0.29% |
| 1994 | 0 | 0.00% | 0 | 0.00% | 1 | 0.82% | 1 | 0.15% |
| 1995 | 1 | 0.21% | 2 | 2.13% | 4 | 3.28% | 7 | 1.02% |
| 1996 | 80 | 16.99% | 5 | 5.32% | 4 | 3.28% | 89 | 12.95% |
| 1997 | 85 | 18.05% | 17 | 18.09% | 37 | 30.33% | 139 | 20.23% |
| 1998 | 123 | 26.11% | 25 | 26.60% | 52 | 42.62% | 200 | 29.11% |
| 1999 | 174 | 36.94% | 45 | 47.87% | 24 | 19.67% | 243 | 35.37% |
| 2000 | 1 | 0.21% | 0 | 0.00% | 0 | 0.00% | 1 | 0.15% |
| Total | 471 | 100.00 | 94 | | 122 | | 687 | |

Table 2

The Effect of Changes in Sovereign Credit Rating on Equity Returns and Government Bond Returns

CAAR is the cumulative average abnormal return; the abnormal return based on the market model for firm j on event day t is: $AR_{j,t} = R_{j,t} - \hat{\alpha}_j - \hat{\beta}_j R_{M,t}$ and $CAAR_{T_1, T_2} = \frac{1}{N} \sum_{t=T_1}^{T_2} \sum_{j=1}^N AR_{j,t}$. For stocks, $R_{j,t}$ is the rate of return on country j 's stock indexes for period t and $R_{m,t}$ is the rate of return on the value-weighted world stock indexes for period t . For bonds, $R_{j,t}$ is the rate of return on country j 's bond index for period $t-1$ to t and $R_{m,t}$ is the return of U.S. Treasury bond of comparable maturity; Z Stat. is the Z statistic of the CAAR; Pos: Neg is the number of positive and negative abnormal returns; GSZ is the generalized sign Z statistic of the ratio of positive relative to negative abnormal returns. CAAR is generated using the market model. Panel A (D) shows the equity (bond) CAAR around the announcement on date T of a downgrade in rating assignment. Panel B (E) shows the equity (bond) CAAR around the announcement on date T of an upgrade in rating assignment. Panel C (F) shows the equity (bond) CAAR around the announcement on date T of an affirmation in rating assignment. *, **, and *** indicate significance levels at 10%, 5%, and 1% respectively.

| Variable | T-1-T+1 | T-2-T+2 | T-5-T+5 | T-45-T-2 | T+2-T+45 |
|--|----------|----------|----------|----------|----------|
| Panel A: Equity-Rating Downgrade | | | | | |
| CAAR | -5.29 | -6.04 | -5.98 | -1.40 | 3.12 |
| Z Stat | -7.41*** | -6.42*** | -5.56*** | -0.24 | 0.53 |
| Pos: Neg | 3:43 | 11:35 | 8:38 | 23:23 | 27:19 |
| GSZ | -5.82*** | -3.46*** | -4.34*** | 0.08 | 1.26 |
| Panel B: Equity-Rating Upgrade | | | | | |
| CAAR | 0.44 | 0.73 | -0.18 | -0.79 | -1.36 |
| Z Stat | 0.80 | 0.85 | -0.12 | -0.45 | -0.66 |
| Pos: Neg | 15:13 | 16:12 | 14:14 | 14:14 | 14:14 |
| GSZ | 0.55 | 0.93 | 0.17 | 0.17 | 0.17 |
| Panel C: Equity-Rating Affirm | | | | | |
| CAAR | 0.39 | 0.64 | 1.19 | 2.17 | 1.74 |
| Z Stat | 1.60 | 1.43 | 1.81* | 1.06 | 1.56 |
| Pos: Neg | 34:25 | 32:27 | 33:26 | 31:28 | 37:22 |
| GSZ | 1.38 | 0.60 | 1.12 | 0.60 | 2.16** |
| Panel D: Government Bonds -Rating Downgrade | | | | | |
| CAAR | -2.43 | -2.13 | -3.79 | -6.90 | -0.16 |
| Z Stat. | -3.22*** | -2.09** | -2.21** | -2.47** | -0.33 |
| Pos: Neg | 7:20 | 9:18 | 11:16 | 9:18 | 17:10 |
| GSZ | -2.46** | -1.69* | -0.92 | -1.69* | 1.39 |
| Panel E: Government Bonds - Rating Upgrade | | | | | |
| CAAR | 0.21 | 0.20 | 0.18 | 0.93 | -0.48 |
| Z Stat | 1.33 | 0.70 | 0.14 | 0.95 | -1.62 |
| Pos: Neg | 15:11 | 16:10 | 14:12 | 15:11 | 13:13 |
| GSZ | 0.79 | 1.18 | 0.40 | 0.79 | 0.01 |
| Panel F: Government Bonds - Rating Affirm | | | | | |
| CAAR | 0.39 | 0.62 | 1.01 | -1.65 | 0.86 |
| Z Stat | 0.85 | 1.48 | 1.84* | -0.29 | 0.74 |
| Pos: Neg | 20:14 | 20:14 | 20:14 | 20:14 | 18:16 |
| GSZ | 1.04 | 1.04 | 1.04 | 1.04 | 0.34 |

Table 3

The Effect of Changes in Economics Outlooks on the Equity and Government Bond Returns

CAAR is the cumulative average abnormal return; the abnormal return based on the market model for firm j on event day t is: $AR_{j,t} = R_{j,t} - \hat{a}_j - \hat{b}_j R_{M,t}$ and $CAAR_{T_1, T_2} = \frac{1}{N} \sum_{t=T_1}^{T_2} \sum_{j=1}^N AR_{j,t}$. For stocks, $R_{j,t}$ is the rate of return on country j 's stock indexes for period t and $R_{m,t}$ is the rate of return on the value-weighted world stock indexes for period t . For bonds, $R_{j,t}$ is the rate of return on country j 's bond index for period $t-1$ to t and $R_{m,t}$ is the return of U.S. Treasury bond of comparable maturity; Z Stat. is the Z statistic of the CAAR; Pos: Neg is the number of positive and negative abnormal returns; GSZ is the generalized sign Z statistic of the ratio of positive relative to negative abnormal returns. CAAR is generated using the market model. Panel A (D) shows the equity (bond) CAAR around the announcement on date T of a downgrade in economic outlook. Panel B (E) shows the equity (bond) CAAR around the announcement on date T of an upgrade in economic outlook. Panel C (F) shows the equity (bond) CAAR around the announcement on date T of an affirmation in economic outlook. *, **, and *** indicate significance levels at 10%, 5%, and 1% respectively.

| Variable | T-1-T+1 | T-2-T+2 | T-5-T+5 | T-45-T-2 | T+2-T+45 |
|--|---------|----------|---------|----------|----------|
| Panel A: Equity- Outlook Downgrade | | | | | |
| CAAR | -1.23 | -0.89 | -0.81 | -0.47 | -0.17 |
| Z Stat | -2.81** | -0.68 | -0.63 | -0.58 | -0.69 |
| Pos: Neg | 6:13 | 7:12 | 10:9 | 7:12 | 9:10 |
| GSZ | -1.55 | -1.09 | 0.29 | -1.09 | -0.17 |
| Panel B: Equity- Outlook Upgrade | | | | | |
| CAAR | 1.63 | 0.92 | 2.83 | 3.10 | -0.45 |
| Z Stat | 1.23 | 0.49 | 1.04 | 0.88 | -0.17 |
| Pos: Neg | 15:7 | 12:10 | 13:9 | 16:6 | 10:12 |
| GSZ | 1.97* | 0.69 | 1.12 | 2.40** | -0.16 |
| Panel C: Equity- Outlook Affirm | | | | | |
| CAAR | 0.30 | 0.38 | 0.31 | -0.42 | 1.67 |
| Z Stat | 1.38 | 1.43 | 0.77 | -0.33 | 0.27 |
| Pos: Neg | 36:27 | 33:30 | 31:32 | 30:33 | 34:29 |
| GSZ | 1.47 | 0.71 | -0.21 | -0.04 | 0.97 |
| Panel D: Government Bonds - Outlook Downgrade | | | | | |
| CAAR | -2.28 | -4.27 | -6.88 | -6.15 | -1.93 |
| Z Stat | -1.81* | -2.53** | -1.93* | -1.96* | -0.12 |
| Pos: Neg | 7:12 | 3:16 | 5:14 | 7:12 | 12:7 |
| GSZ | -1.26 | -3.10*** | -2.18** | -1.26 | 1.03 |
| Panel E: Government Bonds - Outlook Upgrade | | | | | |
| CAAR | 0.63 | 0.89 | 0.37 | 2.48 | 1.00 |
| Z Stat | 2.70** | 1.79* | 0.86 | 2.37** | 0.77 |
| Pos:Neg | 9:2 | 10:1 | 8:3 | 8:3 | 6:5 |
| GSZ | 1.83* | 2.44** | 1.23 | 1.23 | 0.02 |
| Panel F: Government Bonds - Outlook Affirm | | | | | |
| CAAR | 0.04 | -0.10 | -0.35 | -3.03 | -1.69 |
| Z Stat | 0.04 | -0.07 | -0.22 | -1.11 | -0.95 |
| Pos: Neg | 28:21 | 26:23 | 27:22 | 24:25 | 20:29 |
| GSZ | 1.63 | 1.06 | 1.34 | -0.48 | -0.66 |

Table 4

Summary Statistics of the Independent Variables of Regressions on Equity and Bond Cumulative Abnormal Returns for the Effect of Changes in Sovereign Credit Ratings or Economic Outlooks

The description of each explanatory variable is in Appendix 1.

| Explanatory Variables | Equity | | | | Bond | | | |
|----------------------------|------------------------|----------|---------|--------------------|------------------------|----------|----------|--------------------|
| | Number of Observations | Mean | Median | Standard Deviation | Number of Observations | Mean | Median | Standard Deviation |
| Rating Affirmed | | | | | | | | |
| GDP (Billion) | 58 | 568.35 | 168.63 | 1107.69 | 31 | 501.79 | 157.65 | 1060.65 |
| GDP per Capita | 58 | 13496.95 | 11195.1 | 11524.18 | 31 | 11809.65 | 10875.76 | 12442.25 |
| Inflation % | 58 | 6.91 | 3.57 | 19.84 | 31 | 5.80 | 2.796 | 23.82 |
| External Balance (Billion) | 58 | -2.54 | -0.01 | 11.83 | 31 | -2.61 | -0.012 | 10.82 |
| Current Account (Billion) | 58 | 56.32 | -1.94 | 381.33 | 31 | 44.42 | -1.60 | 361.08 |
| Net Foreign Debt (Billion) | 46 | 2.59 | 0.32 | 5.63 | 26 | 2.98 | 0.32 | 4.76 |
| Fiscal Balance (Billion) | 52 | -3.99 | -1.35 | 13.14 | 31 | -4.57 | -1.14 | 12.05 |
| Rating Downgrade | | | | | | | | |
| GDP (Billion) | 57 | 444.3 | 215.75 | 768.05 | 17 | 409.05 | 195.086 | 730.504 |
| GDP per Capita | 57 | 6495.51 | 3598.50 | 7993.30 | 17 | 5352.46 | 3397.87 | 7735.46 |
| Inflation % | 57 | -2.91 | 5.8 | 42.88 | 17 | -2.24 | 5.638 | 49.51 |
| External Balance (Billion) | 57 | -3.48 | -0.04 | 12.79 | 17 | -3.80 | -0.04 | 11.82 |
| Current Account (Billion) | 57 | 95.46 | -4.89 | 539.92 | 17 | 115.23 | -4.39 | 535.66 |
| Net Foreign Debt (Billion) | 57 | -0.1 | -0.13 | 1.04 | 16 | -0.12 | -0.11 | 0.88 |
| Fiscal Balance (Billion) | 54 | -3.63 | -0.97 | 8.04 | 17 | -3.50 | -0.96 | 9.72 |
| Rating Upgrade | | | | | | | | |
| GDP (Billion) | 51 | 261.32 | 168.38 | 241.45 | 23 | 314.20 | 150.49 | 203.43 |
| GDP per Capita | 51 | 9863.05 | 6829.18 | 8513.07 | 23 | 9043.81 | 7641.08 | 7730.10 |
| Inflation % | 51 | 24.65 | 5.26 | 69.09 | 23 | 24.24 | 6.463 | 65.95 |
| External Balance (Billion) | 51 | -2.94 | 0.01 | 12.14 | 23 | -3.44 | 0.012 | 14.22 |
| Current Account (Billion) | 51 | 4.46 | 1.87 | 18.21 | 23 | 5.22 | 1.73 | 19.22 |
| Net Foreign Debt (Billion) | 44 | 2.06 | 0.46 | 4.23 | 17 | 1.99 | 0.56 | 4.09 |
| Fiscal Balance (Billion) | 48 | -4.48 | -2.58 | 5.85 | 23 | -4.69 | -2.46 | 5.89 |

Table 5
Correlation Coefficients

Above (below) diagonal are correlation coefficients of regressions on stock (bond) cumulative abnormal returns for the announcement effects of changes in sovereign credit ratings or economic outlooks. The description of each explanatory variable is in Appendix 1.

| Variables | GDP per Capita | GDP | Inflation | Current Account | Net Foreign Debt | Fiscal Balance | External Balance | Economic development Dummy | Foreign currency dummy | Rating change across class dummy | Upgrade dummy | Downgrade dummy | Investment grade dummy |
|------------------------|----------------|-------|-----------|-----------------|------------------|----------------|------------------|----------------------------|------------------------|----------------------------------|---------------|-----------------|------------------------|
| GDP per Capita | | 0.47 | -0.13 | 0.34 | 0.15 | 0.09 | 0.15 | 0.78 | -0.08 | -0.18 | -0.01 | -0.26 | 0.46 |
| GDP | 0.42 | | -0.09 | 0.66 | 0.00 | -0.05 | 0.14 | 0.38 | 0.06 | -0.07 | -0.14 | 0.01 | 0.11 |
| Inflation | -0.10 | -0.1 | | -0.01 | 0.13 | -0.12 | -0.02 | -0.09 | -0.05 | -0.08 | 0.22 | -0.18 | -0.13 |
| Current Account | 0.36 | 0.66 | -0.01 | | -0.05 | 0.05 | 0.05 | 0.25 | 0.01 | -0.05 | -0.09 | 0.08 | 0.11 |
| Net Foreign Debt | 0.17 | 0.00 | 0.10 | -0.06 | | -0.31 | -0.00 | 0.19 | -0.07 | 0.02 | 0.09 | -0.28 | 0.04 |
| Fiscal Balance | 0.09 | -0.04 | -0.12 | 0.04 | -0.37 | | -0.03 | -0.05 | 0.07 | 0.05 | -0.03 | 0.03 | 0.08 |
| External Balance | 0.17 | 0.17 | -0.03 | 0.05 | -0.00 | -0.03 | | 0.15 | 0.11 | 0.09 | 0.00 | -0.03 | -0.12 |
| Development Dummy | 0.77 | 0.38 | -0.10 | 0.30 | 0.18 | -0.06 | 0.11 | | -0.03 | -0.20 | 0.00 | -0.22 | 0.41 |
| Foreign currency dummy | -0.09 | 0.07 | -0.04 | 0.02 | -0.09 | 0.05 | 0.14 | -0.03 | | 0.06 | -0.08 | 0.01 | 0.05 |
| Cross class dummy | -0.18 | -0.07 | -0.07 | -0.05 | 0.02 | 0.05 | 0.11 | -0.21 | 0.07 | | 0.23 | 0.05 | 0.04 |
| Upgrade dummy | -0.01 | -0.1 | 0.23 | -0.08 | 0.11 | -0.03 | 0.00 | 0.00 | -0.08 | 0.21 | | -0.48 | 0.08 |
| Downgrade dummy | -0.21 | 0.01 | -0.15 | 0.10 | -0.27 | 0.03 | -0.03 | -0.20 | 0.02 | 0.06 | -0.37 | | -0.14 |
| Investment grade dummy | 0.38 | 0.12 | -0.16 | 0.08 | 0.04 | 0.07 | -0.11 | 0.41 | 0.05 | 0.04 | 0.08 | -0.11 | |

Table 6

**Cross-Sectional Analysis of Changes in Sovereign Credit Ratings or Economic Outlooks
on Equity and Bond Index Returns of Rated Countries**

The dependent variable in Panel A (B) is the cumulative abnormal return of equity (bond) over the period one day before to one day after the announcement of sovereign credit rating and economic outlook changes. The description of each explanatory variable is in Appendix 1. Standard errors are heteroskedasticity-adjusted (see White, 1980). *, **, and *** indicate significance levels at 10%, 5%, and 1% respectively.

| Variable | Panel A | | Panel B | |
|----------------------------|--------------------|---------|--------------------|---------|
| | Stocks | | Bond | |
| | Parameter estimate | P-value | Parameter estimate | P-value |
| Intercept | 0.818 | 0.282 | 0.132 | 0.808 |
| Economic development | -0.557 | 0.284 | 0.658 | 0.229 |
| Inflation | 0.001 | 0.980 | 0.023 | 0.362 |
| Current account | 0.003 | 0.017** | 0.001 | 0.063* |
| Fiscal balance | 0.001 | 0.349 | 0.003 | 0.829 |
| Currency | 0.527 | 0.515 | 0.730 | 0.130 |
| Common law | -0.162 | 0.800 | -0.345 | 0.492 |
| Crisis | 0.241 | 0.700 | -0.574 | 0.202 |
| Liquidity | -0.008 | 0.147 | -0.008 | 0.333 |
| Change in outlook | 0.686 | 0.462 | 0.524 | 0.404 |
| Upgrade | -0.104 | 0.924 | 1.703 | 0.088* |
| Downgrade | -2.670 | 0.017** | -0.013 | 0.990 |
| Rating change across class | -2.459 | 0.017** | 1.213 | 0.091* |
| Size of rating change | 0.700 | 0.131 | 1.307 | 0.099* |
| Adjusted R-squared | 30.18% | | 15.29% | |
| Number of observations | 155 | | 69 | |

Table 7
Cross-Sectional Analysis of the Impact of Up(Down) Grade in Rating and Economic Outlook under Selected Country Characteristics on Equity and Bond Index Returns of Rated Countries

This table reports the results of cross-sectional analysis with dependent variables of the cumulative abnormal returns (CAARs) of stocks in Panel A and bonds in Panel B over the period one day before until one day after the announcement [-1, +1]. The independent variables include the interaction terms between rating changes and country characteristics. P (value) is for the hypothesis testing of each coefficient and P (Difference) is based on Wald Test for the hypothesis testing of equality of two coefficients reported above the corresponding P(Difference). Both P(value) and P(Difference) are shown in italics. Control variables are economic development, inflation, current account, fiscal balance, currency, common law, crisis, liquidity, and change in outlook described in Eq. (6). The description of each explanatory variable is in Appendix 1. Standard errors are heteroskedasticity-adjusted (White, 1980). *, **, and *** indicate significance level at 10%, 5%, and 1% respectively.

Panel A: Stocks

| Dependent variables: CAARs of stocks during [-1,+1] | | | | | | | | | |
|---|---------------------|------------------|------------------------|-----------------------|--------------------|--------------|--------------|------------------|------------------------|
| Column | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| H characteristics used in the interaction terms | H=developed country | H=high inflation | H=high current account | H=high fiscal balance | H=foreign currency | H=common law | H=crisis | H=high liquidity | H=change in outlook |
| L characteristics used in the interaction terms | L=emerging country | L=low inflation | L=low current account | L=low fiscal balance | L=local currency | L=civil law | L=non crisis | L=low liquidity | L=change in assignment |
| Upgrade*H | 1.540 | 1.615 | 0.964 | 0.571 | 2.473 | 0.666 | 1.454 | 0.418 | 0.684 |
| <i>P(value)</i> | <i>0.126</i> | <i>0.330</i> | <i>0.465</i> | <i>0.671</i> | <i>0.380</i> | <i>0.595</i> | <i>0.493</i> | <i>0.816</i> | <i>0.501</i> |
| Upgrade*L | 1.090 | 0.390 | 0.095 | 1.021 | 0.237 | 0.312 | 0.039 | 0.017 | 0.272 |
| <i>P(value)</i> | <i>0.383</i> | <i>0.707</i> | <i>0.927</i> | <i>0.366</i> | <i>0.789</i> | <i>0.796</i> | <i>0.968</i> | <i>0.986</i> | <i>0.772</i> |
| <i>P(Difference)</i> | <i>0.018**</i> | <i>0.227</i> | <i>0.451</i> | <i>0.762</i> | <i>0.352</i> | <i>0.797</i> | <i>0.503</i> | <i>0.800</i> | <i>0.749</i> |
| Downgrade*H | -1.521 | -3.273** | -2.332* | -1.575 | -1.195 | -2.663* | -2.477* | -2.88* | -1.680** |
| <i>P(value)</i> | <i>0.177</i> | <i>0.018</i> | <i>0.067</i> | <i>0.280</i> | <i>0.479</i> | <i>0.076</i> | <i>0.063</i> | <i>0.055</i> | <i>0.034</i> |
| Downgrade * L | -2.690 | -0.651 | -2.501** | -2.608** | -3.360*** | -2.534** | -2.791*** | -2.273** | -3.212*** |
| <i>P(value)</i> | <i>0.019**</i> | <i>0.412</i> | <i>0.050</i> | <i>0.038</i> | <i>0.002</i> | <i>0.049</i> | <i>0.008</i> | <i>0.029</i> | <i>0.013</i> |
| <i>P(Difference)</i> | <i>0.323</i> | <i>0.031**</i> | <i>0.904</i> | <i>0.512</i> | <i>0.222</i> | <i>0.938</i> | <i>0.804</i> | <i>0.683</i> | <i>0.283</i> |
| Upgrade across class H | 1.924 | 2.600 | 2.411 | 0.603 | 2.166 | 1.351 | 1.305 | 1.423 | 0.167 |
| <i>P(value)</i> | <i>0.097</i> | <i>0.133</i> | <i>0.111</i> | <i>0.727</i> | <i>0.452</i> | <i>0.326</i> | <i>0.555</i> | <i>0.439</i> | <i>0.824</i> |
| Upgrade across class *L | 0.687 | 0.694 | 1.361 | 1.115 | 0.253 | 0.289 | 0.517 | 0.230 | 0.261 |
| <i>P(value)</i> | <i>0.602</i> | <i>0.588</i> | <i>0.268</i> | <i>0.331</i> | <i>0.819</i> | <i>0.848</i> | <i>0.676</i> | <i>0.856</i> | <i>0.812</i> |
| <i>P(Difference)</i> | <i>0.476</i> | <i>0.069*</i> | <i>0.029**</i> | <i>0.792</i> | <i>0.519</i> | <i>0.573</i> | <i>0.741</i> | <i>0.545</i> | <i>0.363</i> |
| Downgrade across class *H | -0.829 | -4.046** | -2.339 | -6.540*** | -11.632*** | -6.082** | -5.361*** | -5.230*** | -7.620** |
| <i>P(value)</i> | <i>0.555</i> | <i>0.048</i> | <i>0.399</i> | <i>0.004</i> | <i>0.000</i> | <i>0.031</i> | <i>0.005</i> | <i>0.006</i> | <i>0.043</i> |
| Downgrade across class *L | -5.336*** | -7.344*** | -5.824*** | -3.676** | -3.064** | -4.470** | -4.049* | -4.696* | -4.188** |
| <i>P(value)</i> | <i>0.001</i> | <i>0.000</i> | <i>0.001</i> | <i>0.048</i> | <i>0.023</i> | <i>0.012</i> | <i>0.076</i> | <i>0.078</i> | <i>0.019</i> |
| <i>P(Difference)</i> | <i>0.032**</i> | <i>0.173</i> | <i>0.258</i> | <i>0.285</i> | <i>0.005***</i> | <i>0.607</i> | <i>0.634</i> | <i>0.861</i> | <i>0.404</i> |
| Control variables | Included | Included | Included | Included | Included | Included | Included | Included | Included |
| Observations | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 |
| Adj-R squared | 34.57% | 33.47% | 31.47% | 31.26% | 37.74% | 30.50% | 30.67% | 29.64% | 31.85% |

Panel B: Bonds

| Column | Dependent variables: CAARs of bond during [-1,+1] | | | | | | | | |
|---|---|------------------|------------------------|-----------------------|--------------------|--------------|--------------|------------------|------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| H characteristics used in the interaction terms | H=developed country | H=high inflation | H=high current account | H=high fiscal balance | H=foreign currency | H=common law | H=crisis | H=high liquidity | H=change in outlook |
| L characteristics used in the interaction terms | L=emerging country | L=low inflation | L=low current account | L=low fiscal balance | L=local currency | L=civil law | L=non crisis | L=low liquidity | L=change in assignment |
| Upgrade*H | 0.507 | 0.589 | 1.267 | 0.152 | 0.127 | 0.097 | 0.676 | 1.235 | 0.008 |
| <i>P(value)</i> | 0.417 | 0.570 | 0.171 | 0.839 | 0.858 | 0.871 | 0.519 | 0.153 | 0.984 |
| Upgrade*L | 0.673 | 0.495 | 0.674 | 0.709 | 0.980 | 0.562 | 0.634 | 0.407 | 0.167 |
| <i>P(value)</i> | 0.390 | 0.438 | 0.373 | 0.355 | 0.091 | 0.244 | 0.274 | 0.467 | 0.686 |
| <i>P(Difference)</i> | 0.783 | 0.907 | 0.441 | 0.116 | 0.169 | 0.254 | 0.956 | 0.131 | 0.732 |
| Downgrade*H | 0.029 | -3.272* | -1.436 | -0.314 | -0.321 | -5.257*** | -3.207** | -4.301*** | -1.209 |
| <i>P(value)</i> | 0.980 | 0.057 | 0.407 | 0.748 | 0.715 | 0.009 | 0.041 | 0.013 | 0.102 |
| Downgrade * L | -3.578*** | -1.887 | -3.072** | -2.938** | -3.205*** | -0.989 | -2.013* | -1.712** | -7.123*** |
| <i>P(value)</i> | 0.012 | 0.137 | 0.030 | 0.038 | 0.011 | 0.172 | 0.069 | 0.042 | 0.000 |
| <i>P(Difference)</i> | 0.025** | 0.311 | 0.258 | 0.026** | 0.010*** | 0.040** | 0.340 | 0.128 | 0.000*** |
| Upgrade across class *H | 0.912 | 0.727 | 0.569 | 0.695 | 0.339 | 0.211 | 0.461 | 0.722 | 0.251 |
| <i>P(value)</i> | 0.383 | 0.528 | 0.520 | 0.252 | 0.287 | 0.765 | 0.229 | 0.170 | 0.649 |
| Upgrade across class *L | 0.281 | 0.515 | 0.402 | 0.655 | 0.514 | 0.384 | 0.368 | 0.342 | 0.031 |
| <i>P(value)</i> | 0.756 | 0.600 | 0.659 | 0.268 | 0.428 | 0.362 | 0.470 | 0.525 | 0.961 |
| <i>P(Difference)</i> | 0.648 | 0.539 | 0.898 | 0.075* | 0.461 | 0.792 | 0.178 | 0.150 | 0.790 |
| Downgrade across class *H | -0.599 | -2.374 | -0.144 | -0.414 | -1.953 | -7.505*** | -2.338 | -4.483*** | -1.161 |
| <i>P(value)</i> | 0.626 | 0.234 | 0.926 | 0.754 | 0.100 | 0.001 | 0.196 | 0.014 | 0.244 |
| Downgrade across class *L | -2.325 | -2.715** | -2.719 | -4.027*** | -2.694** | -0.654 | -2.845** | -1.021 | -7.313*** |
| <i>P(value)</i> | 0.194 | 0.042 | 0.106 | 0.002 | 0.038 | 0.451 | 0.018 | 0.312 | 0.000 |
| <i>P(Difference)</i> | 0.400 | 0.856 | 0.183 | 0.019** | 0.566 | 0.003*** | 0.773 | 0.083* | 0.001*** |
| Control variables | Included | Included | Included | Included | Included | Included | Included | Included | Included |
| Observations | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| Adj-R squared | 23.87% | 15.35% | 6.96% | 17.51% | 22.25% | 33.91% | 12.94% | 26.42% | 27.89% |

Table 8
Cross-Sectional Analysis of the Impact of Changes in Sovereign Credit Ratings or Economic Outlooks under Country Characteristics on Equity and Bond Returns of Rated Countries

This table reports the results of cross-sectional analysis with dependent variables of the cumulative abnormal returns (CAARs) of stocks in Panels A (OLS regressions) and B (2SLS regressions) and bonds in Panels C (OLS regressions) and D (2SLS regressions) over the period one day before until one day after the announcement [-1, +1]. The independent variables include the interaction terms between rating changes and country characteristics. P (value) is for the hypothesis testing of each coefficient and P (Difference) is based on Wald Test for the hypothesis testing of equality of two coefficients reported above the corresponding P(Difference). Both P(value) and P(Difference) are shown in italics. Control variables are economic development, inflation, current account, fiscal balance, currency, common law, crisis, liquidity, and change in outlook described in Eq. (6). OLS regression includes size of rating change as an exogenous variable whereas 2SLS includes size of rating change as an endogenous variable determined by Eq. (9) for stocks and (10) for bonds. Control variables are economic development, inflation, current account, fiscal balance, currency, common law, crisis, liquidity, and change in outlook described in Eq. (6). The description of each explanatory variable is in Appendix 1. Standard errors are heteroskedasticity-adjusted (see White, 1980). *, **, and *** indicate significance level at 10%, 5%, and 1% respectively.

Panel A: OLS regression of equity returns

| OLS Regression of dependent variables: CAARs of stocks during [-1,+1] | | | | | | | | | |
|---|---------------------|------------------|------------------------|-----------------------|--------------------|--------------|---------------|------------------|------------------------|
| Column | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| H characteristics used in the interaction terms | H=developed country | H=high inflation | H=high current account | H=high fiscal balance | H-foreign currency | H=common law | H=crisis | H=high liquidity | H=change in outlook |
| L characteristics used in the interaction terms | L=emerging country | L=low inflation | L=low current account | L=low fiscal balance | L-local currency | L=civil law | L=non crisis | L=low liquidity | L=change in assignment |
| Size of rating change*H | -0.391 | 0.994* | 0.752 | 1.107* | 0.778 | 1.729*** | 0.433 | 0.508 | 1.012 |
| <i>P(value)</i> | <i>0.481</i> | <i>0.072</i> | <i>0.169</i> | <i>0.083</i> | <i>0.219</i> | <i>0.012</i> | <i>0.421</i> | <i>0.348</i> | <i>0.121</i> |
| Size of rating change *L | 0.828* | 0.172 | 0.942*** | 0.914* | 0.583 | 0.697 | 1.365*** | 1.149** | 1.306** |
| <i>P(value)</i> | <i>0.073</i> | <i>0.687</i> | <i>0.005</i> | <i>0.058</i> | <i>0.180</i> | <i>0.140</i> | <i>0.000</i> | <i>0.015</i> | <i>0.026</i> |
| <i>P(Difference)</i> | <i>0.084*</i> | <i>0.235</i> | <i>0.760</i> | <i>0.801</i> | <i>0.807</i> | <i>0.241</i> | <i>0.140</i> | <i>0.392</i> | <i>0.728</i> |
| Upgrade across class*H | 2.503 | 1.332 | -1.903* | 1.388 | 0.265 | 2.431 | 1.668 | 1.041 | 1.741 |
| <i>P(value)</i> | <i>0.187</i> | <i>0.141</i> | <i>0.088</i> | <i>0.394</i> | <i>0.832</i> | <i>1.042</i> | <i>0.285</i> | <i>0.303</i> | <i>0.298</i> |
| Upgrade across class*L | 0.292 | 0.350 | 0.371 | 0.978 | 0.867 | 0.429 | 0.382 | 1.650 | 1.340 |
| <i>P(value)</i> | <i>0.763</i> | <i>0.795</i> | <i>0.701</i> | <i>0.288</i> | <i>0.403</i> | <i>0.740</i> | <i>0.769</i> | <i>0.175</i> | <i>0.234</i> |
| <i>P(Difference)</i> | <i>0.202</i> | <i>0.229</i> | <i>0.084*</i> | <i>0.812</i> | <i>0.681</i> | <i>0.234</i> | <i>0.154</i> | <i>0.679</i> | <i>0.711</i> |
| Downgrade across class *H | -3.112*** | -3.909* | -2.364 | -6.400*** | -9.616*** | -6.089*** | -2.333* | -5.810*** | -0.213 |
| <i>P(value)</i> | <i>0.012</i> | <i>0.056</i> | <i>0.403</i> | <i>0.002</i> | <i>0.007</i> | <i>0.009</i> | <i>0.087</i> | <i>0.001</i> | <i>0.975</i> |
| Downgrade across class *L | -5.294*** | -7.238*** | -5.578*** | -3.074* | -4.339*** | -4.399*** | -6.075*** | -4.816** | -4.608*** |
| <i>P(value)</i> | <i>0.001</i> | <i>0.000</i> | <i>0.000</i> | <i>0.064</i> | <i>0.001</i> | <i>0.009</i> | <i>0.001</i> | <i>0.049</i> | <i>0.003</i> |
| <i>P(Difference)</i> | <i>0.261</i> | <i>0.180</i> | <i>0.293</i> | <i>0.178</i> | <i>0.148</i> | <i>0.537</i> | <i>0.086*</i> | <i>0.734</i> | <i>0.521</i> |
| Control variables | Included | Included | Included | Included | Included | Included | Included | Included | Included |
| Observations | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 |
| Adj-R squared | 31.55% | 29.94% | 30.31% | 30.44% | 32.56% | 31.25% | 30.42% | 28.02% | 30.73% |

Panel B: 2SLS regression of equity returns

| 2SLS Regression of dependent variables: CAARs of stocks during [-1,+1] | | | | | | | | | |
|--|---------------------|------------------|------------------------|-----------------------|--------------------|--------------|--------------|------------------|------------------------|
| Column | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| H characteristics used in the interaction terms | H=developed country | H=high inflation | H=high current account | H=high fiscal balance | H=foreign currency | H=common law | H=crisis | H=high liquidity | H=change in outlook |
| L characteristics used in the interaction terms | L=emerging country | L=low inflation | L=low current account | L=low fiscal balance | L=local currency | L=civil law | L=non crisis | L=low liquidity | L=change in assignment |
| Size of rating change*H | 0.831 | 1.617 | 1.021 | 1.580 | -0.029 | 1.826* | 0.309 | 0.428 | 0.407 |
| <i>P</i> (value) | 0.440 | 0.115 | 0.339 | 0.154 | 0.985 | 0.056 | 0.760 | 0.693 | 0.727 |
| Size of rating change *L | 0.753 | 0.368 | 2.201 | 0.699 | 1.162 | 0.441 | 2.055** | -.182 | 1.788 |
| <i>P</i> (value) | 0.571 | 0.686 | 0.153 | 0.643 | 0.296 | 0.722 | 0.027 | 0.234 | 0.130 |
| <i>P</i> (Difference) | 0.948 | 0.281 | 0.368 | 0.481 | 0.407 | 0.273 | 0.201 | 0.183 | 0.066* |
| Upgrade across class *H | 1.206 | -0.487 | 0.794 | 0.562 | 0.739 | 0.264 | 0.309 | 0.548 | 0.964 |
| <i>P</i> (value) | 0.145 | 0.515 | 0.312 | 0.611 | 0.390 | 0.768 | 0.760 | 0.527 | 0.831 |
| Upgrade across class *L | 0.894 | 0.661 | 1.813** | -0.018 | 0.011 | 0.682 | 2.055** | 0.231 | 0.800 |
| <i>P</i> (value) | 0.211 | 0.517 | 0.060 | 0.981 | 0.991 | 0.568 | 0.027 | 0.808 | 0.298 |
| <i>P</i> (Difference) | 0.002*** | 0.264 | 0.012*** | 0.613 | 0.513 | 0.530 | 0.236 | 0.500 | 0.156 |
| Downgrade across class *H | -2.460*** | -6.346*** | -4.199* | -7.685*** | -12.440*** | -8.487*** | -6.992*** | -6.910*** | -9.516*** |
| <i>P</i> (value) | 0.001 | 0.001 | 0.090 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.009 |
| Downgrade across class *L | -7.412*** | -7.757*** | -7.457*** | -6.142*** | -5.383*** | -6.291*** | -6.187*** | -7.325*** | -6.188*** |
| <i>P</i> (value) | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.008 | 0.010 | 0.000 |
| <i>P</i> (Difference) | 0.003*** | 0.539 | 0.250 | 0.535 | 0.006*** | 0.465 | 0.765 | 0.891 | 0.005*** |
| Control variables | Included | Included | Included | Included | Included | Included | Included | Included | Included |
| Observations | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 | 155 |
| Adj-R squared | 27.87% | 26.40% | 27.08% | 25.96% | 30.61% | 26.98% | 26.32% | 25.68% | 28.37% |

Panel C: OLS Regression of bond returns

| Column | OLS Regression of dependent variables: CAARs of bonds during [-1,+1] | | | | | | | | |
|---|--|------------------|---------------------------|--------------------------|-----------------------|--------------|--------------|------------------|---------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| H characteristics used with in the interaction terms | H=developed country | H=high inflation | H=high current account | H=high fiscal balance | H-foreign currency | H=common law | H=crisis | H=high liquidity | H=change in outlook |
| L characteristics used in the interaction terms | L=emerging country | L=low inflation | L=low current account | L=low fiscal balance | L-local currency | L=civil law | L=non crisis | L=low liquidity | L=change in assignment |
| Size of rating change*H | -0.047 | 1.463*** | -0.013 | 0.503 | 0.381 | 2.008*** | 1.620** | 1.039 | 0.544 |
| <i>P(value)</i> | 0.845 | 0.012 | 0.968 | 0.197 | 0.567 | 0.008 | 0.015 | 0.100 | 0.190 |
| Size of rating change *L | 1.616*** | 0.030 | 1.357 | 1.087** | 0.952** | 0.072 | 0.317 | 0.498* | 1.198* |
| <i>P(value)</i> | 0.010 | 0.917 | 0.013 | 0.034 | 0.033 | 0.762 | 0.170 | 0.079 | 0.088 |
| <i>P(Difference)</i> | 0.012*** | 0.035** | 0.026 | 0.328 | 0.415 | 0.018** | 0.052** | 0.446 | 0.445 |
| Upgrade across class *H | 0.835 | 1.707 | 0.500 | 0.842 | 0.231 | 1.774 | 0.448 | 0.824 | 0.042 |
| <i>P(value)</i> | 0.462 | 0.245 | 0.386 | 0.192 | 0.365 | 0.633 | 0.516 | 0.317 | 0.949 |
| Upgrade across class *L | 1.658 | 0.766 | 0.999 | 0.739 | 0.806 | 0.469 | 0.016 | 0.907 | 1.085 |
| <i>P(value)</i> | 0.217 | 0.192 | 0.138 | 0.250 | 0.113 | 0.423 | 0.972 | 0.363 | 0.271 |
| <i>P(Difference)</i> | 0.145 | 0.136 | 0.082 | 0.903 | 0.407 | 0.242 | 0.204 | 0.935 | 0.434 |
| Downgrade across class *H | -0.821 | -1.327 | -2.114* | -2.618*** | -2.485** | -4.267*** | -1.209 | -2.300** | -1.077 |
| <i>P(value)</i> | 0.287 | 0.284 | 0.078 | 0.006 | 0.032 | 0.000 | 0.287 | 0.053 | 0.381 |
| Downgrade across class *L | -1.505 | -0.871 | -0.373 | -0.229 | -1.154 | -0.038 | -1.544** | -0.476 | -2.028* |
| <i>P(value)</i> | 0.196 | 0.286 | 0.682 | 0.831 | 0.185 | 0.954 | 0.031 | 0.518 | 0.069 |
| <i>P(Difference)</i> | 0.609 | 0.764 | 0.250 | 0.081* | 0.177 | 0.000*** | 0.799 | 0.163 | 0.462 |
| Control variables | Included | Included | Included | Included | Included | Included | Included | Included | Included |
| Observations | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| Adj-R squared | 24.59% | 20.75% | 16.82% | 12.60% | 9.92% | 27.21% | 20.86% | 12.81% | 14.09% |

Panel D: 2SLS regression of bond returns

| Column | 2SLS Regression of dependent variables: CAARs of bonds during [-1,+1] | | | | | | | | |
|---|---|------------------|------------------------|-----------------------|--------------------|--------------|--------------|------------------|------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| H characteristics used in the interaction terms | H=developed country | H=high inflation | H=high current account | H=high fiscal balance | H=foreign currency | H=common law | H=crisis | H=high liquidity | H=change in outlook |
| L characteristics used in the interaction terms | L=emerging country | L=low inflation | L=low current account | L=low fiscal balance | L=local currency | L=civil law | L=non crisis | L=low liquidity | L=change in assignment |
| Size of rating change*H | 0.204 | 0.705 | 1.914 | 0.833 | 0.920 | 0.236 | 1.746 | 0.675 | 0.447 |
| <i>P</i> (value) | 0.809 | 0.441 | 0.238 | 0.455 | 0.360 | 0.863 | 0.275 | 0.524 | 0.525 |
| Size of rating change *L | 0.444 | -0.791 | 0.105 | 0.807 | 0.636 | 2.337 | 0.097 | 2.036 | 0.896 |
| <i>P</i> (value) | 0.815 | 0.530 | 0.938 | 0.512 | 0.599 | 0.088 | 0.896 | 0.181 | 0.457 |
| <i>P</i> (Difference) | 0.884 | 0.250 | 0.338 | 0.983 | 0.810 | 0.143 | 0.052*** | 0.329 | 0.306 |
| Upgrade across class *H | 0.744 | 0.278 | 0.301 | 0.199 | 0.251 | 0.616 | 0.388 | 0.124 | 0.118 |
| <i>P</i> (value) | 0.046 | 0.723 | 0.588 | 0.708 | 0.348 | 0.411 | 0.215 | 0.701 | 0.794 |
| Upgrade across class *L | 0.402 | 0.352 | 0.173 | 0.559 | 0.141 | 0.429 | 0.496 | 0.073 | 0.448 |
| <i>P</i> (value) | 0.492 | 0.636 | 0.801 | 0.175 | 0.731 | 0.254 | 0.281 | 0.908 | 0.480 |
| <i>P</i> (Difference) | 0.111 | 0.959 | 0.613 | 0.228 | 0.276 | 0.261 | 0.428 | 0.949 | 0.908 |
| Downgrade across class *H | -0.966 | -0.198 | -0.102 | -0.162 | -2.041** | -1.769*** | -0.158 | 1.129 | -0.386 |
| <i>P</i> (value) | 0.096 | 0.892 | 0.890 | 0.890 | 0.028 | 0.003 | 0.892 | 0.157 | 0.409 |
| Downgrade across class *L | -0.425 | -0.733 | -0.950 | -0.719 | -0.157 | -0.084 | -0.833 | -0.433 | 0.399 |
| <i>P</i> (value) | 0.774 | 0.266 | 0.466 | 0.306 | 0.816 | 0.905 | 0.175 | 0.655 | 0.535 |
| <i>P</i> (Difference) | 0.368 | 0.747 | 0.610 | 0.703 | 0.023** | 0.054** | 0.799 | 0.205 | 0.336 |
| Control variables | Included | Included | Included | Included | Included | Included | Included | Included | Included |
| Observations | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| Adj-R squared | 4.52% | 6.31% | 7.18% | 4.76% | 5.55% | 6.74% | 3.22% | 1.84% | 0.23% |