NUST BUSINESS SCHOOL

FINANCIAL INSTITUTIONS & CAPITAL MARKETS

TERM PROJECT

'EFFECT OF MACROECONOMIC FACTORS ON CORPORATE BOND MARKET OF PAKISTAN'

Submitted By:

Muneeb Ahmed Khan

Nisar Ahmed Bhutta

Submitted To:

Mr. Haroon Rashid

Batch:

BBA-2K5

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I.ABSTRACT

This paper examines how major macroeconomic announcements such as CPI, policy rate, fiscal deficit and GDP growth rate affect the spread in the corporate bond market of Pakistan; an underdeveloped market having asymmetrical information. The paper compares the performance of the numerous TFCs issued over the past five years with these factors. In isolation, none of these factors has a major impact on the bond return (spread) but considered cumulatively each has a significant impact in altering the returns.

II.INTRODUCTION

The corporate bond market is an important source of long term financing, providing financial sector stability as well as providing alternative sources of financing. The debt market, affected by various external factors, directly impacts the development of the economy. In Pakistan, the debt market is in the nascent stages of development and there is minimal data available on the topic.

In our research paper, the reactions of the corporate bonds to major macroeconomic data announcements have been analyzed. The returns (premium) of the bonds have been related to the GDP growth rate, CPI, policy rate and fiscal deficit *(Table 1)*[1]. To arrive at the relationship between the factors, statistical tools have been used.

The next section of the paper discusses the research already carried out on the topic in Pakistan and elsewhere. The 4th section describes the data and the methodology

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[1] Economic survey of Pakistan 2006, 2007, 2008
  Monetary policy statement of SBP 2004, 2005, 2006, 2007, 2008

used to analyze it. The last section i.e. Section 5 presents the results and analyzes them to reach a tangible conclusion about the actual correlation between the factors.

III.LITERATURE REVIEW

There is a marked difference in the operations of the corporate debt markets of developed and developing countries. In the mature economies there is no information asymmetry and, therefore, the regular macroeconomic announcements do not have major impacts on bond spreads. As opposed to this, there exists information asymmetry in the developing or emerging countries' bond markets. Accordingly all announcements have, to an extent, an impact on the bond market. Different macroeconomic factors have been correlated with bond spreads to know the impact of different factors. According to the base study, bond returns are greatly effected by the changes in global interest rates as they lower the cost of funding for the international investors in the host country. Macroeconomic releases tend to lower the prevailing uncertainty in the market causing a lower volatility that helps in stabilizing the trading environment.

According to the research papers analyzed, these macroeconomic indicators are less important to investors in presence of transparent policies and investment grade ratings of bonds. In emerging markets like Pakistan investors respond more aggressively to these announcements where there is a situation of financial, political or economic crisis i.e. relatively less transparent policies and very low investment grade ratings for bonds. Even if the surprise element of the announcement is controlled it does not significantly affect the results.

According to the study conducted by Jochen R. Andritzky, Geoffrey J. Banister and Natalia T. Tamirisa for 'IMF Working Paper' on the topic of 'Impact of macroeconomic announcements on emerging market bonds', global market bonds are highly respondent to country ratings. Only in case of uncertain internal environment of a country do the macroeconomic factors have an impact on the spreads and volatility of bonds. The uncertain environment also signifies crisis-like situation in a country.

Thus, according to the research carried out in 12 emerging market countries (Pakistan was not included in the research), most of the major macroeconomic announcements only have an impact in third world countries that are not functioning in the ordinary course.

IV.DATA AND METHODOLOGY

DATA

The data for the analysis, obtained from varying sources, has been divided into dependent and independent variables. The data for the past five years has been taken for analysis. The first independent variable, GDP growth rate has been taken as it is one of the foremost indicator of the macroeconomic performance of a country. The second independent variable i.e. CPI was taken because opposed to WPI and SPI as it is a more wholesome reflection of the inflation rate. Even though there is a doubt on the credibility of the figures provided by the Government of Pakistan, but for our research we have still taken the official figures. Most of the corporate bonds issued in Pakistan are linked with KIBOR, which in turn is linked to the policy rate.

Thus this variable has also been taken. The policy rates were taken from the 'monetary policy statements' of the State Bank of Pakistan which are normally published biannually. These rates experienced a steep increase (of about 300 bps) in the past one year. The fourth independent variable taken for our research is fiscal deficit, an important economic performance variable of a country. Figures for the independent data have been taken from the 'monetary policy statements' of State Bank of Pakistan as well as 'economic survey of Pakistan'.

The dependent variable i.e. return on bonds (spread/ premium on bonds) has been obtained after looking at 34 TFC issues over the past five years *(Table 2)*[2]. All these issues were rated A and above (by JCR-VIS and PACRA) and of these 33 were linked to the 6-month KIBOR. The spread/ premium on the bonds has been obtained by taking the KIBOR rate as the benchmark. The bond spreads have been taken instead of actual bond returns as the purpose of the research is to show the variance of the returns of the debt market in relative terms instead of absolute terms. As all the bonds were linked to KIBOR, therefore, it has not been considered in calculating the bond return/ spread. The spread has been calculated by the following formula:

Bond spread= Return offered on bond – KIBOR rate

An average of the bond spreads of all the TFC's issued in a particular year has been taken to reach the cumulative value for the specific year.

METHODOLOGY

For analysis of the data, statistical tools as well as graphs have been used. Multiple regression analysis has been used to find the correlation between the dependent

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[2] TFC Valuation, Research Department, HBL Asset Management, Karachi

and independent variables as well as showing the impact that each independent variable has, in isolation. The multiple regression analysis also shows as to how much of the variance in the dependent variable can be explained in the independent variable. It also shows the significance of each variable as well as the degree to which it impacts a change.

Apart from this, different graphs have been made to show the relationships of different variables with each other. The line graphs used for the purpose show each independent variable correlated with an independent variable. This provides a separate relationship of each variable with the independent variable.

V.FINDINGS AND ANALYSIS

FINDINGS

The result of our research shows that the almost 99% of the variation in the dependent variable is explained by the independent variables being considered. The value of 0.992 for R^2 *(Table 3)* is an evidence for the afore-mentioned fact. The research undertaken i.e. effect of macroeconomic factors on corporate bond market is also correct; a fact explained by the value of 272 for F *(Table 3)*. Any value greater than 2.5 for this particular factor signifies that the research being undertaken is correct and valid.

As a result of the multiple regression analysis, it has been observed that individually no factor has a very great significance in terms of the impact on bond spreads. (As observed by the t-stat values for each variable in Table 3). However, if all the factors

are considered in relation to one another, the unified significance becomes prominent.

Considering the variables in isolation it can be seen that CPI has the least contribution towards changing the value of the dependent variable. However, the P-Values of 0.40, 0.49 and 0.30 for GDP growth rate, policy rate and fiscal deficit respectively *(Table 3)* do make a noteworthy contribution towards the change in value of the dependent variable i.e. bond spreads.

Observing the graphs *(Graph 1, 2, 3, 4)*, it can be seen that considered in seclusion with each independent variable, the dependent variable moves in tandem with the changing trends. This proves the fact that there exists, to an elementary extent, some direct relationship between the factors. Thus, the findings of both the multiple regression as well as graphs support each other.

ANALYSIS

Analyzing the findings we conclude that our research is valid and justified as it has been observed that the results of the multiple regression support our assumptions about the existing correlation between the variables; dependent and independent. Looking at graph 1 (between bonds return and GDP growth rate) it can be seen that as the GDP growth rate rose in 2005, as a result of the booming Pakistan economy, the return on bonds also increased accordingly. This fact can also be explained by looking at the individual factor analysis in the multiple regression analysis i.e. P-value.

The second graph i.e. bond return and CPI shows a similar moving trend but this view is negated to an extent by the results of the regression. From these results, it can be deduced that CPI does not have any major impact on the return that corporations offer on their bonds. This can be re-phrased to communicate the message that investors do not consider the returns in real terms, rather they only look at the returns in nominal terms.

The third variable i.e. policy rate has homogeneous results when compared to the increase or decrease in the bond spreads; a fact proven by both the regression analysis as well as the graphs. This fact shows that the issuer and investor of bonds are insensitive to the policy rates and consequently KIBOR as an overall increase in these rates does not reduce the spread on the bonds.

Fiscal deficit, the fourth variable also moves in tandem with the bond spreads showing a direct correlation between the dependent and independent variables.

Our research has been conducted, for a larger part, for the years during which Pakistan's economy was stable and growing. Most of the macroeconomic factors were improving during this time. (Apart from the last year i.e. 2008). These years constitute a period of high growth for both the economy as well as the developing bond market of the country. The corporate bond market, still in its infancy stage in Pakistan, can be said to have really strived to move towards maturity during this period. For such a growing market, the shocks such as the current economic downturn can prove to be a period of stagnating growth. The development of a strong debt market having depth is imperative for the development of the economy of Pakistan. As the bond market would develop and access to information becomes easier, the sudden impact of macroeconomic announcements on the volatility and

spreads of bonds would slowly but surely dampen, as is the case with developed

economies.

REFERENCES

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ANNEXURE

TABLE 1

| Year		Independent Variables			Dependent Variable	
	GDP Growth Rate (X_1)	CPI (X_2)	Policy Rate (X_3)	Fiscal Deficit (As % of GDP) (X_4)	Bonds Return (Spread) (Y)	No. of obs. of issues
2004	7.50%	4.60%	7.5%	2.40%	1.25%	3
2005	9.00%	9.30%	8.0%	3.30%	2.06%	7
2006	5.80%	7.90%	9.0%	4.20%	2.23%	5
2007	6.80%	7.80%	9.5%	4.30%	1.80%	13
2008	5.80%	12.00%	12.0%	4.00%	1.63%	6

TABLE 2

| TFC ISSUING COMPANY	Base Rate	Spread	Coupon Rate	Rating	Rating Agency
2004 (Average Spread=1.25%)					
BANK ALFALAH LIMITED-TFC (23-11-04)	K 6	1.50%	0.17	AA-	PACRA
BANK AL-HABIB LIMITED-TFC (15-07-04)	K 6	1.50%	-	AA-	PACRA
SCB (PAK) LTD-TFC (20-01-04) (UNION BANK LTD - TFC (20-01-04))	PIB 5yrs	0.75%	-	AAA	PACRA
2005 (Average Spread=2.06%)					
JAHANGIR SIDDIQUI & COMPANY LIMITED-TFC (30-09-05)	K 6	1.75%	-	AA+	PACRA
ABN AMRO BANK (PCB)-TFC-10-02-05	K 6	1.90%	15.38%	A	PACRA
ASKARI BANK LIMITED-TFC (04-02-05)	K 6	1.50%	0.15	AA	PACRA
ASKARI BANK LIMITED-TFC (31-10-05)	K 6	1.50%	0.16	AA	PACRA
AZGARD NINE LIMITED-TFC (20-09-05)	K 6	2.40%	0.16	A+	PACRA
SONERI BANK LIMITED-TFC (05-05-05)	K 6	1.60%	-	A+	PACRA
TELECARD LIMITED - TFC (27-05-05)	K 6	3.75%	-	A	JCR-VIS
2006(Average Spread=2.23%)					
ALLIED BANK LIMITED - TFC (06-12-06)	K 6	1.90%	17.56%	A	PACRA
JAHANGIR SIDDIQUI & COMPANY LIMITED-TFC (21-11-06)	K 6	1.90%	-	AA	PACRA
PAKISTAN MOBILE COMMUNICATION LIMITED-TFC (31-05-06)	K 6	2.85%	-	AA	PACRA
SCB (PAK) LTD-TFC (01-02-06) (UNION BANK LTD-TFC (01-02-06))	K 6	2.00%	-	AAA	PACRA
SEARLE PAKISTAN LIMITED-TFC (09-03-06)	K 6	2.50%	-	A-	JCR-VIS
2007 (Average Spread=1.80%)					
AL ABBAS SUGAR MILLS LTD - TFC (21-11-07)	K 6	1.75%	17.17%	A	PACRA
BANK AL-HABIB LIMITED-TFC (07-02-07)	K 6	1.70%	-	AA-	PACRA
CENTURY PAPER & BOARD MILLS LIMITED - SUKUK (25-09-07)	K 6	1.35%	-		
ENGRO CHEMICAL PAKISTAN LTD-TFC (30-11-07)	K 6	1.55%	-	AA-	PACRA
ESCORTS INVESTMENT BANK LIMITED-TFC (15-03-07)	K 6	2.50%	-	A+	PACRA
FAYSAL BANK LTD. (12-11-2007)	K 6	1.40%	-	AA-	PACRA
JAHANGIR SIDDIQUI & COMPANY LIMITED - TFC (04-07-07)	K 6	1.70%	-	AA	PACRA
KASB SECURITIES LIMITED - TFC (27-06-07)	K 6	1.90%	-	AA+	PACRA
KASH FOUNDATION - TFC (05-11-07)	K 3	2.45%	-	A	Pacra
NEW ALLIED ELECTRONIC (15-05-2007)	K 3	2.75%	-	A-	JCR-VIS
PAK AMERICAN FERTILIZER LTD. (30-11-07)	K 6	1.75%	-	AA-	PACRA
PAK MOBILE 3-YEARS (01-10-2007)	K 6	1.30%	-	AA	
PAKISTAN MOBILE COMMUNICATION LIMITED-TFC (01-10-07)	K3	1.30%			
2008 (Average Spread=1.63%)					
ENGRO CHEMICAL PAKISTAN LTD - TFC (18-03-08) (PRP-I)	K 6	1.70%	-	AA-	PACRA
MAPLE LEAF CEMENT FACTORY - SUKUK (07-01-08)	K 6	1.75%	-		
NIB BANK LIMITED-TFC (05-03-08)	K 6	1.15%	-	A	PACRA
PAK ARAB FERTILIZERS (28-02-08)	K 6	1.50%	-	AA	PACRA
PAKISTAN MOBILE COMMUNICATION LIMITED-TFC (28-10-08)	K 6	1.65%			
SAUDI PAK LEASING COMPANY LTD-TFC (13-03-08)	K 6	2.00%	-	AA	PACRA

TABLE 3

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.996088674
R Square	0.992192647
Adjusted R Square	-0.031229413
Standard Error	0.003605215
Observations	5

ANOVA

	df	SS	MS	F	Significance F
Regression	4	0.001651789	0.000412947	31.77109524	#NUM!
Residual	1	1.29976E-05	1.29976E-05		
Total	5	0.001664786			

|	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
GDP Growth Rate (X_1)	0.103654662	0.075478738	1.373296167	0.400679698	-0.855393641	1.062702965	-0.855393641	1.062702965
CPI (X_2)	0.061151622	0.109010199	0.560971563	0.67454238	-1.323954289	1.446257533	-1.323954289	1.446257533
Policy Rate (X_3)	-0.160218198	0.15552396	-1.030183376	0.49053587	-2.136337474	1.815901078	-2.136337474	1.815901078
Fiscal Deficit (As % of GDP) (X_4)	0.557250909	0.288653777	1.930516606	0.30426643	-3.110443074	4.224944893	-3.110443074	4.224944893

GRAPH 1
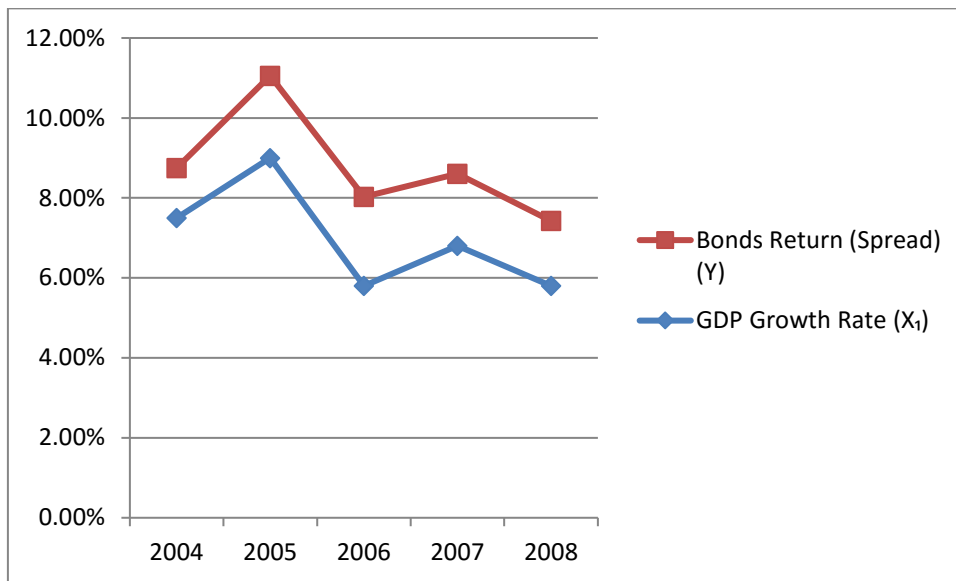
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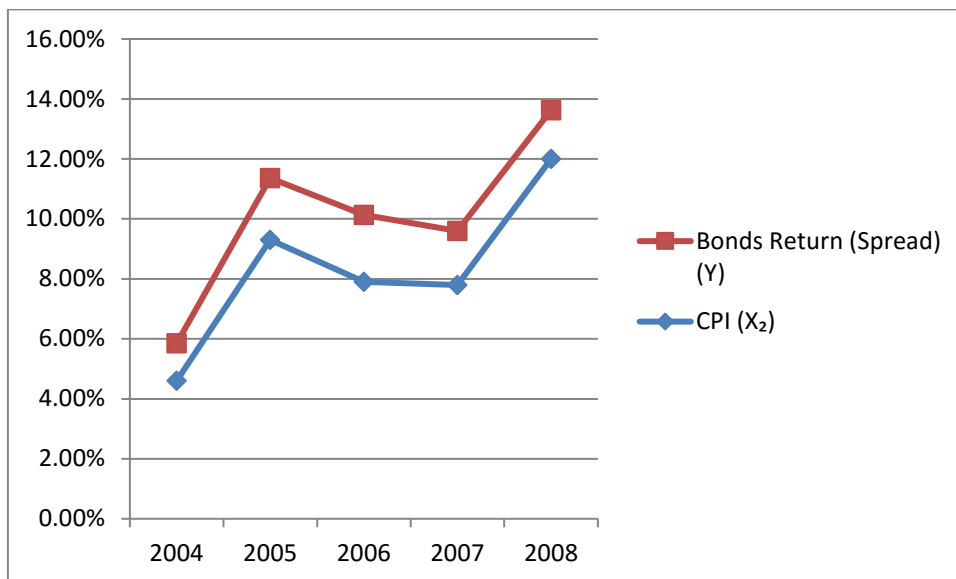
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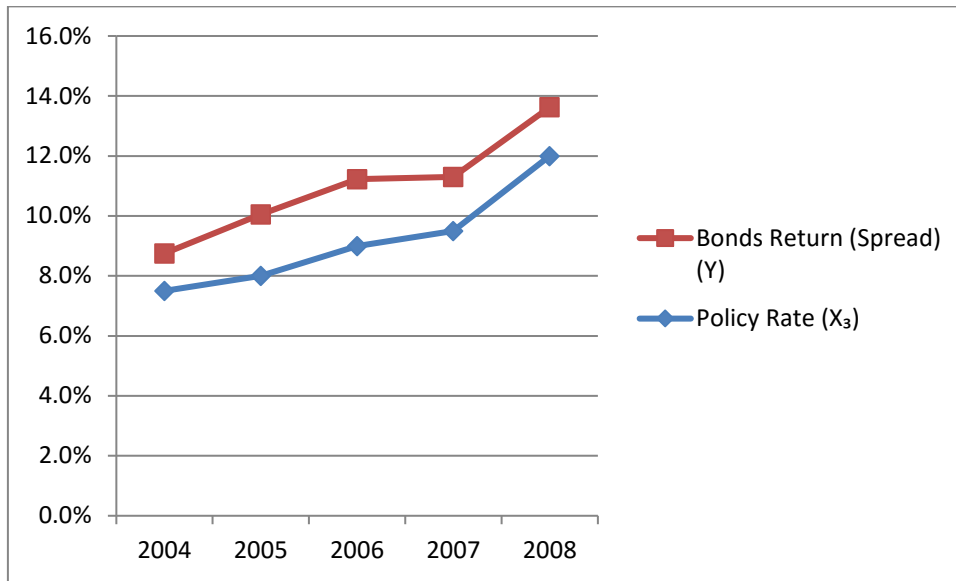
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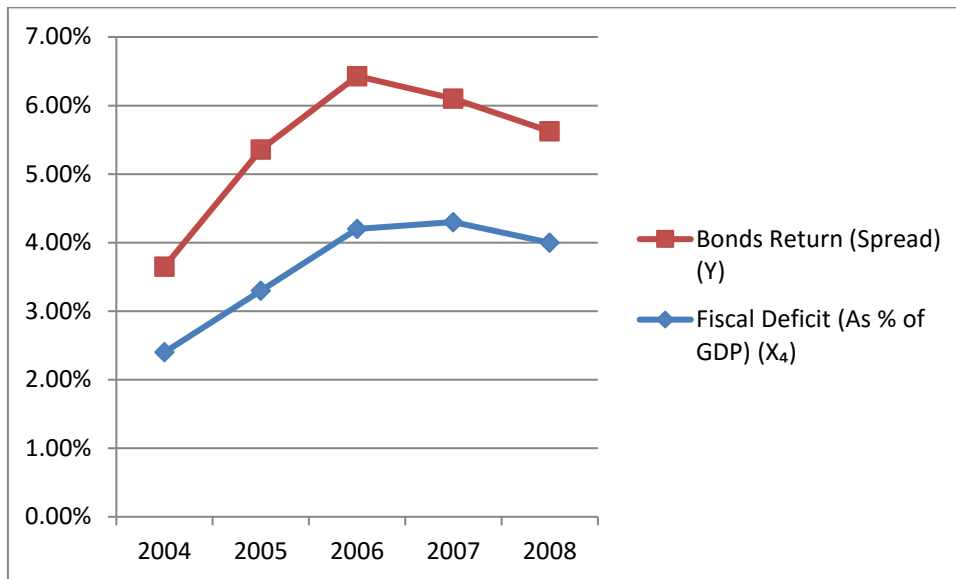
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Muneeb Ahmed Khan

Nisar Ahmed Bhutta

Submitted To:

Mr. Haroon Rashid

Batch:

BBA-2K5

Submission Date:

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Introduction

In the present times foreign investment in Pakistan is flowing out while the equity market is facing one of its worst crises. On top of these factors the country is facing severe liquidity problems and investment has almost dried up. In these times the development of a strong debt market is highly imperative. Such a development would provide the much needed investment as well as an alternative to the few financing modes available to the investors. In our paper we aim to analyze the effects of different macroeconomic factors on the debt market and how a change in any one of these would result in an adjustment in the demand and supply in the market. It also examines the reaction of bond market to major macroeconomic announcements. The paper would provide us a clear understanding of the application of the theoretical framework in the Pakistani debt market.

Methodology

The paper would undertake a detailed analysis of the major macroeconomic announcements over a period of time. The effect of these announcements on the level and volatility of the spread of the bonds will be discussed further. Different statistical techniques as well as trend analysis shall be used for the purpose. Apart from this, different research papers on the topic will be analyzed. The following research papers will be used as base papers:

- Andritzky, Jochen and Geoffery Bannister, 2005, "The Impact of Macroeconomic Announcements on Emerging Market Bonds," *IMF Working Paper,* April 2005.
- Fleming, Michael J. and Eli M. Remolona, 1999, "What Moves the Bond Market," *Journal of Portfolio Management*, Vol. 25, pp. 28–38.

Scope

In our research we would consider the data of the Pakistani market over the past five years. The paper would only focus on the debt market of Pakistan, both Islamic and non-Islamic.

Limitations

The debt market in Pakistan is underdeveloped. There is no extensive research on the topic. Therefore, while writing our paper we will have difficulty in finding research papers relevant to both the topic as well as country. As a result, international papers would have to be analyzed and related to the Pakistani scenario.
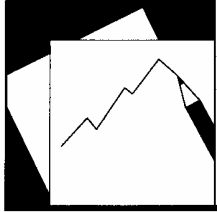
IMF Working Paper

The Impact of Macroeconomic Announcements
on Emerging Market Bonds

Jochen R. Andritzky, Geoffrey J. Bannister,
and Natalia T. Tamirisa

INTERNATIONAL MONETARY FUND

IMF Working Paper

Policy Development and Review Department

The Impact of Macroeconomic Announcements on Emerging Market Bonds

Prepared by Jochen R. Andritzky, Geoffrey J. Bannister, and Natalia T. Tamirisa[1]

Authorized for distribution by Dominique Desruelle

April 2005

Abstract

This Working Paper should not be reported as representing the views of the IMF.
The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper examines how emerging bond markets react to macroeconomic announcements. Global bond spreads respond to rating actions and changes in global interest rates rather than domestic data and policy announcements. All announcements affect market volatility. Data and policy announcements reduce uncertainty and stabilize the trading environment, while rating actions cause greater volatility. Results are broadly robust to country-specific and panel analyses, assuming conditional variance and controlling for the surprise content of news. In subsamples, announcements are found to matter less for countries with more transparent policies and higher credit ratings. In a crisis, rating actions become less important, and investors focus more on simple and timely indicators, like CPI.

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"Brazil's better than expected economic growth in the first quarter of the year helped emerging market bonds bounce back on Thursday. The South American giant's gross domestic product grew at a pace of 2.7 percent between January and March, compared to the same period of 2003, the fastest expansion since President Luiz Inacio Lula da Silva took office in January 2003. The news was welcomed by investors who went back into the market to buy Brazilian bonds. The country's benchmark global 40 bond rose 1.250 to bid 89.813 at a yield of 12.261 percent. The rise dragged J.P. Morgan's Emerging Market Bond Index Plus (EMBI+) up 0.33 percent in total returns. Brazil's debt comprises almost a quarter of the index." *Reuters News*, May 27, 2004.

"Philippine sovereign dollar bond prices rallied across the board on Friday after the government said the budget deficit for the first eleven months was below the target. Sovereign bond prices have tightened across the spectrum by a quarter of a point. We expect the market to consolidate between now and the year-end," said a Manila-based trader at a foreign investment bank. Spreads on Philippine sovereign dollar bonds due 2014 tightened by five basis points to 425 bps over Treasuries." *Reuters News*, December 19, 2003.

I. INTRODUCTION

Asset prices are affected by the arrival of new information. This is one of the accepted cornerstones of modern finance theory, which has laid the foundation for a rich literature investigating the role of information in financial markets. One strain of this literature focuses on the effects of macroeconomic data announcements on various markets including equities, bonds, and currencies. Macroeconomic data announcements have been used to test the market efficiency and rational expectations hypotheses and, more recently, to investigate the microstructure of financial markets and the role of private information in the formation of asset prices. The results of these studies confirm that macroeconomic data announcements have a significant impact on financial markets, although this impact varies across markets and announcements. The direction and magnitude of the impact is generally ambiguous and depends, among other things, on the degree of uncertainty in the market and the surprise content of the announcements.

To date, most studies have concentrated on mature financial markets. This paper extends this literature by examining the effects of macroeconomic data releases on emerging markets. We examine the reaction of emerging bond markets to major domestic and international macroeconomic announcements for a number of countries. Given the imperfect nature of the emerging market bond asset class with relatively scarce information, the asymmetry of access to information between creditors and debtors, and the prevalence of default, we expect macroeconomic releases to have a direct bearing on investor sentiment regarding the creditworthiness of sovereign debtors, and therefore to have a significant impact on spreads of international bonds over benchmark U.S. Treasury bonds. Indeed, data releases are often cited in the press as factors explaining the widening or narrowing of spreads.

We use a gamut of econometric methods to estimate the effect of macroeconomic announcements on the daily change in emerging market bond spreads. The analysis covers announcements of GDP, industrial production, consumer prices, the trade balance, the fiscal balance, country rating actions, and domestic and U.S. policy interest rates for 12 emerging

market countries from January 1998 to July 2004. Announcement effects are modeled in an event-study framework using dummy variables, and, as part of robustness checks, we use measures of surprise effects. We first estimate ordinary least squares (OLS) regressions assuming a constant variance of the residual, and then use a conditional variance GARCH model, with macroeconomic announcement variables entering both the level and variance equations, to gauge the effects of announcements on both the daily change in spreads and its volatility. The measure of volatility we focus on is the daily volatility of spreads on announcement days compared to non-announcement days.

The results are broadly consistent with, and in some respects stronger, than those for mature markets. While most domestic macroeconomic data releases do not appear to influence global spreads directly, they are found to have a significant effect on their volatility. In contrast, country rating actions and U.S. interest rate changes affect both the daily change in spreads and their volatility. These effects are observed even without controlling for the surprise content of announcements, suggesting that most announcements represent new information for emerging market investors. Results are broadly consistent across various country-specific and panel analyses, assuming conditional and unconditional variance. They are generally robust to controlling for the surprise content of news; country, region, and year effects; and to redefining the size of the event window. In subsamples, macroeconomic announcements appear to matter less for investment grade bonds and for more transparent countries. The importance of rating actions appears to decline in times of crisis.

The rest of the paper is organized as follows. In the next section we review the relevant empirical studies on the effects of macroeconomic data releases on financial markets. In Section III we describe our data sources and present some summary statistics that help characterize the data. Section IV describes our empirical approach and Section V presents results for tests of mean and variance equality, OLS and GARCH models and analyses over subsamples of the data. Section VI concludes.

II. Literature Review

The finance and monetary economics literature on the effects of macroeconomic announcements in mature financial markets is rich and extensive. Macroeconomic announcements are often used as a measure of public information to test the market efficiency hypothesis or, by correlating announcements with survey forecasts, to test the rational expectations theory.[2] Examining how monetary policy affects financial markets has also been an important motivation for research on macroeconomic announcements. More recently, the literature on macroeconomic announcements has been spurred by the desire to understand the microstructure of financial markets, focusing on the role of private information, as revealed in order flow, as a complement to public information.

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[2] The rational expectations hypothesis (Muth, 1961) assumes that economic agents are rational optimizers in making forecasts and take actions based on such forecasts, implying that prices react only to the unexpected component of announcements. The efficient market hypothesis of Fama (1970) argues that, under rational expectations, asset prices should reflect all publicly available information, that is, markets should be efficient.

A.   Announcement Effects in Mature Markets

There is a general consensus in the literature that macroeconomic announcements have significant effects on financial markets, both in terms of asset returns and their volatility. However, markets appear to react not to data releases per se but to the unexpected component of these releases. Consistent with theoretical predictions, market reaction to an announcement is stronger if its surprise content is higher.

Differences Across Markets and Types of Announcements

Effects of macroeconomic announcements tend to differ across financial markets and types of announcements. Trade balance news, for example, appears to have different effects on U.S. stock prices, exchange rates, and interest rates, depending on the size and sign of the surprise in the news (Aggarwal and Schirm, 1998). Announcements of retail sales, price indices and non-farm payroll data appear to have the greatest impact on the U.S. Treasury bond market (Kim and others, 2004; Fleming and Remolona, 1997; Balduzzi and others, 2001; Cook and Korn, 1991). To some extent, market participants' reaction to macroeconomic news (particularly, employment announcements) could reflect their expectations of the Federal Reserve's policy response to the news. They also reflect the cyclical nature of announcements: positive surprises in procyclical indicators (such as non-farm payroll data) generally have a negative effect on U.S. Treasury bond prices, while positive surprises in counter-cyclical indicators (such as initial jobless claims) have a positive effect (Balduzzi and others, 2001). Market reaction to announcements tends to be stronger if there is already a high degree of uncertainty in the market (Fleming and Remolona, 1997).

Foreign exchange markets are found to respond to various types of announcements (Chang and Taylor, 2003). However, trade balance, GDP and non-farm payroll employment data appear to affect foreign exchange markets most (Kim and others, 2004). According to some studies, exchange rates are most likely to react to news about the state of the economy rather than to inflationary pressures, but the magnitude of these effects is small (Edison, 1996). There is some evidence for spillover effects of news across major foreign exchange markets. In the U.S. stock market, CPI and PPI announcements, and changes in the federal funds rate appear to have the largest influence on returns and volatility (Kim and others, 2004; Bomfim, 2003).

Volatility Effects and the Adjustment Process

The impact of macroeconomic releases on volatility is generally ambiguous. Many studies find the so-called "calm-before-the storm" effect, with volatility declining before releases of major macroeconomic data (Jones and others, 1998). If an announcement reveals new information not incorporated in asset prices, volatility tends to rise on the announcement day, as markets adjust their positions in response. However, some announcements might lead to a decline in volatility. For example, an announcement of lower than expected inflation might reduce uncertainty in the market and create a more stable trading environment, because it allays the fears of an interest rate increase (Kim and others, 2004).

Macroeconomic data releases have an impact on financial markets that is similar to those associated with policy announcements. The reason for these apparent similarities is policy feedback effects, where policy is expected to be adjusted in response to statistical data releases. The calm-before-the-storm effects on volatility that characterize data releases also apply to policy announcements: volatility in the stock market, for example, tends to be lower on the days prior to meetings of the U.S. Federal Reserve Open Market Committee and higher on the days of the meetings (Bomfim, 2003).

Oral interventions by central bank officials in the United States, the euro area, and Japan have been found to influence both the level and volatility of exchange rates (Fratzscher, 2004). Oral communication by the central banks tends to reduce volatility in the foreign exchange markets and is found to be effective independent of the stance and direction of monetary policy and the occurrence of actual interventions, which suggests that markets perceive oral interventions as new information. The effectiveness of interventions increases if they deviate from the prevalent policy "mantra" and if they are coordinated across countries. Interventions also tend to be more effective when uncertainty in the market is higher. This suggests that oral interventions provide useful public information on the desired direction or level of the exchange rate, thereby helping reduce uncertainty.[3]

More recent literature based on high frequency transaction data has identified two typical stages in markets' adjustment to public information (Fleming and Remolona, 1999; Chang and Taylor, 2003). A major macroeconomic announcement causes an immediate change in prices, while trading volume declines and bid-ask spreads widen. The widening of bid-ask spreads has two interpretations. On the one hand, it can be interpreted as the value of the "option to trade" offered by market makers for investors that want to move first on new information. On the other hand it can be interpreted as the effect of an information asymmetry where participants are unsure about the implications of the new announcement. In the second stage, trading volumes and price volatility rise, as investors reach a consensus about the implications of the new announcement. Volatility set off by public information is extended by traders' private information, as trading order flow also plays an informational role (Green, 2004). All in all, the two-stage process takes place within a relatively short period of time, within minutes or hours following the announcement.

Notwithstanding their statistical significance, most announcement effects are short-lived. The analysis of intraday data shows that most indicators have a significant price effect on U.S. Treasury bonds only within the *first minute* after the announcement (Balduzzi and others, 2001). Similar effects have been found for prices and volatility in Australian Treasury bond markets, although trading volumes tend to be significantly higher for up to one hour after the announcement (Kim and Sheen, 2001). In the foreign exchange markets, for example, significant effects have been found only at less than 15 minute intervals after announcement (Chang and Taylor, 2003). The fast dissipation of announcement effects explains why such effects tend to be most pronounced in intraday data.

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[3] A detailed discussion of economic effects of monetary policy actions and foreign exchange interventions is beyond the scope of this paper, as it focuses on announcements rather than policy actions.

B. The Role of News in Emerging Markets During Financial Crises

There is a dearth of comprehensive research on the impact of macroeconomic announcements in emerging markets. The limited existing literature has focused on the role of policy announcements and other news during financial crises. Ganapolsky and Schmukler (1998) examine the reaction of Argentina's stock market index, Brady bond prices, and peso-deposit interest rates to specific policy announcements and news reports received by markets during the Mexican crisis of 1994–1995. Announcements that were perceived as increasing the credibility of the currency board apparently had a positive impact on market returns. These announcements included the agreement with the International Monetary Fund, the dollarization of reserve deposits in the central bank, and changes in reserve requirements. The appointment of a new finance minister helped reduce volatility of stock and bond returns, while a lowering of the reserve requirements increased the volatility of interest rates.

Kaminsky and Schmukler (1999) investigate what types of local and neighboring-country news moved stock markets during the Asian crisis. Using Bloomberg, the authors classify news into several categories: agreements with international organizations or the financial community, credit ratings, economic news, including real, financial, and external sectors news; fiscal policy, political news, and capital controls. Using an event-study approach, they find that news about agreements with international organizations and credit rating changes were most important in explaining large movements in stock prices during the Asian crisis.[4] However, they also point out that some price movements were not associated with any major news releases, which the authors interpret as suggesting markets were driven by herd instincts during the crisis. A question remains, however, as to which types of macroeconomic announcements matter for emerging markets in non-crisis times. In this paper, we conduct a more general analysis of announcement effects in emerging markets.

III. DATA

We focus on the global bond market with foreign-denominated issues. Unlike local equity or bond markets, the global bond market has a well-diversified base of investors that can be expected to share a common understanding of the fundamental forces driving the market. We use the country sub-indices of the Emerging Market Bond Index–Global (EMBI Global) provided by JP Morgan to calculate the dependent variable.[5] The dependent variable

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[4] Kaminsky and Schmukler (2002) confirm that rating and outlook changes have stronger effects during crises. They also find that these changes are more important for nontransparent countries.

[5] The EMBI Global Index (EMBI) is a total return index for U.S. dollar-denominated sovereign emerging market debt instruments, such as Brady bonds, loans, and Eurobonds. It is the most commonly used index by dedicated emerging market bond funds to track their performance. Building on its predecessor, the EMBI plus, the index covers the sovereign bonds of more than 30 countries and includes issues with a maturity of at least two and a half years and size of at least $500 million. The index contains the most liquid securities: JP Morgan (2004) reports that, as of end-2003, the daily trading volume was around $6 billion, which exceeds that in the U.S. corporate high-yield bond market. Each country sub-index includes a portfolio of the country's sovereign bonds fulfilling the index criteria, and sub-index spreads are measured relative to the 10-year U.S. Treasury bond.

is the daily percentage change in country sub-index bond spreads. We focus on the relative change in spreads, rather than the absolute change, to provide a uniform scaling and allow comparison across time and countries.

The sample covers 12 emerging market countries for the period from January 5, 1998 to July 15, 2004. As of June 2003, the countries included in the sample accounted for about two thirds of the EMBI total capitalization and were reasonably diversified geographically. They were Brazil, Chile, China, Colombia, Korea, Malaysia, Mexico, Poland, South Africa, Thailand, Turkey, and Venezuela. Of the top ten sovereign borrowers, only Russia and the Philippines are not considered because of data limitations. Most series (except for Korea and Malaysia) exhibit some autocorrelation, albeit without any recognizable trends or unit roots. Fewer observations are available for Chile than for other countries, because until 2001 Chile did not have enough bonds outstanding to be eligible to enter the EMBI index (Table 1).

The main independent variables are dummy variables for various types of macroeconomic announcements, i.e., release dates, taken from Bloomberg's calendars of events. Bloomberg is a consistent source of data on macroeconomic announcements for various countries, which is widely used by investors, analysts and traders. Bloomberg calendars of events are published on a regular basis and are available to a broad investor community.

The data cover statistical releases of the following macroeconomic indicators: real GDP; industrial production (IP); consumer prices (CPI); trade balance (TB); and fiscal balance (FB). We also take account of announcements of changes in the domestic policy interest rate (SR). To account for global, systemic factors, we include announcements of changes in the U.S. federal funds rate, denoted by SR(US). Being a major determinant of the risk-free benchmark curve, the U.S. short-term interest rate is an important factor influencing the cost of emerging market financing, and has been found in empirical work to be positively correlated with spreads.[6]

Since rating announcements have been proven to be important determinants of changes in spreads by earlier studies, we also include announcements of rating actions by Standard & Poor's (SP), which cover changes in the actual rating, rating outlooks, and watch listings. We consider this a reasonably good proxy for all rating changes, given the high correlation between S&P, Moody's and Fitch's actions. Recent comparative studies of rating agencies have found that S&P tends to provide the earliest and the most thorough market assessment. According to Gande and Parsley (2005), S&P provides 36 percent more rating changes than Moody's while preceding Moody's rating actions in two-thirds of the time. Reisen and von Maltzan (1999) have found that S&P rating changes cannot be anticipated by markets.

In our setting, rating actions also serve to confirm the validity of our model specification. The rating announcement variable is coded on a –1/0/1 scale, where –1

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[6] See, for example, Arora and Cerisola (2002), Ferrucci (2004), and Kashiwase and Kodres (forthcoming).

indicates a negative rating action (e.g., downgrade) and +1 a positive rating action (e.g., upgrade). We expect spreads to widen (tighten) on negative (positive) announcements, resulting in a negative coefficient in regressions. When modeling volatility of returns, we use only the binary dummy of rating actions, as we expect the volatility to rise on days of rating announcements, no matter whether they were good or bad news.

The frequency of announcements varies across countries, types of announcements, and over time. While data on announcements of common indicators, such as GDP growth, industrial production, CPI, and the trade balance are widely available, budget announcements are reported only for Brazil, Poland, and Mexico. Changes in policy rates are available only for those countries that announce policy rates within their monetary policy framework. For all countries, however, the number of announcements has increased over time, reflecting in part the development of the IMF's Special Data Dissemination Standard (to which all countries in our sample, except China, subscribe) and the general trend toward greater transparency in emerging market countries (Table 2).

The number of overlaps in data releases is small, accounting for less than 10 percent of all announcements. Announcements generally are not clustered around certain days of the week, although several announcements may occur on the same day for a given country. An exception is Poland, where about 60 percent of CPI and budget deficit announcements occur on the same day. In Thailand, all but one announcement of industrial production and the trade balance occur on the same day in our sample. There are relatively few monetary policy announcements in our sample. For the U.S., they largely coincide with the cycle of monetary policy relaxation.

IV. METHODOLOGICAL APPROACH

The methodological approaches used in the literature have evolved over time. The literature started in the form of event studies, which examined the effect of announcements on asset prices, assuming constant variance of the residual in the return equation and estimating the return equation with ordinary least squares. Subsequently, the literature was broadened to examine the effect of announcements on the volatility of asset prices by explicitly modeling the variance. In terms of modeling announcements, the traditional approach of using dummy variables has progressed to incorporate the surprise content of news based on forecasts of macroeconomic indicators. Nonetheless, most studies suffer from a drawback that the robustness of results has not been examined extensively. In this paper, we seek to remedy this.

We examine how releases of macroeconomic information affect the level and volatility of spreads for sovereign bonds included in the EMBI index using a broad variety of approaches: (i) simple ANOVA equality tests of the mean and variance of the daily change in spreads to compare differences on announcement and non-announcement days (for non-overlapping announcements); (ii) country-by-country OLS and GARCH estimations to gain insight into individual country reactions of the daily change in spreads to announcements, and (iii) a dynamic panel regression and a panel GARCH model, which allow us to gain estimation efficiency and to try to generalize results for the sample as a whole. We then conduct extensive robustness and subsample tests.

The *mean equality tests* are the most general approach to examine the differences in mean and variance in subsamples. They represent simple F-tests, where F-statistics of the mean tests are calculated as the ratio of "between" and "within" sums of squares:

$$F = \frac{SS_B}{SS_W} = \frac{n_0 (\bar{x}_0 - \bar{x})^2 + n_1 (\bar{x}_1 - \bar{x})^2}{(\sum_{i=1}^{n_0} (x_{i,0} - \bar{x}_0)^2 + \sum_{i=1}^{n_1} (x_{i,1} - \bar{x}_1)^2)/(n_0 + n_1 - 2)}, \qquad (1)$$

where $\bar{x}_0$ indicates the mean daily change in spreads on non-announcement days and $\bar{x}_1$ on announcement days respectively, and n is the number of observations in each subsample. This test is done for each type of announcement, excluding days of other announcements from the analysis.

The analogous F-statistic for the *variance equality tests* is given by the ratio of variances in the respective subgroups:

$$F = s_0^2 / s_1^2. \qquad (2)$$

We also estimate *OLS regressions* for all countries, which assume an unconditional distribution of the variance of our dependent variable. We use macroeconomic announcement dummies as independent variables. All regressions control for day-of-the week effects. For country i, the model is specified as:

$$R_{i,t} = c_i + a_i R_{i,t-1} + \sum_{w=Mon}^{Thu} \delta_{i,w} D_{i,w} + \sum_{k=GDP}^{SR(US)} \delta_{i,k} D_{i,k,t} + \varepsilon_{i,t} \qquad (3)$$
$$E(\varepsilon_{i,t}) = 0,$$

where D_w are days of the week dummies and D_k are announcement day dummies for different types of data and policy announcements (GDP, CPI, industrial production, trade balance, fiscal balance, domestic short-term policy rate, U.S. federal funds rate, and rating actions, as described above). The regression includes a constant c_i and one lag of the dependent variable, $R_{i,t-1}$. Q-statistics of residual autocorrelation do not point to the need to include lags of higher order. The Lagrange multiplier test shows significant conditional heteroskedasticity effects in residuals (Engle, 1982)—a common effect in financial time series—suggesting that the least square estimates may be inefficient.

To improve efficiency and to examine the effect of announcements on the volatility of the daily change in spreads for individual countries, we employ a *GARCH(1,1) model* of Bollerslev (1986). The model allows us to take into consideration the long memory effects detectable in most financial time series by conditioning the variance of the daily change in spreads on past volatility:

$$R_{i,t} = \beta_i + \phi_i R_{i,t-1} + \sum_{k=GDP}^{SR(US)} \varphi_{i,k} D_{i,k,t} + u_{i,t}\varepsilon$$
$$E(u_{i,t}) = 0 \text{ and } E(u_{i,t}^2) = h_{i,t} \tag{4}$$
$$h_{i,t} = \lambda_{i,0} + \lambda_{i,1} u_{i,t-1}^2 + \lambda_{i,2} h_{i,t-1} + \sum_{w=Mon}^{Thu} \eta_{i,w} D_{i,w} + \sum_{k=GDP}^{SR(US)} \mu_{i,k} D_{i,k,t} + \varepsilon_{i,t}.$$

In this set up, the mean equation includes a constant β_i and an autoregressive term $R_{i,t-1}$ in addition to the announcement dummies. The residual variance is modeled explicitly, using a constant $\lambda_{i,0}$, and the ARCH and GARCH coefficients, $\lambda_{i,1}$ and $\lambda_{i,2}$, for which $\lambda_{i,1}, \lambda_{i,2} > 0$ and $\lambda_{i,1} + \lambda_{i,2} < 1$ to ensure positive and stationary residual variance. GARCH equations are estimated using the maximum likelihood method. Announcement effects enter both the mean and the variance equations.

To examine the common impact of announcements on emerging bond markets as an asset class, we pool data and estimate a panel regression using the Generalized Method of Moments (GMM). The basic **dynamic panel regression** is given by:

$$R_t = \kappa + \theta_h R_{t-1} + \sum_{w=Mon}^{Thu} v_w D_w + \sum_{k=GDP}^{SR(US)} \vartheta_k D_{k,t} + \varepsilon_t \tag{5}$$
$$E(\varepsilon_t) = 0.$$

We use the same country data as before, but implicitly restrict coefficients on announcement dummies to be the same for all countries. We also control for country-, region- and year-specific effects. Variance in this model is not modeled explicitly.

The **panel GARCH model** assumes that today's variance of returns depends on past variance. Covariance between variables is assumed to be zero. This simplification reduces the number of coefficients to be estimated, increasing the degrees of freedom and making computation feasible. The following equations describe the model:

$$R_t = \sigma + \rho R_{t-1} + \sum_{k=GDP}^{SR(US)} \tau_k D_{k,t} + u_t$$
$$E(u_t) = 0 \text{ and } E(u_t^2) = h_t \tag{6}$$
$$h_t = \xi_0 + \xi_1 u_{t-1}^2 + \xi_2 h_{t-1} + \sum_{w=Mon}^{Thu} \psi_w D_w + \sum_{k=GDP}^{SR(US)} \omega_k D_{k,t} + \varepsilon_t,$$

where $\xi_1, \xi_2 > 0$ and $\xi_1 + \xi_2 < 1$. Like the dynamic panel model, the GARCH model is estimated in different versions, controlling for country-, region-, and year-specific effects.

We also use a number of techniques to control for possible biases and errors. To ensure unbiasedness of GARCH estimations, we control for outliers using dummy variables. Outliers are defined as daily changes in spreads exceeding four standard deviations from the mean in our sample. Outliers constitute less than one percent of observations. They appear to correspond to isolated jumps in spreads, possibly reflecting episodes of temporarily low

trading activity and hence low liquidity in the market. Some outliers are concentrated around idiosyncratic market events, such as the rebalancing of portfolios after Argentina was taken out of the EMBI Global index in 2001.

Besides estimating models with different sets of control variables, we test the robustness of the results to a different window during which announcements may have had an effect: three days (pre-announcement, announcement, and post-announcement) instead of one (announcement) day. Widening the window further would lead to a significant increase in the number of overlapping announcements. Overlaps would make it difficult to disentangle whether a certain effect on returns comes, for instance, from an announcement made five days ago or a pre-announcement reaction of an indicator release expected at the end of the week.

In addition to the robustness checks, we estimate the panel GARCH model for different subsamples, including: (i) investment grade and non-investment grade credits; (ii) countries with more and less transparent policies, based on various measures of transparency; (iii) crisis or near-crisis periods versus non-crisis periods, where crisis or near crisis periods include dates where EMBI Global spreads were more than two standard deviations above the detrended mean for the sample. These periods reflect financial crises in Asia and Russia in 1998, Turkey in 2000–2001, Argentina in 2001, and Brazil in 1998–1999 and 2002.

In all of the above models, we implicitly assume that the daily change in spreads for country i is the sum of its mean and a random error, which is analogous to the constant mean return model of Campbell, Lo, MacKinley (1997):[7]

$$R_{i,t} = \mu_i + \varepsilon_{i,t}$$
$$E(\varepsilon_{i,t}) = 0 \tag{7}$$

When discussing variance, we refer to the daily volatility of relative changes in the EMBI country sub-index spread rather than intraday trading volatility. Our dataset of daily EMBI spreads does not allow a judgment about the latter. In the variance equality test, this means that the adjusted return variance on all non-overlapping announcement days is compared to those on non-announcement days. In the GARCH model, the expected squared residual from the mean equation is regarded as variance.

V. RESULTS

We find that announcements generally do not have a systematic effect on the daily change in spreads (with the exception of rating announcements). However, they often have

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[7] We examined the robustness of results to using abnormal returns as a dependent variable. We define abnormal returns as a difference between the actual return and its fitted value from a regression of the EMBI spread for a given country on the global EMBI on non-announcement days. Results for estimations with abnormal returns are broadly in line with those for the constant-mean-return model.

significant effects on the volatility of spreads. Data releases tend to lower volatility of emerging market bond spreads, while rating announcements have the opposite effect. These results are generally robust to using alternative model specifications and estimation methods.

A. Country-Specific Results

Our first set of tests compares the mean proportional change in spreads on announcement and non-announcement days (Table 3). Overall, the results foreshadow the results of OLS regressions and GARCH models, showing only a few cases where the mean return is significantly different on announcement days. The implication is that announcements have no systematic effect on daily changes in spreads. This is what we would expect, since we do not control for the surprise content of announcements or the direction of the surprise. The one notable exception is for the announcement of S&P rating actions, which are associated with a significant difference in the daily change in spreads for eight out of the twelve countries in our sample. For most countries, the sign of the effect is what we would expect, with a positive announcement leading to a decline in spreads and a negative announcement leading to a widening of spreads.

In contrast, tests of the equality of the variance (ANOVA) across announcement and non-announcement days show significant differences in many cases (Table 4). The effect tends to be significant for individual countries for GDP, fiscal balance and U.S. interest rate announcements. This is consistent with our findings from other models.

OLS regressions (Table 5) confirm the result from the mean equality tests that there are few significant effects of announcements on the daily change in spreads. Again the exception is rating announcements, which have a significant effect on the change in the level of spreads in six of nine countries where rating actions took place. In four out of six cases the coefficients are negative as expected, implying that an upgrade leads to a tightening of spreads.

Estimations of GARCH equations at the country level (Table 6) confirm the two main results above: announcements do not have a systematic effect on the daily change in spreads (with the exception of rating announcements); announcements do seem to have an effect on the volatility of spreads on emerging market bonds. GARCH mean equations show only a few significant coefficients for announcements. An exception is rating announcements which are significant for five out of nine countries where rating changes took place. In four out of five cases the coefficient is negative, as we would expect. In contrast, the coefficients on the GARCH estimation for the variance equation show significant effects from announcements in many countries. The effects are consistent for GDP announcements (which appear to reduce the volatility of the daily change in spreads) and for the trade balance (increasing in the volatility of the daily change in spreads), possibly because the interpretation of what these announcements imply for bond pricing is consistent across countries. For other types of announcements, the effects vary across countries.

B. Panel Results

Our next step was to run the GMM and GARCH estimations on the pooled data set to examine the common impact of macroeconomic announcements, rating announcements and U.S. interest rate announcements across countries. As mentioned above, we control for day-of-the-week effects, country and region effects, and year effects. In terms of effects on the daily change in spreads we can compare the results from the OLS regression and the estimation of the mean GARCH equation (Tables 7 and 8). Both estimations show significant effects on spreads for rating and U.S. interest rate announcements. Both types of announcements lead to tightening of spreads, which is in line with expectations. Positive rating announcements typically compress spreads. Likewise, U.S. interest rate announcements in our sample reflect a cycle of considerable monetary policy easing, and thus can be also expected to lead to lower spreads for emerging market bonds.[8] Furthermore, fiscal balance announcements tend to lower spreads. These results are robust to controlling for country-, region- and year-specific effects. However, further robustness analysis, as described below, failed to confirm the finding of significant announcement effects for fiscal balance announcements, which might in part reflect the limited availability of data for this type of announcements.

As regards the apparent importance of rating announcements, significant effects do not necessarily reflect the high information content of these announcements. They may simply reflect special institutional rules in the private sector. Many investors are restricted, either by client mandates or prudential regulations, from investing in sub-investment grade sovereign debt (defined by Standard and Poor's as BB+ and below). This implies that if a country has a sub-investment grade credit rating, the investor base for its bonds may be significantly narrower than for a country with an investment-grade credit rating, including more prominently speculative investors as opposed to "buy and hold" long-term investors. An upgrade to investment grade, by widening the investor base, will confer a significant benefit to a country's bonds, increasing demand for the bonds and making price movements less volatile. In our sample, this effect may be operating for three upgrades to investment grade: South Korea (1/25/99), Mexico (2/7/02), and South Africa (2/25/00).

With regard to the *volatility* of the daily change in spreads, as in the country equations, the panel GARCH variance equation shows significant effects for a number of different types of announcements (Table 8). GDP, fiscal balance, and U.S. interest rate announcements tend to reduce the volatility of spreads, while announcements of the trade balance and rating actions tend to increase the volatility of spreads. A possible explanation may be that investors generally have similar views about what a given GDP, fiscal balance, or U.S. interest rate announcement implies for the country risk (as reflected in international bond spreads), and convergence of their views reduces volatility. If investors' views differ, as

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[8] During our sample period the U.S. Federal Reserve Open Market Committee cut interest rates 16 times, raised them 7 times and left them unchanged 33 times. Rates fell from 5.5 percent at the beginning of our sample period to 1.25 percent at the end. When −1/0/1 dummies (−1: interest rate cut, 1: interest rate increase) are used instead of a 0/1 dummy for U.S. rates, the OLS coefficient becomes positive (0.004) and less significant (p-value of about 10 percent). Other coefficients do not change much.

is likely to be the case with trade balance announcements, or if an announcement tends to lead to a rebalancing of investors' portfolios, volatility is likely to rise. The above results are robust to controlling for country-, region-and year-specific effects. Alternatively, in the case of rating announcements, the tightening of spreads seen in the mean equation may involve rebalancing of investor portfolios that causes transitional volatility.

C. Further Robustness Checks

The above results are broadly robust to changes in the size of the event window and to controlling for the surprise content of announcements.

When we redefine the ***event window*** as covering three days—not only the announcement day but the preceding and the following days—and run the panel GARCH regression with the redefined announcement dummies, the results remain largely unchanged (Table 8). As in the baseline regressions, rating upgrades and U.S. interest rate changes are found to lead to tighter spreads. GDP and industrial production announcements no longer have significant effects on the level of spreads. In the volatility equation, announcement effects generally have the same sign as in regressions with the one-day window, but are smaller in magnitude, suggesting that they dissipate over time.

This finding is in line with Jones and others (1998) who find in a regime-switching GARCH model for the U.S. Treasury bond market that announcement shocks do not persist, and volatility declines on the day following the announcement. It is consistent with the interpretation that markets quickly incorporate new information into prices and that the trading or information-gathering process does not generate volatility on announcement or succeeding days. It is also noteworthy that with the three-day window all announcements are found to have an effect on volatility, which might imply that markets react to all types of macroeconomic announcements, albeit with different leads and lags.

Next we control for the ***surprise content of news***. Our baseline regressions suggested that markets rarely react to announcements per se, and by isolating the unexpected component of announcement we can test if markets react to surprises. In addition, we can check if our baseline results are robust to measuring all types of announcements similarly. There is a risk that not controlling for surprises in our baseline regressions might bias the significance of results downward, if asymmetric effects of positive and negative announcements were to cancel each other.

We measure surprise as a standardized difference between the released indicator and the median expectation by market participants, based on Bloomberg surveys of market participants. Positive surprises are thus defined as a higher-than-expected value of the respective macroeconomic variable, while negative surprises correspond to lower-than-expected values. Bloomberg survey data are available for GDP, industrial production, CPI, trade balance, and fiscal balance announcements. We also include data on surprises in U.S. non-farm payroll data as a proxy for surprises relating to future U.S. interest rate announcements. Given the limited and non-systematic coverage of market participants by Bloomberg surveys, we cannot preclude that these data do not contain measurement errors. This requires caution in interpreting the results.

In GARCH regressions with measures of surprises in domestic announcements, we find that positive surprises in industrial production and CPI announcements lead to a tightening of spreads, possibly because they make market participants revise their growth forecasts of emerging market economies (Table 9). Negative and positive surprises in these and other announcements (GDP and trade balance) are found to have statistically significant effects on volatility. When we control for surprises in international macroeconomic announcements, proxied by the U.S. payroll data, we find that only surprises in CPI announcements (positive and negative) affect the level of spreads and that virtually all macroeconomic announcements have an effect on the volatility of spreads. Taken as a whole, these results are broadly consistent with the literature on mature markets which finds ambiguous effects of positive or negative surprises in announcements on volatility. The results can be also interpreted as suggesting that some announcements, for example, GDP generally do not represent "news", as they are widely anticipated by markets based on releases of higher frequency data, for example, industrial production and CPI.

Regressions controlling for the surprise content of news also suggest that our baseline regressions are not biased by the fact that we do not differentiate announcements into positive and negative ones. Even after controlling for the surprise content of news, we still find that announcements do not have a systematic effect on the level of spreads. We confirm that announcements generally have statistically significant effects on the volatility of spreads. This implies that macroeconomic announcements generally represent new information for emerging markets. This finding is stronger than that in the literature on mature markets, which tends to detect announcement effects on volatility only after controlling for the surprise content of news. This might be the result of the generally less transparent and more uncertain environment for investors in emerging markets, which increases the information value of macroeconomic and policy announcements even when they confirm expectations.

D. Impact of Announcements in Different Country Subsamples

By way of extension, we consider whether the results obtained on the entire sample would hold in various subsamples. We find that they do, although—as expected—they appear more significant and pronounced in cases where information is scarce or limited.

First, we split the data into two subsamples distinguished by whether the underlying bond was of *investment or non-investment grade credit rating* (Table 10). Results show that for non-investment grade countries announcements of domestic interest rate changes and fiscal policy have more pronounced effects on the level and the volatility of spreads, while rating announcements tend to matter less. This could imply that macroeconomic announcements have a greater information content for non-investment grade countries than for investment-grade countries.

We also examine if there are any systematic differences in the announcement effects during *crisis periods* compared to more tranquil periods. Our sample covers several crisis events: in Asia and Russia in 1998, Turkey in 2000–2001, Argentina in 2001, and Brazil in 1998–1999 and 2002. We find that the importance of CPI announcements tends to increase during crises, possibly reflecting their high frequency, accuracy, and clarity.

Rating actions tend to become less significant in times of crisis (Table 10). It might be that during a crisis, the information content of rating actions declines as markets perceive ratings as lagging indicators of creditworthiness. Uncertainty and volatility rise during a crisis, as investors tend to trade based on private information and focus on such types of news as cabinet changes and negotiations with the International Monetary Fund. The finding of a lower significance of rating actions in crisis is consistent with Kaminsky and Schmukler (2002): in their sample rating actions are also found to be less significant statistically during crisis periods. However, in their estimations, the coefficient on the rating variable is larger in crisis periods, which leads the authors to conclude that the importance of rating increases.

We also split the sample by the degree of *transparency* of countries' policies (Table 11). For a measure of transparency we use the frequency of releases for the indicators covered by our study. We define the measure for each country as the number of macroeconomic releases in a given 200 day rolling period, normalized by the average number of releases over the period for our sample, which allows us to split the sample into two.[9] We find stronger announcement effects, particularly of ratings, for less transparent countries. One possible interpretation of this finding is that in less transparent countries the information content of announcements is lower, there is greater uncertainty about economic developments in less transparent countries, and market participants attach a greater importance to rating changes which tend to be based on direct discussions between the rating agency and the authorities. The finding that ratings tend to be more important in less transparent countries is consistent with that in Kaminsky and Schmukler (2002).

When we split the sample by the *magnitude of data revision*—another measure reflecting transparency of countries' policies—we also find that ratings have stronger effects for countries with larger data revisions. Markets might be perceiving statistics of such countries as less reliable and are more uncertain about the economic situation there (Table 11).

VI. CONCLUSION

This study contributes to the nascent literature on the effects of macroeconomic announcements in emerging markets. We do not find evidence that individual domestic data and policy announcements have systematic effects on the level of international bond spreads for emerging market countries. Global bond markets appear to respond mainly to announcements of changes in international ratings, which are designed to serve as composite forward-looking indicators of domestic fundamentals and policy developments and a broad measure of country risk. Changes in global interest rates also tend to affect the level of spreads, possibly because they lower the cost of funding for international bond investors and

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[9] The findings are broadly robust, however, to alternative measures of transparency, such as the Opacity Index. The Index is compiled by the Kurtzman Group, under the sponsorship of the PricewaterhouseCoopers Endowment for the Study of Transparency and Sustainability, and is available at http://www.opacity-index.com/index.html.

the cost of financing for emerging market sovereigns. Although there are few statistically significant effects of announcements on the level of spreads, we find many on volatility.

The direction of the volatility effects is ambiguous. Domestic data announcements generally lead to lower volatility, suggesting that new statistical information helps reduce the relatively high uncertainty that characterizes emerging bond markets and helps stabilize the trading environment. Policy announcements appear to reduce volatility when markets are able to quickly reach a consensus as to what these announcements imply for country risk, as appears to be the case with announcements of changes in global interest rates. If there is scope for alternative interpretations, volatility tends to rise in response to a policy announcement, as tends to happen after changes in domestic policy rates are announced. International rating actions tend to raise volatility, possibly because they typically require investors to rebalance their portfolios. The above results are broadly robust across various estimation methods and specifications, including country-specific and panel analyses with conditional and unconditional variance.

Our subsample analysis shows that announcements tend to matter less for transparent countries and for countries whose bonds have investment-grade ratings. Most announcements, including rating actions, tend to become less consequential in times of crisis, possibly because investors turn their attention to other types of news. An exception to this is CPI announcements, which investors seem to react more strongly to in times of crisis, possibly because CPI can provide a rough indication of the likely duration and depth of the crisis and the prospective timing of the recovery.

Controlling for the surprise content of announcements does not materially change our results, suggesting that our baseline regressions are not biased by the fact that we do not differentiate between positive and negative announcements. This is a stronger result than that found in the literature on mature markets. We suggest that this might be the result of the generally less transparent information environment in emerging markets, which increases the information value of macroeconomic and policy announcements even when they confirm expectations.

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Table 1. EMBI Spreads

	Brazil	Chile	China	Colombia	Korea	Malaysia	Mexico	Poland	South Africa	Thailand	Turkey	Venezuela
Mean	0.0001	-0.0006	-0.0003	0.0002	-0.0011	-0.0003	-0.0004	-0.0007	-0.0003	-0.0010	0.0000	0.0002
Maximum	0.20	0.30	0.25	0.27	0.22	0.21	0.20	0.55	0.43	1.19	0.28	0.39
Minimum	-0.21	-0.33	-0.34	-0.16	-0.37	-0.16	-0.14	-0.58	-0.19	-0.61	-0.18	-0.20
Standard deviation	0.03	0.04	0.04	0.03	0.03	0.02	0.03	0.06	0.03	0.07	0.03	0.03
Number of observations	1,703	1,339	1,703	1,703	1,703	1,703	1,703	1,703	1,703	1,703	1,703	1,703

Source: Bloomberg and authors' calculations.
The table reports key statistics for the dependent variable, the daily percentage change in country EMBI spreads. The sample period runs from 01/05/1998 to 07/15/2004.

Table 2. Domestic and International Announcements

	1998	1999	2000	2001	2002	2003	2004 [1]	Total
Gross Domestic Product (GDP)	8	12	24	25	32	37	22	160
Industrial Production	27	36	71	97	99	94	52	476
Consumer Price Index (CPI)	46	60	100	112	121	118	68	625
Trade Balance	46	56	60	77	78	93	59	469
Short-Term Interest Rate	8	6	5	11	15	13	6	64
Fiscal Balance	8	12	18	24	24	25	18	129
Rating Actions	11	7	10	7	13	9	1	58

Source: Bloomberg.
[1] Period 1/1/2004 to 7/15/2004.
The table shows the total number of annoucements per indicator and year in all countries in the sample.

Table 3. Mean Equality Tests

	Brazil	Chile	China	Colombia	Korea	Malaysia	Mexico	Poland	S. Africa	Thailand	Turkey	Venezuela	Panel
GDP													
Anova F-statistic, p-value	0.20	0.18	0.04	0.89	0.99	0.97	0.71	0.53	0.15		0.50	0.31	*0.39*
Non-announcement days	0.0004	0.0001	-0.0003	0.0003	-0.0007	0.0002	-0.0005	0.0001	0.0000		0.0004	0.0004	*0.0000*
Announcement days	-0.0090	-0.0165	0.0312	0.0029	-0.0008	0.0000	0.0018	-0.0089	-0.0139		0.0062	-0.0074	*-0.0028*
Industrial Production													
Anova F-statistic, p-value	0.36	0.18			0.85	0.89	0.49		0.35		0.74	0.24	*0.25*
Non-announcement days	0.0004	0.0001			-0.0007	0.0002	-0.0005		0.0000		0.0004	0.0004	*0.0000*
Announcement days	-0.0030	-0.0063			0.0003	-0.0004	0.0019		-0.0051		-0.0013	-0.0046	*-0.0023*
CPI													
Anova F-statistic, p-value	0.82	0.50	0.57	0.23	0.54	0.09	0.87	0.38	0.45	0.93	0.46		*0.39*
Non-announcement days	0.0004	0.0001	-0.0003	0.0003	-0.0007	0.0002	-0.0005	0.0001	0.0000	-0.0004	0.0004		*0.0000*
Announcement days	0.0012	-0.0032	0.0037	-0.0045	-0.0040	-0.0072	-0.0012	-0.0101	0.0031	0.0006	-0.0026		*-0.0015*
Trade Balance													
Anova F-statistic, p-value	0.29	0.38	0.55	0.34		0.06	0.86		0.73		0.14	0.99	*0.16*
Non-announcement days	0.0004	0.0001	-0.0003	0.0003		0.0002	-0.0005		0.0000		0.0004	0.0004	*0.0000*
Announcement days	-0.0033	-0.0041	-0.0069	0.0043		-0.0067	-0.0017		-0.0014		-0.0063	0.0006	*-0.0029*
Fiscal Balance													
Anova F-statistic, p-value	0.53						0.75	0.07					*0.04*
Non-announcement days	0.0004						-0.0005	0.0001					*0.0000*
Announcement days	-0.0024						0.0036	-0.0201					*-0.0088*
Short-Term Interest Rate													
Anova F-statistic, p-value			0.34		0.41	0.29	0.33	0.81	0.64	0.06			*0.81*
Non-announcement days			-0.0003		-0.0007	0.0002	-0.0005	0.0001	0.0000	-0.0004			*0.0000*
Announcement days			0.0171		-0.0185	0.0260	0.0134	0.0029	0.0041	-0.0485			*-0.0012*
Rating Actions													
Anova F-statistic, p-value	0.06	0.94	0.91	0.86	0.00	0.05	0.04	0.04	0.03	0.94	0.08	0.10	*0.01*
Positive announcements	-0.0111	0.0019	0.0074	-0.0047	-0.0575	-0.0269	0.0000		-0.0890		-0.0017	-0.0600	*-0.0246*
Non-announcement days	0.0004	0.0001	-0.0003	0.0003	-0.0007	0.0002	-0.0005	0.0001	0.0000	-0.0004	0.0004	0.0004	*0.0000*
Negative announcements	0.0393		0.0144	0.0145	0.0216	0.0216	-0.0746	-0.0871	-0.0057	0.0044	-0.0283	0.0086	*-0.0053*
U.S. Federal Funds Rate													
Anova F-statistic, p-value	0.98	0.43	0.04	0.96	0.12	0.01	0.63	0.51	0.81	0.25	0.39	0.65	*0.01*
Non-announcement days	0.0004	0.0001	-0.0003	0.0003	-0.0007	0.0002	-0.0005	0.0001	0.0000	-0.0004	0.0004	0.0004	*0.0000*
Announcement days	0.0002	0.0069	-0.0187	0.0000	-0.0115	-0.0139	-0.0039	-0.0094	-0.0023	-0.0176	-0.0050	-0.0025	*-0.0068*

Source: Authors' estimates.

The table presents p-values and means for the ANOVA test of mean equality by the type of announcement, by country, and for the entire panel. The test compares the mean daily percentage changes in EMBI spreads on announcement and non-announcement days. Overlapping announcements are excluded from the sample for the purposes of this test.

Table 4. Variance Equality Tests

	Brazil	Chile	China	Colombia	Korea	Malaysia	Mexico	Poland	S. Africa	Thailand	Turkey	Venezuela	Panel
GDP													
F-test, p-value	0.00	0.15	0.20	0.00	0.00	0.00	0.09	0.00	0.91		0.68	0.00	0.00
Non-announcement days	0.0293	0.0348	0.0409	0.0271	0.0307	0.0241	0.0289	0.0606	0.0328		0.0282	0.0297	0.0389
Announcement days	0.0093	0.0256	0.0672	0.0041	0.0143	0.0143	0.0228	0.0313	0.0330		0.0322	0.0117	0.0274
Industrial Production													
F-test, p-value	0.98	0.00			0.74	0.92	0.90		0.33		0.67	0.01	0.00
Non-announcement days	0.0293	0.0347			0.0307	0.0241	0.0289		0.0328		0.0282	0.0297	0.0389
Announcement days	0.0294	0.0477			0.0322	0.0241	0.0294		0.0374		0.0302	0.0232	0.0328
CPI													
F-test, p-value	0.00	0.79	0.32	0.00	0.36	0.04	0.19	0.01	0.06	0.27	0.28		0.05
Non-announcement days	0.0293	0.0347	0.0409	0.0271	0.0307	0.0241	0.0289	0.0606	0.0328	0.0683	0.0282		0.0389
Announcement days	0.0456	0.0359	0.0468	0.0196	0.0277	0.0191	0.0258	0.0924	0.0280	0.0612	0.0319		0.0414
Trade Balance													
F-test, p-value	0.05	0.01	0.03	0.25		0.00	0.22		0.01			0.00	0.00
Non-announcement days	0.0293	0.0347	0.0409	0.0271		0.0241	0.0289		0.0328			0.0297	0.0389
Announcement days	0.0349	0.0271	0.0288	0.0242		0.0381	0.0366		0.0270			0.0063	0.0299
Fiscal Balance													
F-test, p-value	0.00						0.00	0.00					0.00
Non-announcement days	0.0293						0.0289	0.0606					0.0389
Announcement days	0.0219						0.0115	0.1120					0.0711
Short-Term Interest Rate													
F-test, p-value			0.58		0.85		0.42	0.54	0.21	0.21			0.00
Non-announcement days			0.0409		0.0307		0.0289	0.0606	0.0328	0.0683			0.0389
Announcement days			0.0366		0.0384		0.0235	0.0565	0.0442	0.1117			0.0599
Rating Actions†													
Levene test, p-value	0.85	0.02	0.00	0.09	0.91	0.28	0.83	0.19	0.84		0.00	0.89	0.05
Non-announcement days	0.0293	0.0347	0.0409	0.0271	0.0307	0.0241	0.0289	0.0606	0.0328		0.0282	0.0297	0.0389
Announcement days	0.0344	0.0137	0.0084	0.0136	0.0342	0.0387	0.0527	0.0364	0.0589		0.0704	0.0303	0.0489
U.S. Federal Funds Rate													
F-test, p-value	0.08	0.80	0.69	0.01	0.43	0.77	0.07	0.00	0.16	0.01	0.00	0.01	0.00
Non-announcement days	0.0293	0.0347	0.0409	0.0271	0.0307	0.0241	0.0289	0.0606	0.0328	0.0683	0.0282	0.0297	0.0389
Announcement days	0.0230	0.0339	0.0444	0.0193	0.0276	0.0259	0.0222	0.0362	0.0258	0.0486	0.0173	0.0207	0.0306

Source: Authors' estimates.

† absolute value, i.e. 0/1 dummy.

The table reports p-values and variances for the ANOVA test of variance equality by the type of announcement, by country and for the entire panel. The test compares the mean variances of the daily percentage changes in spreads on announcement and non-announcement days. Overlapping announcements are excluded from the sample for the purposes of this test.

Table 5. Country-by-Country OLS Regressions

	Brazil	Chile	China	Colombia	Korea	Malaysia	Mexico	Poland	S. Africa	Thailand	Turkey	Venezuela
Constant	-0.003 *	-0.003	0.001	-0.002	-0.001	0.001	-0.002	-0.001	0.001	-0.004	0.001	-0.005 ***
	0.002	*0.002*	*0.002*	*0.001*	*0.002*	*0.001*	*0.002*	*0.003*	*0.002*	*0.004*	*0.002*	*0.002*
Lagged dependent variable	0.133 ***	-0.197 ***	-0.219 ***	0.124 ***	0.024	0.003	0.086 ***	-0.161 ***	-0.171 ***	-0.139 ***	0.067 ***	0.090 ***
	0.024	*0.027*	*0.024*	*0.024*	*0.024*	*0.024*	*0.024*	*0.024*	*0.024*	*0.024*	*0.024*	*0.024*
GDP	-0.008	-0.017	0.013		0.000	-0.001	0.001	-0.008	-0.009		0.005	-0.006
	0.007	*0.012*	*0.011*		*0.007*	*0.007*	*0.006*	*0.014*	*0.009*		*0.008*	*0.007*
Industrial Production	-0.001	-0.007			0.000	0.000	0.002		-0.007	0.151 **	-0.002	-0.005
	0.004	*0.005*			*0.005*	*0.004*	*0.003*		*0.005*	*0.070*	*0.005*	*0.004*
CPI	0.002	-0.004	0.004	-0.003	-0.003	-0.008 *	0.000	-0.001	0.003	-0.001	-0.003	
	0.004	*0.005*	*0.006*	*0.004*	*0.005*	*0.005*	*0.004*	*0.009*	*0.004*	*0.010*	*0.004*	
Trade Balance	-0.003	-0.004	-0.011	0.005		-0.006	0.004		-0.001	-0.152 **	-0.008 *	0.003
	0.003	*0.005*	*0.010*	*0.004*		*0.004*	*0.005*		*0.004*	*0.069*	*0.005*	*0.015*
Fiscal Balance	-0.003						0.002	-0.009				
	0.004						*0.012*	*0.009*				
Short-Term Interest Rate			0.012				0.013	0.001	0.003	-0.042 *		
			0.016				*0.014*	*0.012*	*0.008*	*0.026*		
Rating Actions	-0.046 ***		-0.001		-0.051 ***	-0.017 **	0.027 *	0.062 *	-0.048 ***		0.012	
	0.011		*0.023*		*0.012*	*0.009*	*0.014*	*0.035*	*0.019*		*0.009*	
U.S. Federal Funds Rate	0.001	-0.001	-0.014	-0.001	-0.008	-0.013 **	-0.005	-0.001	-0.002	-0.014	-0.006	-0.003
	0.006	*0.008*	*0.008*	*0.006*	*0.006*	*0.005*	*0.006*	*0.013*	*0.007*	*0.015*	*0.006*	*0.006*

Source: Authors' estimates.

***, **, and * indicates signifiance on the 1 percent, 5 percent, and 10 percent level.

The table reports coefficients and robust standard errors of country-by-country OLS regressions of the daily percentage change in EMBI spreads on announcement dummies. For all indicators, except rating actions, independent variables are 0/1 dummies for announcement days. For rating actions, the independent variable is measured as -1, 0, and 1, with -1 indicating a negative change, 0 no change, and +1 a positive change in the rating or outlook on creditworthiness. All regressions control for days-of-the-week effects.

Table 6. Country-by-Country GARCH Models

	Brazil	Chile	China	Colombia	Korea	Malaysia	Mexico	Poland	S. Africa	Thailand	Turkey	Venezuela
Mean equation												
Constant	-0.0004	-0.0003	-0.0011	-0.0006	-0.0009	0.0004	-0.0011 *	-0.0020 *	-0.0014 **	-0.0006	-0.0006	-0.0005
	0.0006	*0.0007*	*0.0010*	*0.0006*	*0.0007*	*0.0009*	*0.0006*	*0.0011*	*0.0007*	*0.0023*	*0.0006*	*0.0005*
Lagged dependent variable	0.1226 ***	-0.0916 ***	-0.2815 ***	0.1082 ***	0.0005	0.0040	0.0522 *	-0.1729 ***	-0.1075 ***	-0.1916 ***	0.1110 ***	0.0787 ***
	0.0246	*0.0327*	*0.0364*	*0.0261*	*0.0306*	*0.0393*	*0.0281*	*0.0304*	*0.0279*	*0.0430*	*0.0271*	*0.0268*
GDP	-0.0081	-0.0236 ***	-0.0005		0.0043	0.0003	-0.0011	-0.0096	-0.0037		0.0062	-0.0067 **
	0.0079	*0.0057*	*0.0066*		*0.0052*	*0.0049*	*0.0038*	*0.0153*	*0.0045*		*0.0098*	*0.0030*
Industrial Production	-0.0011	-0.0029			-0.0031	-0.0022	-0.0019		-0.0048	0.1483	0.0024	-0.0052 *
	0.0024	*0.0104*			*0.0029*	*0.0083*	*0.0028*		*0.0062*	*0.6070*	*0.0036*	*0.0028*
CPI	0.0005	-0.0042	0.0016	-0.0017	-0.0106	-0.0073	0.0011	0.0032	0.0001	-0.0074	-0.0025	
	0.0027	*0.0033*	*0.0048*	*0.0026*	*0.0113*	*0.0045*	*0.0030*	*0.0045*	*0.0023*	*0.0057*	*0.0031*	
Trade Balance	-0.0032	-0.0057	-0.0089	0.0054 *		-0.0048	0.0006		0.0002	-0.1663	-0.0076	0.0039
	0.0029	*0.0037*	*0.0083*	*0.0032*		*0.0049*	*0.0057*		*0.0038*	*0.6064*	*0.0056*	*0.0372*
Fiscal Balance	-0.0013						0.0054	-0.0030				
	0.0023						*0.0071*	*0.0063*				
Short-Term Interest Rate			0.0104				0.0032	0.0093	0.0021	-0.0423	0.0017	
			0.0070				*0.0095*	*0.0067*	*0.0072*	*0.0479*	*0.0080*	
Rating Actions	-0.0245 *		0.0953 ***		-0.0480	-0.0189 **	0.0134	0.0676	-0.0662 **			-0.0267 *
	0.0137		*0.0262*		*0.0469*	*0.0080*	*0.0394*	*0.0637*	*0.0270*			*0.0141*
U.S. Federal Funds Rate	-0.0042	0.0005	-0.0071	-0.0025	-0.0182 ***	-0.0170 ***	-0.0092	-0.0001	0.0052	-0.0274	-0.0066	-0.0018
	0.0067	*0.0094*	*0.0066*	*0.0035*	*0.0039*	*0.0045*	*0.0057*	*0.0156*	*0.0041*	*0.0349*	*0.0071*	*0.0023*
Variance equation												
Constant	0.0000 *	0.0003 ***	0.0011 ***	-0.0001	0.0006 ***	0.0000	0.0000	0.0000	-0.0001 ***	0.0010 ***	0.0000	0.0001 **
	0.0000	*0.0001*	*0.0001*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0001*	*0.0000*	*0.0003*	*0.0000*	*0.0000*
ARCH(1)	0.1556 ***	0.1814 ***	0.1554 ***	0.0939 ***	0.0820 ***	0.0856 ***	0.1282 ***	0.1435 ***	0.1103 ***	0.1447 ***	0.1153 ***	0.2602 ***
	0.0176	*0.0199*	*0.0135*	*0.0095*	*0.0083*	*0.0175*	*0.0155*	*0.0179*	*0.0072*	*0.0150*	*0.0105*	*0.0236*
GARCH(1)	0.7963 ***	0.5348 ***	0.7724 ***	0.8694 ***	0.7704 ***	0.7833 ***	0.8019 ***	0.8241 ***	0.8513 ***	0.8092 ***	0.8269 ***	0.7034 ***
	0.0217	*0.0351*	*0.0140*	*0.0117*	*0.0155*	*0.0274*	*0.0239*	*0.0184*	*0.0115*	*0.0112*	*0.0139*	*0.0241*
GDP	-0.0001 **	-0.0002 ***	-0.0005 ***		-0.0003 ***	-0.0006 ***	-0.0003 ***	0.0004	-0.0003 ***		0.0002	-0.0001 ***
	0.0001	*0.0000*	*0.0001*		*0.0001*	*0.0001*	*0.0001*	*0.0003*	*0.0001*		*0.0001*	*0.0001*
Industrial Production	-0.0002 ***	0.0022 ***			-0.0002 ***	0.0001	0.0000		0.0001	-0.0058 ***	-0.0001 *	0.0002 ***
	0.0000	*0.0002*			*0.0000*	*0.0001*	*0.0001*		*0.0001*	*0.0013*	*0.0001*	*0.0000*
CPI	0.0001 **	-0.0003 ***	-0.0002	-0.0001 ***	0.0018 ***	-0.0004 ***	-0.0001	-0.0005 ***	-0.0004 ***	-0.0048 ***	0.0001 *	
	0.0001	*0.0001*	*0.0001*	*0.0000*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0000*	*0.0006*	*0.0000*	
Trade Balance	0.0003 ***	0.0001	-0.0003	0.0000		0.0005 ***	0.0003 **		0.0001	0.0082 ***	0.0002 ***	0.0000
	0.0001	*0.0001*	*0.0002*	*0.0000*		*0.0001*	*0.0001*		*0.0001*	*0.0008*	*0.0001*	*0.0002*
Fiscal Balance	-0.0002 ***						-0.0004 ***	0.0004 **				
	0.0000						*0.0001*	*0.0002*				
Short-Term Interest Rate			-0.0009 ***				0.0000	-0.0001	0.0000	-0.0014		
			0.0001				*0.0002*	*0.0002*	*0.0001*	*0.0014*		
Rating Actions	0.0001		0.0033 *		0.0030 ***	-0.0002	-0.0005 **	-0.0004	0.0002		0.0005 ***	0.0005
	0.0002		*0.0019*		*0.0006*	*0.0002*	*0.0002*	*0.0007*	*0.0004*		*0.0002*	*0.0004*
U.S. Federal Funds Rate	0.0001	0.0001	-0.0007 ***	0.0000	-0.0002 ***	-0.0004 ***	0.0001	-0.0005 **	-0.0001	0.0058 ***	0.0000	-0.0002 ***
	0.0001	*0.0002*	*0.0002*	*0.0000*	*0.0001*	*0.0001*	*0.0001*	*0.0002*	*0.0001*	*0.0004*	*0.0001*	*0.0000*

Source: Authors' estimates.

***, **, and * indicates signifiance on the 1 percent, 5 percent, and 10 percent level.

The table reports coefficients and robust standard errors of country-by-country GARCH models of the daily percentage change in EMBI spreads. For all indicators, except rating actions, independent variables are 0/1 dummies for announcement days. For rating actions, the independent variable is measured as -1, 0, and 1, with -1 indicating a negative change, 0 no change, and +1 a positive change in rating or outlook in the mean equation and as a 0/1 dummy variable in the variance equation. The variance equation controls for days-of-the-week effects.

Table 7. Dynamic Panel Regressions

	Basic Model	Country Effects	Region Effects	Year Effects
Constant	-0.0011 *	-0.0007	-0.0008	0.0018
	0.0006	0.0011	0.0007	0.0013
Lagged dependent variable	-0.0885 ***	-0.0886 ***	-0.0886 ***	-0.0905 ***
	0.0070	0.0070	0.0070	0.0070
GDP	-0.0018	-0.0018	-0.0018	-0.0017
	0.0031	0.0031	0.0031	0.0031
Industrial Production	-0.0021	-0.0021	-0.0022	-0.0020
	0.0018	0.0018	0.0018	0.0018
CPI	-0.0007	-0.0007	-0.0007	-0.0006
	0.0016	0.0016	0.0016	0.0016
Trade Balance	-0.0026	-0.0027	-0.0027	-0.0026
	0.0018	0.0019	0.0018	0.0019
Fiscal Balance	-0.0059 *	-0.0059 *	-0.0060 *	-0.0058 *
	0.0035	0.0035	0.0035	0.0035
Short-Term Interest Rate	-0.0008	-0.0006	-0.0008	-0.0005
	0.0049	0.0049	0.0049	0.0049
Rating Actions	-0.0131 ***	-0.0130 **	-0.0131 **	-0.0129 **
	0.0051	0.0051	0.0051	0.0051
U.S. Federal Funds Rate	-0.0064 ***	-0.0064 ***	-0.0064 ***	-0.0064 ***
	0.0024	0.0024	0.0024	0.0024
Day of week effects	Yes	Yes	Yes	Yes
Country effects	No	Yes	No	Yes
Region effects	No	No	Yes	No
Year effects	No	No	No	Yes

Source: Authors' estimates.
***, **, and * indicates significance on the 1 percent, 5 percent, and 10 percent level.
The table reports coefficients and robust standard errors for dynamic panel regressions of the daily percentage change in EMBI spreads on announcement dummies. The sample includes 19,900 observations. For all indicators, except rating actions, independent variables are 0/1 dummies for announcement days. For rating actions, the independent variable is measured as -1, 0, and 1, with -1 indicating a negative change, 0 no change, and +1 a positive change in rating or outlook. Country effects are dummy variables for individual countries. Region effects are dummies for three regions: Asia, Europe and Africa, and Latin America. Year effects are time-specific dummy variables.

Table 8. Panel GARCH Models

	Basic Model	Country Effects	Region Effects	Year Effects	Three Day Event Window
Mean equation					
Constant	-0.0006 ***	-0.0004 *	-0.0006 ***	-0.0007 ***	-0.00051 **
	0.0002	*0.0002*	*0.0002*	*0.0002*	*0.00020*
Lagged dependent variable	-0.0186 ***	-0.0155 *	-0.0183 **	-0.0154 **	-0.02276 ***
	0.0071	*0.0082*	*0.0072*	*0.0074*	*0.00734*
GDP	-0.0033 *	-0.0050 ***	-0.0035 **	-0.0036 **	-0.00047
	0.0017	*0.0015*	*0.0017*	*0.0016*	*0.00097*
Industrial Production	-0.0026 **	-0.0023	-0.0026 **	-0.0024 *	-0.00064
	0.0012	*0.0016*	*0.0012*	*0.0013*	*0.00075*
CPI	-0.0011	-0.0003	-0.0011	-0.0010	-0.00111 *
	0.0009	*0.0012*	*0.0009*	*0.0009*	*0.00059*
Trade Balance	-0.0015	-0.0009	-0.0014	-0.0016	-0.00024
	0.0013	*0.0017*	*0.0013*	*0.0013*	*0.00077*
Fiscal Balance	-0.0010	-0.0016	-0.0013	-0.0026	0.00003
	0.0020	*0.0022*	*0.0019*	*0.0020*	*0.00129*
Short-Term Interest Rate	0.0044	0.0042	0.0043	0.0049	0.00063
	0.0041	*0.0043*	*0.0040*	*0.0037*	*0.00225*
Rating Actions	-0.0117 ***	-0.0091 *	-0.0118 ***	-0.0121 ***	-0.00697 ***
	0.0030	*0.0048*	*0.0031*	*0.0032*	*0.00206*
U.S. Federal Funds Rate	-0.0048 ***	-0.0059 ***	-0.0048 ***	-0.0040 ***	-0.00144 *
	0.0016	*0.0017*	*0.0015*	*0.0015*	*0.00084*
Variance equation					
Constant	0.00000	0.00002	0.00000	0.00003 ***	0.00022 ***
	0.00001	*0.00002*	*0.00001*	*0.00001*	*0.00001*
ARCH(1)	0.10707 ***	0.12997 ***	0.10976 ***	0.11690 ***	0.12959 ***
	0.00283	*0.00567*	*0.00295*	*0.00363*	*0.00397*
GARCH(1)	0.82685 ***	0.72722 ***	0.81979 ***	0.77358 ***	0.75965 ***
	0.00356	*0.00964*	*0.00384*	*0.00571*	*0.00556*
GDP	-0.00015 ***	-0.00032 ***	-0.00016 ***	-0.00016 ***	-0.00008 ***
	0.00002	*0.00002*	*0.00002*	*0.00001*	*0.00001*
Industrial Production	-0.00001	0.00001	0.00001	0.00006 ***	0.00002 ***
	0.00001	*0.00003*	*0.00001*	*0.00002*	*0.00001*
CPI	0.00000	-0.00008 ***	-0.00001	-0.00005 ***	-0.00002 ***
	0.00001	*0.00003*	*0.00001*	*0.00001*	*0.00001*
Trade Balance	0.00016 ***	0.00018 ***	0.00016 ***	0.00015 ***	0.00004 ***
	0.00002	*0.00004*	*0.00002*	*0.00002*	*0.00001*
Fiscal Balance	-0.00016 ***	-0.00035 ***	-0.00017 ***	-0.00020 ***	-0.00005 ***
	0.00003	*0.00000*	*0.00003*	*0.00003*	*0.00001*
Short-Term Interest Rate	0.00024 ***	-0.00005	0.00019 ***	0.00008	0.00010 ***
	0.00007	*0.00011*	*0.00006*	*0.00007*	*0.00003*
Rating Actions	0.00019 ***	0.00049 ***	0.00018 ***	0.00021 ***	0.00009 ***
	0.00004	*0.00013*	*0.00004*	*0.00006*	*0.00002*
U.S. Federal Funds Rate	-0.00008 ***	-0.00016 ***	-0.00007 ***	-0.00006 ***	-0.00003 ***
	0.00002	*0.00004*	*0.00002*	*0.00002*	*0.00001*
Day of week effects	Yes	Yes	Yes	Yes	Yes
Country effects	No	Yes	No	Yes	No
Region effects	No	No	Yes	No	No
Year effects	No	No	No	Yes	No

Source: Authors' estimates.

***, **, and * indicates signifiance on the 1 percent, 5 percent, and 10 percent level.

The table reports coefficients and robust standard errors for panel GARCH models of the daily percentage change in EMBI spread. For all indicators, except rating actions, independent variables are 0/1 dummies for announcement days. For rating actions, the independent variable is measured as -1, 0, and 1, with -1 indicating a negative change, 0 no change, and +1 a positive change in rating or outlook in the mean equation and as a 0/1 dummy variable in the variance equation. Country effects are fixed effects for countries. Region effects are dummies for three regional groups: Asia, Europe and Africa, and Latin America. Year effects are time-specific dummy variables. The last column reports results from using a three-day-event window, which defines an announcement event from the day preceeding to the day following the announcement.

Table 9. Controlling for Surprise Content of Announcements

	Surprises in Domestic Announcements	Surprises in Domestic and International Announcements
	(1)	(2)
Mean equation		
Constant	-0.00051	-0.00047
	0.00036	*0.00032*
Lagged dependent variable	-0.03546 ***	-0.03217 ***
	0.00984	*0.00939*
GDP positive surprise	-0.00474	-0.00165
	0.01269	*0.01303*
GDP negative surprise	0.00115	-0.00486
	0.00354	*0.02781*
Industrial Production positive surprise	-0.00943 **	-0.00899
	0.00368	*0.00677*
Industrial Production negative surprise	0.00612	0.00379
	0.00505	*0.00475*
CPI positive surprise	-0.01658 ***	-0.01428 ***
	0.00545	*0.00494*
CPI negative surprise	-0.00898	-0.00846 *
	0.00550	*0.00448*
Trade Balance positive surprise	0.00300	0.00149
	0.00280	*0.00409*
Trade Balance negative surprise	0.00380	0.00419
	0.00404	*0.00355*
Fiscal Balance positive surprise	0.00792	0.00439
	0.01239	*0.01835*
Fiscal Balance negative surprise	0.00825	0.00693
	0.00612	*0.00720*
U.S. Payroll positive surprise		-0.00009 ***
		0.00003
U.S. Payroll negative surprise		0.00002
		0.00002
Variance equation		
Constant	0.00032 ***	0.00022 ***
	0.00000	*0.00001*
ARCH(1)	0.14194 ***	0.13358 ***
	0.00826	*0.00702*
GARCH(1)	0.66821 ***	0.70467 ***
	0.01527	*0.01185*
GDP positive surprise	-0.00084 ***	-0.00071 ***
	0.00022	*0.00008*
GDP negative surprise	-0.00051 *	-0.00044 **
	0.00030	*0.00022*
Industrial Production positive surprise	-0.00031	-0.00031 ***
	0.00020	*0.00003*
Industrial Production negative surprise	-0.00075 ***	-0.00067 ***
	0.00020	*0.00015*
CPI positive surprise	-0.00030	-0.00028
	0.00022	*0.00018*
CPI negative surprise	-0.00046 **	-0.00045 ***
	0.00020	*0.00015*
Trade Balance positive surprise	-0.00038 **	-0.00032 ***
	0.00016	*0.00005*
Trade Balance negative surprise	-0.00017	-0.00015
	0.00020	*0.00015*
Fiscal Balance positive surprise	-0.00124	-0.00105
	0.00104	*0.00074*
Fiscal Balance negative surprise	-0.00055	-0.00043
	0.00036	*0.00027*
U.S. Payroll positive surprise		0.00000
		0.00000
U.S. Payroll negative surprise		0.00000
		0.00000

Source: Authors' estimates.
***, **, and * indicates signifiance on the 1 percent, 5 percent, and 10 percent level.

The table reports coefficients and robust standard errors for a panel GARCH model of the daily percentage change in EMBI spread with the surprise contents of announcement as explanatory variables. Surprise is calculated as a standardized difference between the released indicator and the median expectation by market participants, based on Bloomberg surveys. The model in the first column uses domestic indicators only, while that in the second column includes announcements of U.S. non-farm payroll employment figures.

Table 10. Differentiating Announcement Effects by Credit Ratings and Crisis Occurrence

	Rating		Debt Crisis Periods†	
	Investment Grade	Non-Investment Grade	Non-crisis	Crisis
	(1)	(2)	(3)	(4)
Mean equation				
Constant	-0.00069 ***	-0.00002	-0.00099 ***	0.00058
	0.00024	0.00033	0.00020	0.00051
Lagged dependent variable	-0.08691 ***	0.09366 ***	-0.03177 ***	0.00700
	0.00940	0.01283	0.00873	0.01622
GDP	-0.00236	-0.00502	-0.00359 **	-0.00465
	0.00192	0.00322	0.00176	0.00385
Industrial Production	-0.00279	-0.00098	-0.00170	-0.00185
	0.00206	0.00165	0.00138	0.00403
CPI	-0.00098	0.00140	0.00061	-0.00589 ***
	0.00129	0.00167	0.00113	0.00198
Trade Balance	-0.00194	-0.00153	-0.00169	-0.00257
	0.00190	0.00197	0.00152	0.00320
Fiscal Balance	0.00109	-0.00137	0.00035	-0.00919 **
	0.00318	0.00194	0.00249	0.00459
Short-Term Interest Rate	0.00612	-0.02462 **	0.00434	0.00444
	0.00394	0.01131	0.00460	0.00836
Ratings Actions	-0.01479 ***	-0.00268	-0.01127 ***	-0.00722
	0.00522	0.00629	0.00400	0.00805
U.S. Federal Funds Rate	-0.00388 *	-0.00637 ***	-0.00471 **	-0.00826 **
	0.00213	0.00242	0.00187	0.00334
Variance equation				
Constant	0.00021 ***	0.00002 ***	0.00007 ***	-0.00011 ***
	0.00002	0.00000	0.00001	0.00000
ARCH(1)	0.14501 ***	0.10312 ***	0.13577 ***	0.10137 ***
	0.00562	0.00662	0.00457	0.00886
GARCH(1)	0.72485 ***	0.83405 ***	0.75767 ***	0.83878 ***
	0.00763	0.00889	0.00610	0.01129
GDP	-0.00022 ***	-0.00014 ***	-0.00022 ***	-0.00025 ***
	0.00003	0.00004	0.00002	0.00006
Industrial Production	0.00006 **	-0.00010 ***	-0.00002	0.00026 ***
	0.00003	0.00003	0.00002	0.00007
CPI	-0.00003	-0.00002	0.00003	-0.00029 ***
	0.00002	0.00003	0.00002	0.00005
Trade Balance	0.00011 ***	0.00017 ***	0.00019 ***	-0.00002
	0.00003	0.00003	0.00002	0.00006
Fiscal Balance	-0.00008	-0.00037 ***	-0.00017 ***	-0.00009
	0.00006	0.00003	0.00005	0.00009
Short-Term Interest Rate	0.00008	-0.00022	0.00029 ***	-0.00024
	0.00008	0.00026	0.00009	0.00016
Rating Actions	0.00029 **	0.00058 ***	0.00030 ***	0.00030
	0.00012	0.00012	0.00007	0.00022
U.S. Federal Funds Rate	-0.00016 ***	-0.00007 **	-0.00005 **	-0.00040 ***
	0.00003	0.00004	0.00003	0.00007
Day of week effects	Yes	Yes	Yes	Yes

Source: Authors' estimates.

***, **, and * indicates signifiance on the 1 percent, 5 percent, and 10 percent level.

† Asia and Russia 1998, Turkey 2000-2001, Argentina 2001, and Brazil 1998-1999 and 2002.

The table presents coefficients and robust standard errors for panel GARCH models of the daily percentage change in EMBI spreads, for various subsamples. For all indicators, except rating actions, independent variables are 0/1 dummies for announcement days. For rating actions, the independent variable is measured as -1, 0, and 1, with -1 indicating a negative change, 0 no change, and +1 a positive change in rating or outlook in the mean equation and as a 0/1 dummy variable in the variance equation. Columns (1) and (2) compare announcement effects for bonds with the investment grade rating to those with the non-investment grade rating. Columns (3) and (4) split the sample by crisis periods, defined as the detrended global EMBI spread being larger than its sample period mean plus two standard deviations. All estimations control for days-of-the-week effects in the variance equation.

Table 11. Differentiating Announcement Effects by Degree of Transparency of Countries' Policies

	Relative Number of Releases		Economic Opacity Index		Magnitude of Revision	
	High Frequency	Low Frequency	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
Mean equation						
Constant	-0.00070 **	0.00002	-0.00046	-0.00054 **	-0.00042	-0.00028
	0.00033	0.00041	0.00051	0.00026	0.00026	0.00061
Lagged dependent variable	-0.04376 ***	-0.00988	-0.03272	-0.01249	-0.02479 ***	-0.02831
	0.01046	0.01458	0.01787 *	0.01089	0.00942	0.01810
GDP	-0.00264	-0.00615 **	-0.00660 *	-0.00049	-0.00346	-0.01129 ***
	0.00205	0.00244	0.00342	0.00222	0.00217	0.00373
Industrial Production	-0.00046	-0.00341	0.00023	-0.00336 **	-0.00301	-0.00226
	0.00217	0.00247	0.00266	0.00159	0.00187	0.00302
CPI	0.00245	-0.00511 ***	0.00094	-0.00347 *	-0.00163	0.00062
	0.00160	0.00197	0.00211	0.00182	0.00136	0.00299
Trade Balance	-0.00168	-0.00059	-0.00231	-0.00132	-0.00045	-0.00256
	0.00213	0.00278	0.00254	0.00222	0.00224	0.00315
Fiscal Balance	-0.00141	0.00314	-0.00054	0.00220	-0.00002	-0.00138
	0.00180	0.01509	0.00389	0.00394	0.00352	0.00454
Short-Term Interest Rate	0.00699	0.00251	0.00292	0.00648	0.00224	0.01122
	0.00499	0.00905	0.00911	0.00560	0.00510	0.01107
Rating Actions	-0.00904	-0.01453 *	-0.01957	0.00485	-0.00491	-0.02579 ***
	0.00563	0.00741	0.01537	0.00470	0.00446	0.00550
U.S. Federal Funds Rate	-0.00796 ***	-0.00644 ***	-0.00825 **	-0.00395 **	-0.00624 ***	-0.00710
	0.00248	0.00230	0.00389	0.00185	0.00178	0.00438
Variance equation						
Constant	0.00002	0.00033 ***	0.00024 ***	0.00008 ***	0.00010 ***	0.00015 ***
	0.00001	0.00003	0.00002	0.00001	0.00001	0.00002
ARCH(1)	0.14420 ***	0.12622 ***	0.13321 ***	0.09814 ***	0.10592 ***	0.16651 ***
	0.00681	0.01071	0.01189	0.00469	0.00490	0.01571
GARCH(1)	0.71509 ***	0.74099 ***	0.76524 ***	0.86305 ***	0.79162 ***	0.65733 ***
	0.00956	0.01823	0.01852	0.00503	0.00758	0.02765
GDP	-0.00032 ***	-0.00051 ***	-0.00051 ***	-0.00019 ***	-0.00028 ***	-0.00040 ***
	0.00004	0.00007	0.00010	0.00003	0.00003	0.00010
Industrial Production	-0.00008 *	-0.00011 **	-0.00012	-0.00009 ***	-0.00001	-0.00015
	0.00004	0.00006	0.00007	0.00002	0.00003	0.00009
CPI	0.00009 ***	-0.00017 ***	-0.00008	0.00019 ***	-0.00012 ***	0.00023 **
	0.00003	0.00005	0.00006	0.00002	0.00003	0.00011
Trade Balance	0.00026 ***	0.00001	0.00022 ***	-0.00007 ***	0.00020 ***	0.00033 ***
	0.00005	0.00006	0.00007	0.00003	0.00004	0.00011
Fiscal Balance	-0.00043 ***	-0.00053 ***	-0.00062 ***	-0.00016 ***	-0.00013 **	-0.00043 **
	0.00003	0.00018	0.00010	0.00006	0.00006	0.00017
Short-Term Interest Rate	0.00004	0.00027	0.00009	0.00015	0.00025 **	-0.00033
	0.00016	0.00022	0.00023	0.00010	0.00011	0.00035
Rating Actions	0.00003	0.00076 ***	0.00041	0.00044 ***	0.00038 ***	-0.00060 **
	0.00008	0.00024	0.00035	0.00008	0.00010	0.00028
U.S. Federal Funds Rate	-0.00022 ***	-0.00025 ***	-0.00016	-0.00012 ***	-0.00026 ***	0.00000
	0.00005	0.00005	0.00010	0.00003	0.00003	0.00016
Day of week effects	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimates.

***, **, and * indicates signifiance on the 1 percent, 5 percent, and 10 percent level.

This table presents coefficients and robust standard errors for panel GARCH models of the daily percentage change in spreads, for different subsamples. For all indicators, except rating actions, independent variables are 0/1 dummies for announcement days. For rating actions, the independent variable is measured as -1, 0, and 1, with -1 indicating a negative change, 0 no change, and +1 a positive change in rating or outlook in the mean equation and as a 0/1 dummy variable in the variance equation. The first two columns compare announcement effects in countries which publish more indicators than the sample median and countries which publish less. Estimations in columns (3) and (4) use the Economic Opacity Index as a measure of transparency. The last pair of estimations compare countries which make smaller than average revisions to the initially released figures and countries which tend to make large revisions, following the initial announcement. All estimations control for days-of-the-week effects in the variance equation.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.996088674
R Square	0.992192647
Adjusted R Square	-0.031229413
Standard Error	0.003605215
Observations	5

ANOVA

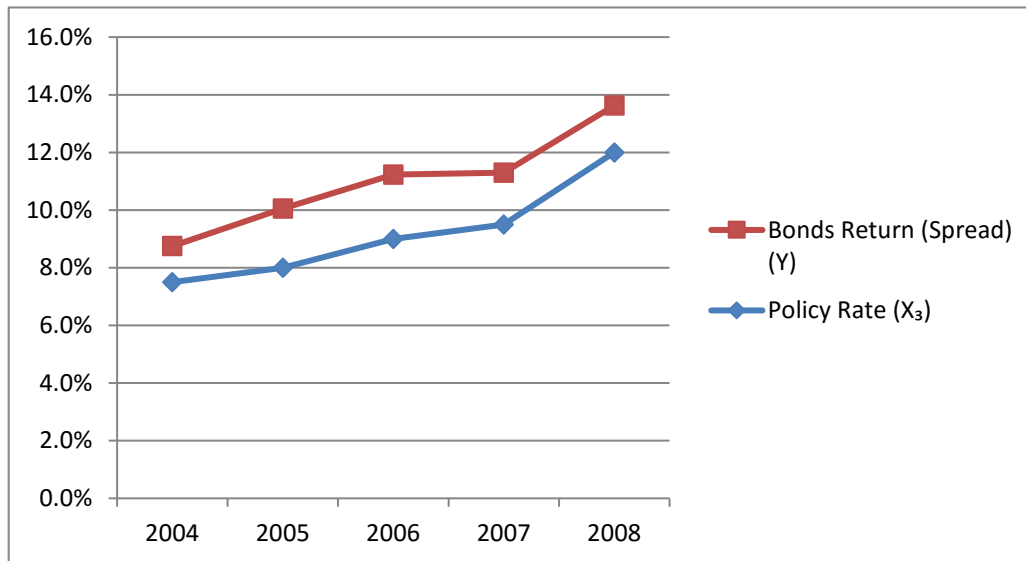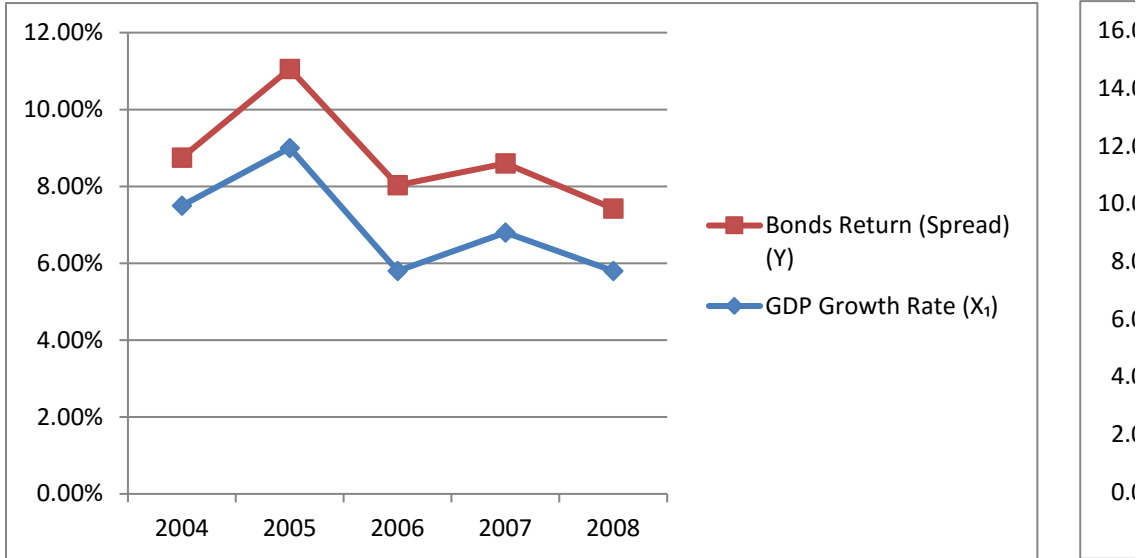|	df	SS	MS	F	Significance F
Regression	4	0.001651789	0.000412947	31.77109524	#NUM!
Residual	1	1.29976E-05	1.29976E-05		
Total	5	0.001664786			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
GDP Growth Rate (X_1)	0.103654662	0.075478738	1.373296167	0.400679698	-0.855393641	1.062702965
CPI (X_2)	0.061151622	0.109010199	0.560971563	0.67454238	-1.323954289	1.446257533
Policy Rate (X_3)	-0.160218198	0.15552396	-1.030183376	0.49053587	-2.136337474	1.815901078
Fiscal Deficit (As % of GDP) (X_4)	0.557250909	0.288653777	1.930516606	0.30426643	-3.110443074	4.224944893

Lower 95.0%	Upper 95.0%
#N/A	#N/A
-0.855393641	1.062702965
-1.323954289	1.446257533
-2.136337474	1.815901078
-3.110443074	4.224944893

Bonds chart 1

Year	Independent Variables			
	GDP Growth Rate (X_1)	CPI (X_2)	Policy Rate (X_3)	Fiscal Deficit (As % of GDP) (X_4)
2004	7.50%	4.60%	7.5%	2.40%
2005	9.00%	9.30%	8.0%	3.30%
2006	5.80%	7.90%	9.0%	4.20%
2007	6.80%	7.80%	9.5%	4.30%
2008	5.80%	12.00%	12.0%	4.00%

Dependent Variable Bonds Return (Spread) (Y)	No. of obs. of issues
1.25%	3
2.06%	7
2.23%	5
1.80%	13
1.63%	6
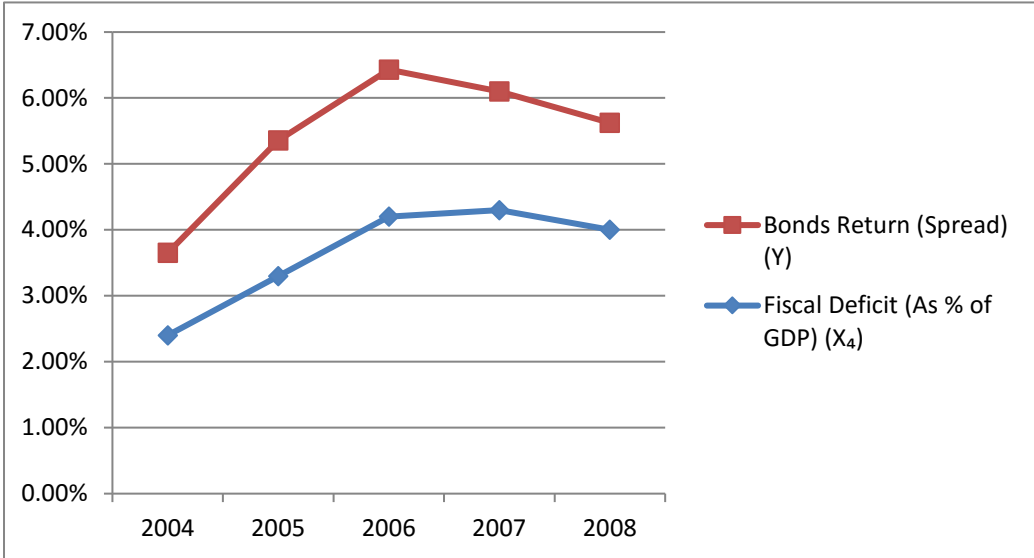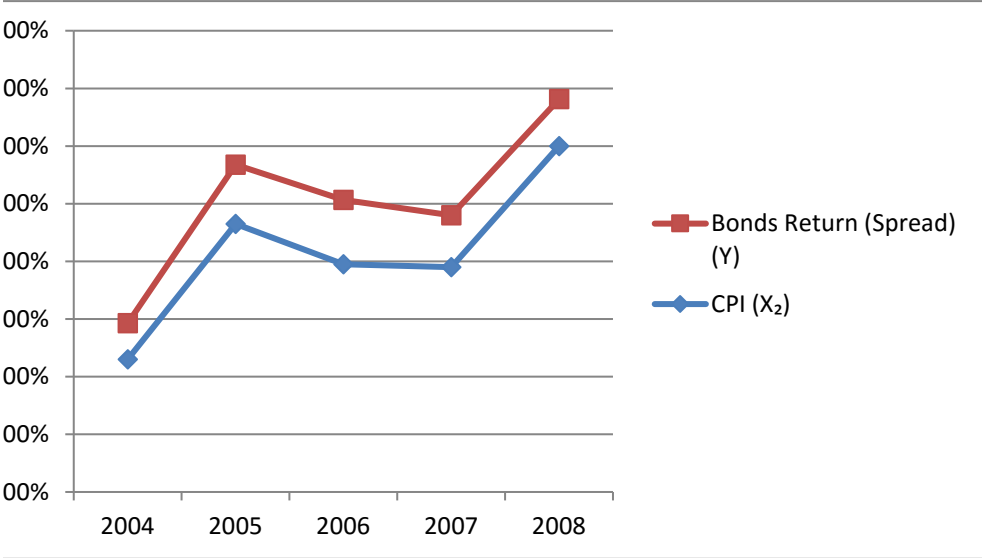
chart 2

ISSUING COMPANY	Base Rate	Spread	Coupon Rate	Rating	Rating Agency
2004 (Average Spread=1.25%)					
BANK ALFALAH LIMITED-TFC (23-11-04)	K 6	1.50%	0.17	AA-	PACRA
BANK AL-HABIB LIMITED-TFC (15-07-04)	K 6	1.50%	-	AA-	PACRA
SCB (PAK) LTD-TFC (20-01-04) (UNION BANK LTD - TFC (20-01-04))	PIB 5yrs	0.75%	-	AAA	PACRA
2005 (Average Spread=2.06%)					
JAHANGIR SIDDIQUI & COMPANY LIMITED-TFC (30-09-05)	K 6	1.75%	-	AA+	PACRA
ABN AMRO BANK (PCB)-TFC-10-02-05	K 6	1.90%	15.38%	A	PACRA
ASKARI BANK LIMITED-TFC (04-02-05)	K 6	1.50%	0.15	AA	PACRA
ASKARI BANK LIMITED-TFC (31-10-05)	K 6	1.50%	0.16	AA	PACRA
AZGARD NINE LIMITED-TFC (20-09-05)	K 6	2.40%	0.16	A+	PACRA
SONERI BANK LIMITED-TFC (05-05-05)	K 6	1.60%	-	A+	PACRA
TELECARD LIMITED - TFC (27-05-05)	K 6	3.75%	-	A	JCR-VIS
2006(Average Spread=2.23%)					
ALLIED BANK LIMITED - TFC (06-12-06)	K 6	1.90%	17.56%	A	PACRA
JAHANGIR SIDDIQUI & COMPANY LIMITED-TFC (21-11-06)	K 6	1.90%	-	AA	PACRA
PAKISTAN MOBILE COMMUNICATION LIMITED-TFC (31-05-06)	K 6	2.85%	-	AA	PACRA
SCB (PAK) LTD-TFC (01-02-06) (UNION BANK LTD-TFC (01-02-06))	K 6	2.00%	-	AAA	PACRA
SEARLE PAKISTAN LIMITED-TFC (09-03-06)	K 6	2.50%	-	A-	JCR-VIS
2007 (Average Spread=1.80%)					
AL ABBAS SUGAR MILLS LTD - TFC (21-11-07)	K 6	1.75%	17.17%	A	PACRA
BANK AL-HABIB LIMITED-TFC (07-02-07)	K 6	1.70%	-	AA-	PACRA
CENTURY PAPER & BOARD MILLS LIMITED - SUKUK (25-09-07)	K 6	1.35%	-		
ENGRO CHEMICAL PAKISTAN LTD-TFC (30-11-07)	K 6	1.55%	-	AA-	PACRA
ESCORTS INVESTMENT BANK LIMITED-TFC (15-03-07)	K 6	2.50%	-	A+	PACRA
FAYSAL BANK LTD. (12-11-2007)	K 6	1.40%	-	AA-	PACRA
JAHANGIR SIDDIQUI & COMPANY LIMITED - TFC (04-07-07)	K 6	1.70%	-	AA	PACRA
KASB SECURITIES LIMITED - TFC (27-06-07)	K 6	1.90%	-	AA+	PACRA
KASH FOUNDATION - TFC (05-11-07)	K 3	2.45%	-	A	Pacra
NEW ALLIED ELECTRONIC (15-05-2007)	K 3	2.75%	-	A-	JCR-VIS
PAK AMERICAN FERTILIZER LTD. (30-11-07)	K 6	1.75%	-	AA-	PACRA
PAK MOBILE 3-YEARS (01-10-2007)	K 6	1.30%	-	AA	
PAKISTAN MOBILE COMMUNICATION LIMITED-TFC (01-10-07)	K3	1.30%			
2008 (Average Spread=1.63%)					
ENGRO CHEMICAL PAKISTAN LTD - TFC (18-03-08) (PRP-I)	K 6	1.70%	-	AA-	PACRA
MAPLE LEAF CEMENT FACTORY - SUKUK (07-01-08)	K 6	1.75%	-		
NIB BANK LIMITED-TFC (05-03-08)	K 6	1.15%	-	A	PACRA
PAK ARAB FERTILIZERS (28-02-08)	K 6	1.50%	-	AA	PACRA
PAKISTAN MOBILE COMMUNICATION LIMITED-TFC (28-10-08)	K 6	1.65%			
SAUDI PAK LEASING COMPANY LTD-TFC (13-03-08)	K 6	2.00%	-	AA	PACRA

Average Spread

1.25%

2.06%

2.23%

1.80%

1.63%