

Essay on spillovers from advanced economics (AE) to emerging economics (EM) during the global financial crisis

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Abstract

Purpose – The purpose of this paper is to estimate the bond market linkages between emerging markets (EM) and advanced markets (AM) yields by estimating yield equations for EMs as a function of AM yields and illustrating the quantitative macroeconomic effects on EMs of global yield shocks in a multi-country dynamic stochastic general equilibrium modeling model.

Design/methodology/approach – The research used a monthly sample of 45 advanced and EM economies covering the period 1998Q1 to 2010Q6. In this paper, the authors have shown that, indeed, there is a spillover effect from AD to EM countries and that most transmission channels, although they vary in significance, are all economically relevant. The main results of the paper underline the importance of international spillover across countries in the financial market. The strongest international transmission of shocks to EM is from the USA and the UK.

Findings – The authors find evidence that shocks in the volatility index and commodity fuels have a positive and significant impact on EM bond yield. Moreover, shocks in three-month US treasury bills, credit default swap, the London gold price and the Brent petrol price have a significant negative impact on EM bond yield. Finally, the result shows that global external shocks are found to be significant in determining bond yield and causing spillover into the EM.

Originality/value – These findings are especially important for policy makers in understanding the transmission of shocks in the bond market across different countries, as well as for risk management.

Keywords Financial risk and risk management, Emerging market, Spillover effect, International lending and debt problems, Financial meltdown, International policy coordination and transmission, Bond market linkage, Advanced market

Paper type Research paper

1. Introduction

Advanced markets (AM) and emerging markets (EM) compete in the same international bond market. Rising debt and deficit levels usually affect bond prices. There has been a surge in purchases of EM debt and a dip in buyers' appetite for US treasury bonds. This has sparked speculation that emerging nations have become the next safe haven for bond investors. EM bonds have enjoyed the best first quarter on record as new issuance has surged and interest rate spreads over US treasuries have narrowed to their lowest since 2008. Initially, investors viewed bonds in EMs as high-yield substitutes for equities.



Although EM bonds are conspicuous for their high average returns, these are associated with idiosyncratic country factors under different sources of risk compared with developed market bonds (Erb *et al.*, 1999). Sovereign bond markets in developing countries have sold a record \$157bn as of June 2010, a 42 per cent increase over the same period in 2009 (Roxburgh *et al.*, 2011). This paper underlined the importance of international spillover, both within asset classes and across financial markets. Their results show evidence that international spillover is significant both statistically and economically. For instance, shocks to US short-term interest rates exert a substantial influence on euro area bond yields and equity markets and, in fact, explain as much as 10 per cent of overall euro area bond markets and equity markets.

There are some indications that the sensitivity of EM yield to AM yield has increased recently[1]. This paper investigates the bond market linkages between EM and AM yields by estimating yield equations for EMs as a function of AM yields and by illustrating the quantitative macroeconomic effects on EMs of global yield shocks in a multi-country model. This paper has one important implication for investors and policymakers, especially during this period of recovery from financial crisis. The total debt level in many advanced countries has risen significantly over the past few years. For example, the average debt levels of the five countries with systematic financial crises (Iceland, Ireland, Spain, the UK and the USA) are up by 75 per cent since 2007. Similarly, the debt of countries that have not experienced a major financial crisis increased on average about 20 per cent in real terms between 2007 and 2009 (Reinhart and Rogoff, 2009). Expectedly, this spike in debt has been a reflection of the huge annual deficit of these countries. Furthermore, with financial markets becoming increasingly integrated, financial market linkages are believed to be an increasingly important mechanism for the transmission of shocks across countries. Since the early 1990s, there has been a tremendous increase in financial liberalization in developing countries and a substantial increase in financial interdependencies between Latin America and the USA (Calvo and others, 1993, Edwards and others, 2003, cited in Benelli and Ganguly, 2007). This process in turn raises the question of whether increased financial liberalization and interdependence have magnified the spillovers of financial shocks. For a more comprehensive and clearer investigation of the spillover between EM bond yield and advanced economies bond yield, we consider the country-specific risk, the development of local financial markets and the structural break of capital flows in predicting EM bond returns.

Both advanced economies (AM) and emerging economies (EM) compete in the same international bond market, and rising debt and deficit levels in AMs will increase the risk of interest rate shocks from AMs to EMs. Recently, there has been a surge in purchases of EM debt and a marked dip in buyers' appetite for USA treasury bonds have sparked speculation that emerging nations have become the next safe haven for bond investors. EM bonds have enjoyed the best first quarter on record as new issuance surged and interest rate spreads over USA treasuries have narrowed to their lowest since 2008. Sovereign bond markets in developing countries have sold a record \$157bn in 2010, a 42 per cent jump over the same period in 2009, which marked the previous record, according to data from Dealogic Holdings plc. There are some indications that the sensitivity of EM yield to AM yield has increased recently. What could be the factors responsible for the redistribution of capital in these economies?

This paper investigates the bond market linkages between EM and AM yields by estimating yield equations for EMs as a function of AM yields and illustrates the quantitative macroeconomic effects on EMs of global yield shocks in a multi-country dynamic stochastic general equilibrium modeling (DSGE) model. It will also provide some

insight in the recent situation in the EMs. These will have an important implication for investors and policymakers alike, especially during this period of recovery from financial crises. An understanding of the extent of co-movement between EM and AM is essential for the structure and adjustment of their international portfolio.

2. Advanced economies and emerging economies compete in the same market

Between 1992 and 2000 the rapid growth in USA real output and aggregate demand propelled the global economy. The favorable cyclical position and prudent fiscal policies led to a strong fiscal outlook, while higher productivity growth and a rapidly advancing stock market resulted in an investment boom and an expansion of the USA external deficit. To date, both the USA and the rest of the world have benefited from the US fiscal stimulus. It has had a positive impact on the USA and foreign output – as the USA has increased imports from the rest of the world – without yet putting significant pressure on long-term interest rates. The US fiscal expansion provided important support for global demand at a time when monetary policies – particularly in the USA and Japan are volatile. However, many observers, including IMF staff, have expressed concern about the medium-term effects of the USA fiscal expansion and pointed out the potential implications of sustained and large US fiscal deficits for global interest rates, productivity and income – especially as monetary policy returns to a more neutral stance and investment revives – as well as for the US current account deficit, which has reached record high levels, and the value of the US dollar going forward. The US federal government's unified budget has shifted from a surplus of 21/2 per cent of gross domestic product (GDP) (\$236bn) in FY2000 to an estimated deficit of 41/2 per cent of GDP (\$521 billion) in FY2004. (Mühleisen and Towe, 2004).

A fiscal expansion of the AM can affect the world economy through four key channels. First, it boosts economic activity at home and abroad by means of the demand side effect through the fiscal multiplier. The impact on activity depends on the composition of the expansion and the resulting upward pressures of the interest rate and the exchange rate. For EM economies, for instance, the changes in US interest rates and exchange rates induced by US fiscal deficits can generate additional short-term effects through a range of financial channels. Higher US interest rates in particular tend to reduce net capital inflows into EMs. As much of the EM public debt is indexed to USA or world interest rates or in EMs where exchange rates are connected to the dollar, a deterioration of the fiscal position of the US market can lead to an intervention that tightens the monetary condition. Changes in the AM's exchange and interest rates can also affect the EM's private balance sheet through the mechanism called a financial accelerator. Moreover, shocks that lead to an appreciation of the US dollar – and thereby a depreciation of the EM's currency – tend to worsen the corporate balance sheets of the EMs, especially when these are borrowed in dollars and produce goods for domestic markets which can again lead to an increase in risk premium and exacerbate an economic contraction.

3. Overview of transmission of spillover

Many authors have analyzed the spillover effect in the past. For example, Hilliard (1979) analyzed the correlation between world stock industrial indices and while testing the daily data of ten world exchanges he found evidence of a very close intracontinental relationship among market indices. No traces of intercontinental relationships were found. Hamao *et al.* (1990) analyzed two first-moment spillover effects between the UK, the US and the Japanese stock return market using the GARCH(1,1)Model. They reported highly significant spillover effects from the US and UK markets to the Japanese market. Morck *et al.* (2000) emphasize important characteristics of EMs' financial returns. They found that the stock prices in EMs

usually move in the same direction as the developed markets that exhibit nonsynchronous movement (Figures 1 and 2).

4. Literature review

Both economic theory and empirical findings suggest that the openness and development of financial markets are likely to contribute to economic growth by removing frictions and

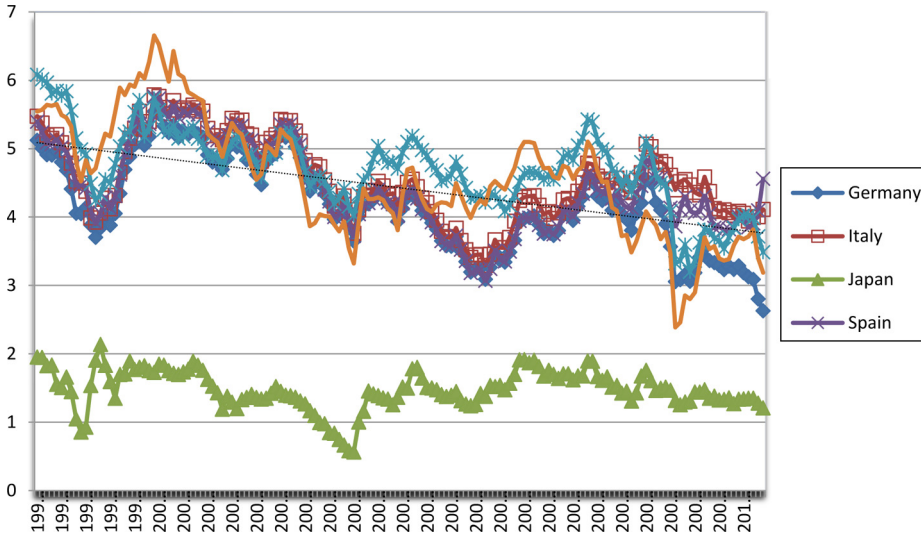


Figure 1. Advanced economics bond yield

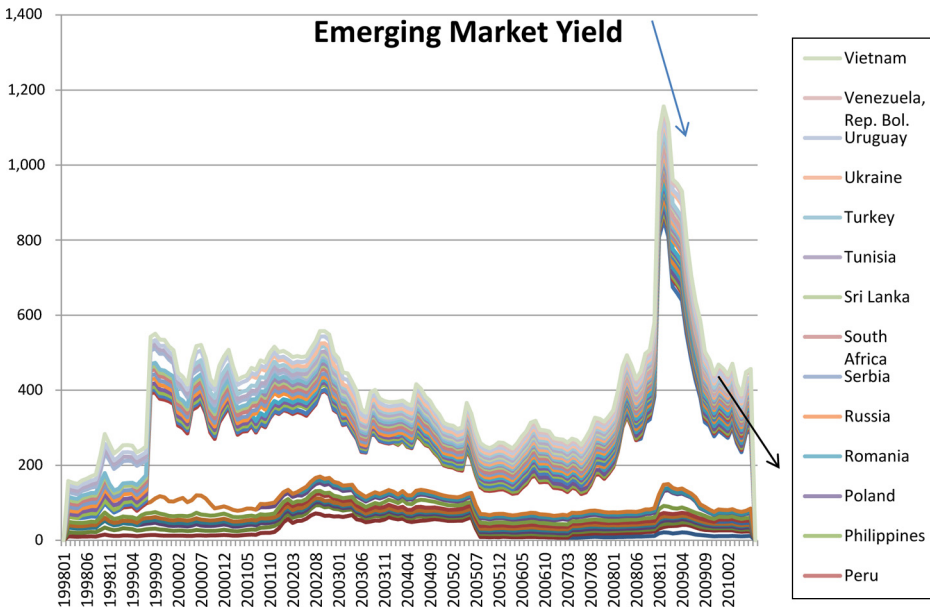


Figure 2. Some emerging market bond yields

barriers to trade and by allocating capital more efficiently. Financial development in particular reflects the economic, political, and sociological situation as well as the legal and regulatory environment in a country (La Porta *et al.*, 1997; Levine, 1999; Arestis and Sawyer, 2002; Rajan and Zingales, 2003). In studies on EM debt securities, the bond return has been measured by either bond yields or bond index returns. Bond yields are derived from yields to maturity and the value of bond yields is limited by the holding periods. The bond index returns capture accrued and amortization payments and capital gains (losses) on a daily, weekly, monthly or other period basis.

Many literatures have considered factors that affect the spillover among different countries. These factors include financial development, macroeconomic fundamentals, and country risk with regard to local financial development. Many literatures [2] have also considered the degree of financial development in both the stock and bond markets of an EM country. The financial development of the local stock market is measured by the difference between the country's stock index and the T-bond rate for bonds of similar maturity (SER). Exchange rates have been the portent of financial crises in EM countries. For instance, a high local short-term interest rate often leads to the local currency's depreciation and any interest rate instability may hamper the growth of the bond market and reduce the government's debt service capacity (Eichengreen and Luengnaruemitchai, 2004; Jostova, 2006). Inflation rates are related to exchange rates as well as imports and exports and also affect the sovereign debt. The amount of fiscal balances is negatively associated with bond market capitalization. Eichengreen and Luengnaruemitchai (2004) find that budget deficits are a significant determinant of public debt market capitalization. Idiosyncratic country risk is regarded as a possible determinant of emerging equity or bond market returns (Erb *et al.*, 1996, 1999, 2000). International investors can get an understanding of the market conditions of emerging countries through the country risk ratings. Political risk ratings, financial risk ratings and local bond yield spreads can help investors to understand the country risk. The bond yield spread is the difference between the EM bond yield and the USA T-B rate. A higher bond spread means that an investor requires a higher risk premium in which case the bond price will decrease. Erb *et al.* (1999) find evidence of a significantly negative relationship between the country risk rating and the emerging bond spread.

Financial markets have become increasingly integrated, both domestically and internationally. The nature of this integration and the transmission channels through which shocks dissipate are, however, still not that well understood. One strand of literature focuses exclusively on spillovers across different domestic asset prices, whereas another concentrates on international spillovers only for individual asset prices. However, understanding the increasingly close domestic and international linkages of asset prices requires a complete and comprehensive modeling of all transmission channels that are at play. (Ehrmann and Fratzscher, 2005).

Their paper underlined the importance of international spillover, both within asset classes as well as across financial markets. Their result shows evidence that international spillover is significant both statistically and economically. For instance, shocks to the US short-term interest rate exerts a substantial influence on euro area bond yields and equity markets and explain as much as 10 per cent of overall euro area bond and equity markets. According to the international capital asset pricing model asset returns are influenced by local idiosyncratic risk factors and common global market risk factors. Previous research indicates that emerging bond returns are determined by world and local factors (Barr and Priestley, 2004; Jostova, 2006; Jüttner *et al.*, 2006; Lin and Ye, 2007).

5. Structural break in capital flows

The rapid growth of cross-border capital investment in recent years has generated much interest in the behavior and impact of international investors, especially in regard to investment in EMs. According to [Bekaert and Harvey \(2000, Bekaert et al., 2005\)](#) an increase in the flow of foreign capital into EMs may signal market openness and liberalization. As market liberalization may enhance the efficiency of the capital market as well as reduce the cost of capital, it could affect future economic growth in EM countries ([Bekaert and Harvey, 2000, Bekaert et al., 2005, 2007](#)).

Linkages across domestic financial markets are increasingly better understood. Earlier researchers on the spillovers across different domestic asset prices often find a positive correlation between stock returns and bond yields, such as [Shiller and Beltratti \(1992\)](#) and to some extent [Barsky \(1989\)](#) and [Campbell and Ammer \(1993\)](#) for the USA, though their studies are mostly based on low-frequency data. More recent work finds that equity prices react strongly to monetary policy shocks in the USA ([Bernanke and Kuttner 2004; Ehrmann and Fratzscher, 2004](#)). At the same time, monetary policy has been shown to respond to equity markets ([Rigobon and Sack, 2003](#)). In a simultaneous analysis of bond prices, short-term interest rates and equity markets, [Rigobon and Sack \(2003\)](#) find that the causality of the transmission process may run in several directions. Interest rates and equity prices may change from positive to negative depending on which of the asset prices are dominant in particular periods.

6. Macroeconomic fundamentals

The second group of variables represents macroeconomic fundamentals, which might have an impact on the long-term insolvency problem of a country. In recent years, the extent to which a country has been perceived to be well-managed or well-disciplined in its macroeconomic policymaking has given an important influence on the changes of yields it faces. The inflation rate (INF) can be regarded as a proxy for the quality of economic management: the higher the INF, the worse the economic management, and so, the higher the yield spread. The influence of international developments on a country's creditworthiness is examined through two variables that capture the effects of external shocks to a country's trade and financial flows. Shocks to a country's trade flows are represented by changes in a country's terms of trade (TOT). We expect that improvements in the TOT, *ceteris paribus*, would lead to a lower yield spread. The real exchange rate (RXI) is also included to measure the trade competitiveness of an economy. [Sachs \(1985\)](#) demonstrated the importance of exchange rate management and the trade regime to the debt crisis. [Cline \(1983\)](#) also claimed that inappropriate exchange rate policies in a number of LDCs were among the most important causes of the debt crises. Sustained real appreciation of these countries' currencies played a major role in the process of over-borrowing. A less competitive RXI or appreciation is expected to adversely affect the yield spread. This negative effect would be especially pronounced in the case of Latin American countries where overvalued currencies were one of the important causes of capital flight.

7. The model

7.1 Estimation of the yield equation from emerging market as a function of advanced market yields and other global factors

Many changes took place during the years in our sample, namely, 1998 to 2010. Some are aptly described as a continuous evolution such as increased linkages among global financial markets and the increased mobility of capital due to globalization, the rise in hedge funds, specialization, the Asian and Russian crises, and the recent global financial crises of 2008.

Given this background of financial market evolution and turbulence, it seems unlikely that there could be a single model or empirical framework that captures the entire spillover between EM and AM over the years. To fill in part of this gap, we developed a macroeconomic framework to estimate a yield equation for EMS as a function of AM yields.

7.1.1 Conceptual definition. Yield spread of a US dollar-denominated bond is typically defined as the difference in yield between that bond and a benchmark US treasury bond of a similar maturity. To assess the determinants of government bond spreads, we adopt a dynamic panel approach to estimate yield equation for EMs as a function of AM yield and other global factors.

A *bond*, simply defined, is a type of investment which is quite similar to an IOU. It is a loan in the form of a security with two basic components: the face value (principal) and the coupons (interest rate). It is a contract between the issuer and the bondholder to pay a certain amount of money in the future. The issuer of the bond promises to pay the bondholder the principal and interest according to the terms and conditions listed in the bond. Many cities and countries issue bonds to fund new highways and other projects.

The definition of bond yield is the rate of return on the bond, which takes into account the sum of the interest payment, the redemption value at the bond's maturity, and the initial purchase price of the bond. Yield on the bond relates to the return on the capital you invest in the bond. You will come across the term "yield" quite often, as it relates to investing in bonds. The types of yields you will need to be aware of are listed below:

- *Current yield:* The current yield calculates the percentage of the return that the annual coupon payment provides to the investor. It calculates the percentage of the actual dollar coupon payment of the price the investor pays for the bond. This can be easily found by dividing the bond's coupon yield by its market price.
- *Coupon yield:* The annual interest rate established when the bond is issued.
- *Yield to maturity:* This is the return that investors receive on their entire investment in the bond.
- *Credit defaults swap (CDS):* A defaulted, triggered credit derivative. Most CDS settlements are physical whereby the protection seller buys a defaulted reference asset from protection buyers at face value. Cash settlement involves a net payment to the protection buyer equal to the difference between the reference asset face value and the price of the defaulted asset.
- *EM:* Developing countries' financial markets that are less than fully developed, but are nonetheless accessible to foreign investors.
- *LIBOR:* The London Interbank Offered Rate is an index of the interest rate at which banks offer to lend unsecured funds to other banks in the London wholesale money market.
- *VIX option index:* The VIX volatility option index. The volatility index (VIX) covers 1998Q1 till 2010Q6, and is the ticker for the Chicago Board Option Exchange. VIX is a popular measure of the implied volatility of S&P500 index option. A high value corresponds to a more volatile market and is therefore a more costly option which can be used to defray risk from volatility by selling option. It is also called the fear index.

For the purpose of this paper, we will adopt the approach designed by [Alexopoulou et al. \(2010\)](#) and [Rowland and Torres \(2004\)](#). This method is particularly suitable for panel data composed of different countries and is expected to show some similarities in the

specifications and parameters. Based on the existing literature on the bond market linkages between EM and AM yields, yield differentials relative to the emerging area are explained in terms of domestic fundamentals and common factors. Literature has already established the profound impact of macroeconomic variables as significant causes of spillover over time; hence, the paper emphasizes only external factors and internal country risk shock.

Yield spread = f (macroeconomic fundamentals, common factors, local factors risk).

7.2 Choice of variables

Our dependent variable is a monthly average spread computed from yield on harmonized long-term government bonds relative to the long-term EM average yield for the following 30 countries in EM: USA, Canada, Germany, Italy, Spain, UK and Japan from 1998 to 2010.

Specifically, we considered the following explanatory variables which are the potential underlying determinants of yield in a bond market:

- (1) External shocks (Common factor).
 - three-month US treasury bill rate proxy for global liquidity constraint.
 - corporate spread in the USA;
 - commodity prices;
 - oil price index;
 - Brent index;
 - volatility (VIX) index;
 - London gold price;
 - inflation targeting; and
 - gold index.
- (2) Local country risk (internal country risk guide)[3].
 - political risk rating;
 - financial risk rating; and
 - dummy variables for finding of policy changes in the AM.

$$Y_{it} = \beta_{it} + \sum_{k=2}^k \beta_{kit} X_{kit} + e_{it} \quad (1)$$

Y_{it} = yield for EM7.3;

X_{kit} = explanatory variables for the yield for advanced economies;

β_{it} = intercept;

β_{kit} = sensitivity measure of individual country's explanatory variables; and

e_{it} = unexplained residual for yield spread.

7.3 Data

Panel data specification was used to estimate the bond market linkages between EM and AM yields by estimating yield equations for EMs as a function of AM yields and illustrating the quantitative macroeconomic effects on EMs of global yield shocks in a multi-country DSGE model. The research used a monthly sample of 45 advanced and EM economies covering the period 1998Q1 to 2010Q6. A total of 45 countries were considered in the empirical study. Six of them were advanced economies and thirty-nine were EM economies.

To ensure consistency in the data, many of the variables were taken from Bloomberg and World Economic Outlook, whereas others such as corruption, political risk and financial risk were taken from International Country Risk Guide (ICRG).

The economies examined are as follows:

- *Emerging economies*: Argentina, Belize, Brazil, Bulgaria, Chile, China, Colombia, Croatia, the Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Georgia, Hungary, Indonesia, Iraq, Jamaica, Kazakhstan, Lebanon, Lithuania, Malaysia, Mexico, Pakistan, Panama, Peru, the Philippines, Poland, Romania, Russia, Serbia, South Africa, Sri Lanka, Tunisia, Turkey, the Ukraine, Uruguay, Venezuela and Vietnam.
- *Advanced economies*: Spain, Germany, Japan, Italy, the UK and the USA.

8. Empirical results

This section presents the empirical results for the bond yield spillover effect from AM to EM by applying yield equation with different sets of variables. The bond market linkage between EM and AM yields are explained in a panel regression by differenced value of bond yield for AD countries, the VIX, three-month US treasury bills, the commodity price, the Brent petrol price and the London gold price as shown in [Table I](#). [Table I](#) shows factors that can explain the spillover linkages between the EM and AD. We find that the effect of US bond yield and UK bond yield on EM is significant and larger than the bond yield for AD countries. Here, we find large spillovers from bond prices in the USA and the UK to the EM. On average, a 1 per cent shock in US bond yield leads to a corresponding adjustment of EM bond yield prices of 0.50 per cent. On the other hand, the spillover from the euro area (Italy, Spain and Germany) and Japan is extremely small and not statistically significant. This confirms the central role that US and UK bond markets play in the world bond market.

We also find changes in the world commodity price (using nonfuel, energy and world commodity prices) to have a negative and statistically significant impact on EM bond spillover. This means a 25 per cent drop in nonfuel or energy commodity prices would increase the growth rate of bond yield in EM countries. [Table I](#) also suggests that the VIX have a positive and statistically significant impact on EM bond spillover. The positive coefficient of the VIX suggests the crucial role the VIX plays in the spillover effect of AD to EM. Moreover, the three-month US treasury bills were also included as part of the independent variables to explain the spillover effect to EM countries. The three-month US treasury bills were only significant at a 99 per cent level and have a negative impact on EM bond yield spillover.

8.1 Robustness

We now turn to the robustness test to check how the above results would change under alternative specification of the model. In particular, we check the robustness of the results with regard to adding all the independent variables. [Table II](#) shows the robustness test after adding up all the independent variables to test those that determine transmission of shocks between AD and EM countries. We find that:

- The advanced countries bond yield all have a positive and statistically significant impact on EM bond yield.
- Changes or shock in the VIX and commodity fuel (one of the control variables) have a positive and significant impact on EM bond yield.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	demeb_y	demeb_y	demeb_y	demeb_y	demeb_y	demeb_y
duk_y	2.010*** (0.698)					
dvix	0.141*** (0.026)	0.140*** (0.026)	0.128*** (0.025)	0.133*** (0.026)	0.129*** (0.025)	0.127*** (0.025)
vixstddeviation	0.031 (0.032)	0.031 (0.032)	0.029 (0.032)	0.031 (0.032)	0.030 (0.032)	0.027 (0.032)
dt_bill	-1.067* (0.588)	-1.283** (0.600)	-0.967 (0.594)	-1.015* (0.594)	-1.066* (0.600)	-1.006* (0.591)
changemon_fuel	-0.186*** (0.045)	-0.177*** (0.044)	-0.165*** (0.044)	-0.176*** (0.045)	-0.162*** (0.044)	-0.169*** (0.044)
dus_y		1.734*** (0.547)				
dsp_y			0.970 (0.737)			
dger_y				1.335* (0.787)		
djp_y					1.734* (1.001)	
dit_y						1.450* (0.778)
Constant	-0.148 (0.200)	-0.162 (0.200)	-0.172 (0.200)	-0.159 (0.200)	-0.175 (0.200)	-0.153 (0.201)
Observations	4,175	4,175	4,175	4,175	4,175	4,175
Number of ifs	39	39	39	39	39	39

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: WEO, Bloomberg and ICRG

Table I.
Bond market linkage between EM and AD

Table II.
Robustness test

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	demeb_y	demeb_y	demeb_y	demeb_y	demeb_y	demeb_y
duk_y	0.933*** (0.114)					
Dvix	0.034*** (0.004)	0.033*** (0.004)	0.034*** (0.004)	0.032*** (0.004)	0.027*** (0.004)	0.030*** (0.004)
vixstddeviation	0.009* (0.005)	0.009** (0.005)	0.006 (0.005)	0.009* (0.005)	0.008* (0.005)	0.006 (0.005)
dt_bill	0.122 (0.093)	0.072 (0.093)	0.127 (0.094)	0.127 (0.095)	0.097 (0.097)	0.145 (0.093)
changenon_fuel	-0.005 (0.009)	0.000 (0.009)	0.006 (0.009)	-0.000 (0.009)	0.004 (0.009)	0.005 (0.009)
lcds2	-0.013*** (0.004)	-0.015*** (0.004)	-0.012*** (0.004)	-0.014*** (0.004)	-0.015*** (0.004)	-0.012*** (0.004)
dgold_lon	-0.001* (0.001)	-0.001 (0.001)	-0.002*** (0.001)	-0.001** (0.001)	-0.002*** (0.001)	-0.002*** (0.001)
dbrent_petro	-0.008* (0.004)	-0.010** (0.004)	-0.009** (0.004)	-0.011** (0.004)	-0.008* (0.004)	-0.010** (0.004)
dem_policy	0.006* (0.004)	0.006 (0.004)	0.005 (0.004)	0.005 (0.004)	0.006* (0.004)	0.005 (0.004)
dus_y		0.742*** (0.084)				
dsp_y			0.906*** (0.128)			
dger_y				0.870*** (0.130)		
djp_y					1.047*** (0.186)	
dit_y						0.954*** (0.130)
Constant	-0.016 (0.032)	-0.020 (0.032)	-0.002 (0.033)	-0.006 (0.033)	-0.018 (0.033)	-0.002 (0.033)
Observations	725	725	725	725	725	725
Number of ifs	9	9	9	9	9	9

Notes: Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: WEO and Bloomberg

- Changes or shock in three-month US treasury bills, Credit default swap, the London gold price and the Brent petrol price (control variables) have a negative and significant impact on EM bond yield.
- Changes in financial risk and political risk have a negative and significant impact on EM bond yield.

We find that:

Global external shocks are found to be significant in determining bond yield and causing spillover into the EM.

9. Conclusion

The objective of the paper has been to estimate the bond market linkages between EM and AM yields by estimating yield equations for EMs as a function of AM yields and illustrating the quantitative macroeconomic effects on EMs of global yield shocks in a multi-country DSGE model. The research employed a monthly sample of 45 advanced and EM economies covering the period 1998Q1 to 2010Q6. A total of 45 countries were considered in the empirical study. Six of them were advanced economies and thirty-nine were EM economies. The literature mostly concentrates on either cross-country tests or markets across different countries. In this paper, we have shown that, indeed, there is a spillover effect from AD to EM countries and that most transmission channels, although they vary in significance, are all economically relevant. These findings are especially important for policy makers in understanding the transmission of shocks in the bond market across different countries, as well as for risk management.

The main results of the paper underline the importance of international spillover across countries in the financial market. The strongest international transmission of shocks to EM is from the USA and UK. We find evidence that shocks in the VIX and commodity fuel (one of the control variables) have a positive and significant impact on EM bond yield. Moreover, changes or shocks in three-month US treasury bills, credit default swap, the London gold price and the Brent petrol price (control variables) have a significant negative impact on EM bond yield. Finally, changes in financial risk and political risk were found to have a significant negative impact on EM bond yield.

Notes

1. Refer Frank and Hesse (2009) and Nikiforos (2008).
2. See literature by Eichengreen and Luengnaruemitchai (2004) and Jostova (2006).
3. Juttner *et al.* (2004) in ideas.repec.org/p/mac/wpaper/0406.html

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Appendix. Definition of variables

Contagion: is the cross-border spread of financial shocks. Such an international spillover means that economic or financial troubles that originate in one nation can affect others.

Contagion can occur at any time during a business cycle; not just at the trough. Therefore, contagion is not necessarily related to a crisis, although it is during a crisis when contagion is most apparent. More specifically, contagion is the international spread of shocks in the absence of any shared shocks between the countries.

Cross-country links: The links among countries are in part responsible for the spread of contagion. There are three main types of links: financial links, real links and political links.

Financial links: Financial links are present between two nations when they both use the same international financial system. When leveraged financial institutions face margin calls and the value of their collateral drops as a result of adverse shocks in one nation, firms that have borrowed must raise their reserves. To do this, they sell off some of their holdings to the countries that have not yet been hit by the shocks. But by so doing, they spread the shocks to other economies.

Real links: Can be thought of as the economic relationships among countries and economic units and are typically associated with global trade. When two nations engage in trade between themselves, a discount in one currency erodes the other nation's competitive advantage. The result is that both countries' currencies are devalued to restore the balance in their external sectors. International FDI is another example of real links.

Political links: Political ties can affect shocks among countries. When crises or shocks occur, countries usually respond to this shock.

Political risk index: The value of the Political Risk Service (PRS) Group's political risk indicator (which ranges between 0 and 100). The risk rating is a combination of 12 subcomponents. Overall, a political risk rating of 0.0 to 49.9 per cent indicates a very high risk; 50.0 to 59.9 per cent, high risk; 60.0 to 69.9 per cent, moderate risk; 70.0 to 79.9 per cent, Low Risk; and 80.0 per cent or more, very low risk. The data are from 1984 through to 1997. For each country, we back-fill the 1984 value to 1980. Source: Various issues of the International Country Risk Guide.

Corruption: ICRG political risk sub-component. This is a measure of corruption within the political system. Corruption distorts the economic and financial environment, reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introduces an inherent instability into the political process. The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans. Although the PRS measure takes such corruption into account, it is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, "favor-for-favors", secret party funding and suspiciously close ties between politics and business. In PRS's view, these sorts of corruption pose risk to foreign business, potentially leading to popular discontent, unrealistic and inefficient controls on the state economy and encourage the development of the black market.

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Author	Methodology	Variables used	Major findings	Comments
Erb <i>et al.</i> (1999); 40 countries over the period 1991:01-1999:09	Graphical presentations	EM bond of JP Morgan securities, total returns, sovereign credit spread	In relatively good times, EM bonds seem to have some rather unique return characteristics. In times of crisis, they are highly correlated with equity markets by showing negative skewness, high volatility	The methodology is too simple to make such a sweeping declaration and draw such a conclusion
Yang (2004); 5 industrialized countries during the period 1986:01-2000:12.	Recursive co-integration, Granger causality and VAR model	J.P.Morgan total return government bond indexes are proxies of realized government bond yields for the USA, Japan, Germany, the UK and Canada government bond	Recursive co-integration clearly shows long-run relationships exist among five bond markets during sample period	The results contradict recent studies
Yang (2005); 6 major European government bond markets ranging from 1988:01 to 2003:12	Granger causality, Co-integration test and forecast error variance	European government markets bond for Germany, France, Italy, the UK, Belgium and The Netherlands	The VAR approach suggests those European government market bonds are generally interdependent without a distinctive leadership. The UK and Italy are found to be less integrated with other markets	The paper only examined the government market bonds, but other types of bond are not examined, i.e. sovereign bond or corporate bond
Bayoumi and Swiston (2007) use daily and intra-daily data on yield on inflation-indexed bond from 1997 to 2006	Cross-country correlation in bond yield and inflation expectation	Inflation-indexed yields and bonds, nominal bonds and real yields	Real bond yields are found to be closely linked across countries, with development from the US markets determining around half of real foreign yields and no evidence of spillover back to the USA	Very good paper, very insightful, but still need a clear and concise explanation

(continued)

Table AI.
Selected empirical finding on bond yield and spillover

Table AI.

Author	Methodology	Variables used	Major findings	Comments
Frank and Hesse (2009), used the daily three-month US dollar Libor overnight index swap (OIS) which encompasses 2003-2008	Multivariate GARCH framework which allows for heteroscedasticity	Stock market returns, variance for proxy for market volatility, average credit default swap spread(CDS), EMCI+ spread for the region of Latin America	Findings suggest that implied correlation between the 3month US Libor-OIS spread and EMBI+ spread of Asia, Europe and LAC sharply increase after the subprime crises	The literature is still silent on the real cause of linkages between EMs and AMs
Vitek (2010) present simulation results for global financial market turbulence scenarios	Graphical representation using simulation results from macroeconometrics model of the world economy	Combined four global financial market turbulence scenarios driven by alternative combination of term premium, equity risk premium, and exchange rate risk premium shocks	The four scenarios presented featured extensive linkages between the real and financial sectors both within and across its fifteen constituents economies	In countries that have not fully integrated into EM, bonds by these markets will still offer significant diversification opportunities for global investors

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