# Emerging market sovereign bond spreads, credit ratings and global financial crisis

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ABSTRACT

This paper investigates the impacts of sovereign credit ratings and global financial conditions on the evolution of EMBI Global (EMBIG) spreads for a panel of 23 developing countries by using daily data for the period between 1998 and 2012. To this end, we employ not only the conventional panel estimation procedures, but also the recent methods tackling with either cross-sectional dependence stemming from common global shocks or a potential endogeneity. Our results suggest that credit ratings along with global financial conditions re the main determinants of EMBIG spreads. The determinants of EMBIG spreads are not invariant to speculative and investment grade episodes and transitions between them. The recent global crisis changed the determinants of EMBIG spreads and led to credit ratings' impact to converge between speculative and investment grade countries.

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## 1. Introduction

The emerging market bond index (EMBI) spread[1] as a measure of sovereign default risk and financial fragility of emerging market economies (EME) is one of the basic macroeconomic variables, which are closely monitored by financial markets and economic policy makers. Understanding the determinants of EMBI spreads has, thus, crucial policy implications. Consequently, there is now a substantial and growing literature on this issue.

One strand of the literature maintains that not only domestic factors but also external factors stemming from advanced countries, such as global liquidity conditions and international interest rates, are the main drivers of the EMBI spreads (Kamin and von Kleist, 1999; Gonzalez-Rozada and Levy-Yeyati, 2008; Özatay et al., 2009). Another strand of the literature focuses on the effects of domestic fundamentals in the determination of the spreads (Kaminsky and Schmukler, 2002; Dailami et al., 2008; Aizenman et al., 2013; Riedel et al., 2013; and Amstad et al., 2016). According to the pioneering study by Cantor and Packer (1996, pp.49), "sovereign ratings effectively summarize and supplement the information contained in macroeconomic indicators".

Consequently, sovereign credit ratings (CR) have often been taken as one of the basic determinants of the EMBI spreads especially for high frequency data.

In this study, we aim to investigate the relationship between CR and EMBI Global (EMBIG) spreads for a panel of 23 EME by using daily data. We investigate also whether the determinants of EMBIG spreads are invariant to speculative and investment grading episodes. Furthermore, the implications of transitions between investment and speculative ratings for EMBIG spreads are analyzed. This study also investigates whether the impact of CR on EMBIG spreads changed during the recent global crisis.

The literature often employs conventional panel data estimation procedures which do not allow for cross-section dependence. However, omitted common variables or global shocks stemming from contagion induce cross-section dependence and lead to inconsistent coefficient estimates. Therefore, we consider not only the conventional panel data procedures but also the panel autoregressive distributed lag (PARDL) mean group (PARDL-MG) and cross-sectionally augmented common correlated effects PARDL-MG (CCE-PARDL-MG) procedures by Chudik and Pesaran (2015). The CCE procedure is known to yield an efficient and robust estimator in a general non-stationary framework when there is cross-section dependence (Chudik and Pesaran, 2015). The PARDL approach is valid even if the regressors are not weakly-exogenous and the variables of interest are stationary, non-stationary or mutually cointegrated (Pesaran et al., 2001).

The plan of the rest of the paper is as follows. In Section 2, we present a brief literature review about the determinants of EMBIG

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[1] The EMBI spread by J.P. Morgan is the difference between the yields on EME sovereign bonds and bonds issued by an industrialized country with identical currency denomination and maturity.

spreads. Section 3 presents our empirical results. This section first presents the results of the estimations of our baseline static equation by the conventional (panel fixed effects) along with the recent CCEP (common correlated effects, pooled) and fully modified ordinary least squares (FM-OLS) procedures. The implications of augmenting the equations with cross-sectional means of the variables for the existing global financial conditions variables in the CCEP equations are also discussed in this section. Section 3 presents also the evidence that the cross-sectional means of EMBIG spreads co-moves with global financial conditions. The implications of this evidence are found to be important for our postulations and findings. Section 3.1 presents the results of our panel cointegration and error-correction mechanism (ECM) equations estimated by CCE-PARDL and CCE-PARDL-MG procedures. This section also examines the effect of global financial crisis on the determinants of sovereign spreads. In Section 3.2, we analyze the asymmetric impact of investment and speculative grade episodes on the evolution of EMBIG spreads. This section also investigates the consequences of a transition from a speculative grade to an investment grade, or vice versa, by one or more credit agency on the EMBIG spreads. Finally, Section 4 concludes.

## 2. The determinants of the EMBIG spreads: a brief review of the literature

EMBIG spreads reflect the additional borrowing cost that an EME has to bear in international financial markets relative to the risk-free country. A general model on the determinants of emerging market sovereign bond spreads (S) can be written as:

$$S_{it} = c + \alpha X_{it} + \beta Z_{it} + u_{it} \qquad (1)$$

where c is a constant term, X and Z are, respectively, the vectors of domestic and external variables, $\alpha$ and $\beta$ are the transposes of the corresponding coefficient vectors and u is the disturbance term. The subscripts i and t stand for country and time.

The set of variables in X contains domestic economic fundamentals indicating country default risk or creditworthiness. Sovereign debt indicators (external debt/GDP, interest payments, international reserves, net foreign asset position, fiscal positions etc.), GDP growth, international reserves, trade openness, current account deficits and default history are the most commonly used variables to represent the domestic economic fundamentals. Eichengreen and Mody (1998); Kaminsky and Schmukler (2002); Dailami et al. (2008), Aizenman et al. (2013), Riedel et al. (2013), Kennedy and Palerm (2014); Clark and Kassimatis (2015) and Amstad et al. (2016) are among the studies finding that domestic fundamentals are significant in determining sovereign spreads.

According to Cantor and Packer (1996), sovereign credit ratings (CR) efficiently summarize the macroeconomic conditions and policy variables affecting the solvency of sovereigns. Consequently, a strand of literature, especially studies using high frequency data for which many macroeconomic variables are not available, prefers to use CR as a proxy for macroeconomic conditions and policy variables.[2] According to an event study by Cantor (2013), positive rating changes have no considerable effect whilst negative rating changes have a small but not impressive effect on spreads. This is consistent with a view that financial markets are efficient and ratings do reflect domestic fundamentals so that rational market participants forecast and behave accordingly

before CR changes.[3] The results by Cavallo et al. (2013), on the other hand, suggest that CR and spreads are noisy signals of domestic fundamentals and ratings add information beyond what is already imbedded in market prices. Consistent with this, the literature often finds that ratings do matter for spreads (Kaminsky and Schmukler, 2002; Gonzalez-Rozada and Levy-Yeyati, 2008; Özatay et al., 2009; Cavallo et al., 2013; Aizenman et al., 2013).

In the literature, the set of variables in Z contains industrial country (mainly U.S.) interest rates or the Fed target rate to proxy global liquidity and some alternative measures, including high yield corporate bonds in advanced economies and volatility implicit in U.S. stock options (VIX), to capture global risk appetite or financial conditions. Increases in international interest rates are expected to increase EME default probability and risk premium, decrease the demand for risky assets and consequently increase EME sovereign spreads (Kamin and von Kleist, 1999).

Following Calvo et al. (1993), there is now a growing literature suggesting that external factors such as global financial conditions are amongst the main determinants of business cycles in EME (Kose et al., 2012 and Erdem and Özmen, 2015). The results by Gonzalez-Rozada and Levy-Yeyati (2008), Özatay et al. (2009), Levy-Yeyati and Williams (2010) and Banerji et al. (2014) suggest that sovereign default risks and thus spreads in EME are significantly triggered by global financial conditions proxied by a subset of variables including VIX, US Treasury bond yields, US high yield spreads and libor rates.

The impacts of domestic and external variables on EMBIG spreads may not be invariant to investment and speculative grade ratings. According to Jaramillo and Tejada (2011), reaching investment grade lowers sovereign spreads substantially beyond the level implied by domestic fundamentals. Levy-Yeyati and Williams (2010) finds that the effect of interest rates and liquidity preferences are significantly stronger for low grade EME.

The impacts of domestic and external variables on EMBIG spreads may also be different at tranquil periods than episodes of financial stress. Kaminsky and Schmukler (2002) finds that credit ratings have stronger effects during crisis. Riedel et al. (2013) uses the variables proposed by structural credit models to explain daily Eurobond credit spreads in four major Latin American countries. Their results suggest that the determinants of the spreads are not invariant to endogenously estimated credit cycles and a transition to a crisis regime. In their study on the determinants of EMU sovereign bond yield spreads, Gómez-Puiga et al. (2014) finds that the marginal effects of global market sentiment variables on sovereign spreads increased during the crisis compared to the pre-crisis period. According to Amstad et al. (2016), in the context of 18 EME and 10 AE sample, global risk factors has become even more dominant in explaining CDS after the GFC. Beirne and Fratzscher (2013) finds that the sensitivity of sovereign risk to domestic fundamentals has increased substantially after the GFC. On the other hand, Comelli (2012) proposes that the impact of country-specific variables weakened during the recent GFC. The results by Levy-Yeyati and Williams (2010) suggest that the impact of Fed fund rate changes is positive in tranquil times but becomes negative in times of turmoil. Compared to low and medium volatility periods of the global markets, the effect of global financial conditions is found to be higher in high-volatility periods (Csontó, 2014). This is consistent with a finding that

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[2] Alternatively, Riedel et al. (2013) proposes the use of variables, such as exchange rates, interest rates and asset price changes, postulated by structural credit risk models. We believe that investigating whether the structural credit risk variables and CR add a significant value over the other appears to be a promising research agenda.

[3] Note that, credit rating agencies have been criticised extensively especially during and after the recent global financial crisis due to the accusation of being failed to accurately and timely assess the risks in financial and public sectors. Consequently, both the market efficiency under rational expectations and ratings as a summary of domestic fundamentals postulations along with a need for regulation of the ratings sectors has become an important policy and research topic. BIS (2013) and Amstad and Packer (2015) provide important contributions to these and related issues. According to Amstad and Packer (2015), after the GFC, the rating agencies have significantly changed their assessment strategies and began to put more emphasis on monetary policy regimes, financial cycles, event risk and economic growth. Consequently, the divergence between AE and EME, which is indeed still considerably high, has tend to decrease after the GFC.

markets price risk more aggressively when the risk of sovereign default rises (Aizenman et al., 2013). Bernoth and Erdogan (2012) and Afonso et al. (2015) also find that the determinants of sovereign spreads are time-varying. The results by Özatay et al. (2009) suggest that along with global financial conditions, crises contagion and sovereign ratings, EMBI spreads also respond substantially to U.S. macroeconomic news and changes in the Fed target interest rate. The magnitude and the sign of the effect of U.S. news are found to crucially depend on the state of the U.S. economy, such as the presence of inflation dominance.

## 3. Empirical analysis

As already discussed, EMBIG spreads can be specified as determined by domestic fundamentals and variables representing global financial or external conditions. This study uses daily observations. Therefore, following the literature using high frequency data (Gonzalez-Rozada and Levy-Yeyati, 2008; Özatay et al., 2009), we consider sovereign credit ratings as a proxy for domestic fundamentals.[4] Global financial conditions are proxied by the volatility implicit in US stock options (VIX) compiled by the Chicago Board Options Exchange as a measure of international risk appetite – or the price of risk (Gonzalez-Rozada and Levy-Yeyati, 2008). According to Rey (2015) global financial cycles co-moves with VIX, which is important in creating boom and bust cycles in EME. We consider 3-month USD libor rate to proxy global liquidity conditions.[5] Our panel sample contains daily observations for the January 5, 1998 and December 14, 2012 period for 23 EME.[6]

We start by estimating the following equation:

$$embig_{it} = c + \alpha_1(rat_{it}) + \alpha_2(vix_t) + \alpha_3(libor_t) + u_{it} \qquad (2)$$

where embig is the natural log. of EMBIG spread of the country i, c is the constant term, rat is the log. of average of outlook and watch augmented credit ratings of country i assigned by the three major rating agencies (Moody's, Standard and Poor's and Fitch),[7] vix is the natural log. of VIX index and libor is the natural log. of 3-month USD libor rate.

The literature often employs conventional panel data estimation procedures in investigating the determinants of EMBIG spreads. Eq. (1.1) in Table 1 presents the results of the panel fixed effects (PFE) regression[8] for our data. The results suggest an increase in sovereign ratings (rat) representing better domestic fundamentals leads to a decrease in EMBIG spreads. An increase in VIX (an increase in the price of risk or a decrease in the risk appetite in international financial markets) substantially and significantly increases the EMBIG spreads. The impact of international interest rates appears to be positive.

Considering the potential endogeneity of the ratings for EMBIG spreads, we estimate Eq. (1) also by employing FM-OLS procedure of Phillips and Hansen (1990) and Pedroni (2004). The FM-OLS procedure takes into account the potential heterogeneity in the long-run relationships along with endogeneity and serial correlation. The FM-OLS results presented by Eq. (1.2) of Table 1 are essentially the same with those for the PFE. Consequently, our results may be interpreted as not significantly contaminated by a simultaneity bias.

The conventional panel fixed effects procedures maintain that the cross-country innovations for the evolution of the dependent variable are independent of each other. The presence of cross-country dependence, however, may lead to inconsistent coefficient estimates as shown by Pesaran (2006) and Chudik and Pesaran (2015). Common global shocks, which are not fully represented by the global conditions variables such as VIX or libor, potentially arising from contagion of a crisis or from global shocks such as the recent GFC may induce cross-section dependence in the equation[9] and thus lead to inconsistent regression coefficient estimates if they are correlated with the explanatory variables. To account for the cross-sectional dependence, we employ the common correlated effects pooled (CCEP) estimator by Pesaran (2006), which yields consistent estimates also in the presence of common factors. Furthermore, Pesaran and Tosetti (2011) show that the CCEP estimators are robust to both possible serial correlations and cross-sectional dependence.

The CCEP procedure suggests approximating the linear combinations of the unobserved factors by cross section averages of the dependent and explanatory variables and then estimating the regressions of interest augmented with these cross section averages. Therefore, to obtain the CCEP estimator, we estimate the following equation:

$$embig_{it} = c_i + \alpha_1(rat_{it}) + \alpha_2(vix_t) + \alpha_3(libor_t) + \alpha_4(csm\_embig_t) \\ + \alpha_5(csm\_rat_t) + u_{it} \qquad (3)$$

where, csm_embig and csm_rat are the cross-sectional averages of log. EMBIG spreads and log. ratings, respectively.

Eq. (1.3) in Table 1 reports the results of the CCEP procedure. The impacts of ratings and libor are virtually the same with the PFE and FM-OLS estimation results. However, the VIX coefficient substantially declines but remains statistically significant in the CCEP estimation. Although they do not necessarily propose an economic interpretation, the significant cross-sectional means of sovereign spreads and ratings potentially offer some important information on the evolution of EMBIG spreads. An increase in the mean spreads, potentially reflecting worsening global financial conditions and contagion, increases individual country spreads.

A decrease in the VIX, representing an improvement in global financial conditions, often leads to surges in capital inflows to emerging market economies and thus higher growth and better macroeconomic conditions. According to Rey (2015), there is a global financial cycle in capital inflows and this cycle co-moves with the VIX. The plots of vix (right axis) and csm_embig (left axis) in Fig. 1 show that these two variables tend to move together during both tranquils and turmoils of

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[4] This does not necessarily mean that CR perfectly summarizes domestic macroeconomic fundamentals. As suggested by Cavallo et al. (2013), CR and spreads may be interpreted as noisy signals of domestic fundamentals. As pointed by an anonymous referee, these signals have different frequencies and thus CR may only be partially representing domestic fundamentals. Furthermore, due to its much lower variability, the CR variable may indeed be acting like a dummy variable especially in models estimated by using panel fixed effects procedure. We are grateful to the anonymous referee for raising this crucially important issue.

[5] According to IMF (2004), three-month USD LIBOR rate is an indicator of international liquidity conditions and serves as a benchmark in determining borrowing costs. IMF (2004, p.68) also notes that, "other measures of short-term rates, such as the Fed Funds target rate or three-month treasury bill rates, are very closely correlated with the three-month LIBOR rate".

[6] The source of EMBIG spread, VIX and libor data is Bloomberg. The credit ratings data are from Moody's, S&P and Fitch. The countries in the sample are selected based on their market share in the composite EMBIG index and countries with a market share of less than 1% are excluded. Our sample contains an unbalanced panel data for the following EME: Argentina, Brazil, Chile, China, Colombia, Croatia, Hungary, Indonesia, Kazakhstan, Lebanon, Lithuania, Malaysia, Mexico, Panama, Peru, Philippines, Poland, Russia, South Africa, Turkey, Ukraine, Uruguay and Venezuela. The working paper version of this study (Özmen and Doğanay Yaşar, 2015) contains also figures of individual country observations for EMBIG spreads and credit ratings for our sample of countries.

[7] Following Kamin and von Kleist (1999); Afonso et al. (2007) and the following literature, ratings are transformed into a numerical scale with 1 being the worst credit risk and 21 the best. We interpret the outlook as a five-notch grading scale around the credit rating as in Gonzalez-Rozada and Levy-Yeyati (2008) and Özatay et al. (2009). The outlook-augmented ratings are computed by adding 0.4, 0.2, 0.0, −0.2 and −0.4 respectively for the positive outlook, positive watch, neutral, negative watch, and negative outlook notches to the corresponding numerical value of ratings. Our numerical ranking of outlook and watch decisions differs from that of Gonzalez-Rozada and Levy-Yeyati (2008) and Özatay et al. (2009) since we interpret credit-watch decisions as signaling a higher probability of rate change in a shorter period of time than outlook decisions and thereby assign a higher (lower) numerical value to positive (negative) credit-watch than the positive (negative) outlook. Our numerical scale is presented by Özmen and Doğanay Yaşar (2015).

[8] Both the redundant fixed effects and Hausman tests (not reported) strongly preferred the fixed effects specifications in this paper.

[9] The Pesaran (2004) test, for instance, yielded 331.2 and thus strongly rejected the cross-sectional independence of the residuals from Eq. (1.1).

**Table 1**
The determinants of EMBIG spreads.

| Equation | (1.1) | (1.2) | (1.3) |
|---|---|---|---|
| Procedure | PFE | FM-OLS | CCEP |
| constant | 7.764 (0.039)*** | | 1.617 (0.025)*** |
| $rat_{it}$ | −2.020 (0.013)*** | −1.801 (0.025)*** | −1.738 (0.008)*** |
| $vix_t$ | 0.891 (0.008)*** | 0.913 (0.097)*** | 0.093 (0.003)*** |
| $libor_t$ | 0.010 (0.003)*** | 0.0124 (0.0034)*** | 0.020 (0.0006)*** |
| $csm\_embig_t$ | | | 0.913 (0.002)*** |
| $csm\_rat_{it}$ | | | 1.130 (0.010)*** |
| Statistics | $R^2 = 0.81$ | $R^2 = 0.79$ | $R^2 = 0.90$ |
| | $F = 13110$ | $LRV = 0.86$ | $F = 24846$ |
| | $N = 23$ | $N = 23$ | $N = 23$ |
| | $NT = 77105$ | $NT = 77082$ | $NT = 77105$ |
| | $PCD = 331.2\ [0.00]$ | $IPS = -12.72^{+++}$ | $PCD = -24.64\ [0.00]$ |
| | $Pedroni = -16.7^{+++}$ | | $Pedroni = -6.21^{+++}$ |
| | $Kao = -12.4^{+++}$ | | $Kao = -9.55^{+++}$ |
| | $IPS = -12.67^{+++}$ | | $IPS = -7.85^{+++}$ |

Notes: The values in parentheses are robust standard errors. N and NT are, correspondingly, the numbers of countries and observations for the sample. *** denotes significance at 1% level. Pedroni and Kao represent the panel ADF test statistics proposed by Pedroni (2004) and Kao (1999) respectively, to test the null hypothesis of "no panel co-integration". IPS shows the results of the panel unit root tests suggested by Im et al. (2003) to test for the stationarity of the residuals from the related equations. The optimum lag lengths for these tests are determined by Schwarz Information Criteria (SIC). $^{+++}$ indicates that null of "no panel co-integration" is rejected at the 1% level. PCD is the Pesaran (2004) test for cross-sectional independence.
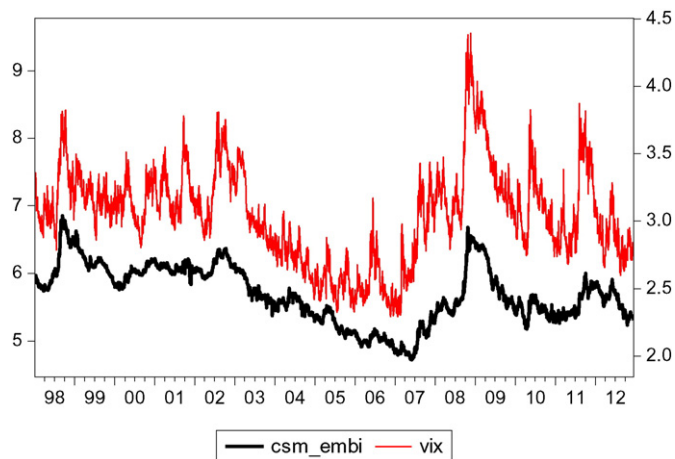


**Fig. 1.** The VIX and CSM of EMBIG spreads.

international financial conditions.[10] During tranquility phases of the international financial cycle, such as observed during the post-2002 period until the recent global financial crisis, demand for sovereign bonds increases leading to an increase (decrease) in their prices (yields). During the financial stress periods of the financial cycle, on the other hand, just the reverse tends to occur as observed during the recent crisis. In this context, in a regression containing both of the variables (vix and csm_embig), the impact of global financial cycles may be decomposed into two, the vix representing the global risk appetite in general and the csm_embig representing the risk appetite solely towards EME assets. In the absence of one of these two variables, the remaining variable may be interpreted as proxying the global financial cycle albeit being potentially biased due to their high positive correlation with the other. Consistent with these interpretations, the coefficient of VIX substantially decreases with the inclusion of cross-sectional mean of spreads.[11]

A decrease (increase) in the cross-sectional average of ratings (csm_rat) may be reflecting a general deterioration (improvement) in the fundamentals of EME. According to Kaminsky and Schmukler

(2002), a rating change in one country may be perceived by financial markets as a warning signal for countries alike. Thereby, a change in a group of EME ratings may trigger expectations that a corresponding change may occur for similar EME. In such a case, due to their "spill-over" effects, decreases in average ratings may be expected to increase individual EMBIG spreads. On the other hand, a decrease in the cross-sectional average of ratings can also be interpreted as an improvement in the relative creditworthiness of countries with better macroeconomic fundamentals. Consequently, due to such "flight to quality" effect, a decrease in the average EME ratings may lead to a fall in individual country spreads. Arezki et al. (2011) investigates effects of credit ratings during the European debt crisis and finds that a rating downgrade in one country is associated with a positive spill-over in countries perceived as more credible, which can be explained by "flight-to-quality". Supporting also the findings of Özatay et al. (2009), the positive and significant $csm\_rat_t$ coefficient may be interpreted as the "flight to quality" impact is dominating the "spill-over" impact.

Table 2 reports the results of Im et al. (2003) panel unit root tests for rat and embig along with augmented Dickey-Fuller tests for libor and vix. The results of unit root tests presented suggest that all the variables in Eq. (1) are integrated of order one (I(1)).[12] Consequently, we need to test whether these I(1) variables are not cointegrated. The results from the Kao (1999), Pedroni (2004) and Im et al. (2003) panel co-integration tests, shown in Table 1, all suggest that the equation residuals are stationary and thus there is a co-integration relationship between the variables.[13] Consequently, the coefficients of the static equations in Table 1 may be interpreted as representing long-run equilibrium relationships between EMBIG spreads and the explanatory variables.

### 3.1. PARDL-MG and CCE-PARDL-MG estimations

We proceed with the estimation of the following reparametrised panel version of autoregressive distributed lag (PARDL, (p, p, p, p)) model (Pesaran et al., 2001):

$$\Delta embig_{i,t} = \theta ec_{t-1} + \sum_{j=1}^{p-1} a_j \Delta embig_{i,t-j} + \sum_{j=0}^{p-1} b_j \Delta rat_{i,t-j}$$
$$+ \sum_{j=0}^{p-1} c_j \Delta vix_{t-j} + \sum_{j=0}^{p-1} d_j \Delta libor_{t-j} + u_{i,t} \qquad (4)$$

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[10] A time series regression of mean EMBIG (csm_embig) on vix for the period yielded csm_embig $= 2.8 + 0.94vix$ with an $R^2 = 0.6$.

[11] According to Rey (2015), the global financial cycle, which indeed co-moves with the VIX, is not aligned with EME countries' specific conditions. Consequently, we may expect an insignificant impact of VIX on sovereign ratings. Supporting this argument, a regression of csm_rat on vix yielded an insignificant slope coefficient with $R^2 = 0.0$ (not reported).

[12] The results from the other commonly used unit root tests essentially yielded the same results and not reported to save the space.

[13] Note that these residuals-based cointegration tests maintain that there can be only one within group cointegration in the panel (Breitung and Pesaran, 2008).

**Table 2**
Unit root tests.

| Variables | IPS | |
|---|---|---|
| | Levels | First differences |
| $embig_{it}$ | −1.45 | −245.9** |
| $rat_{it}$ | 4.14 | −279.5** |
| Variables | ADF | |
| $libor_t$ | −1.54 | −13.31** |
| $vix_t$ | −0.63 | −42.1** |
| $csm\_embig_t$ | −1.79 | −64.1** |
| $csm\_rat_t$ | 0.09 | −61.6** |

IPS and ADF are Im et al. (2003) panel unit root and augmented Dickey-Fuller tests, respectively. ** denotes the rejection of the unit root null at the 5% level. The lag lengths determined by Schwarz Information Criteria.

where Δ is the first difference operator and ec (error correction term) are the stationary residuals from the estimations of the long-run relationships with Θ representing the speed of adjustment. The PARDL model is preferred since it enables to analyze empirically the long-run relationship along with short-run dynamics even when it is not known with certainty whether variables of interest are stationary (I(0)), non-stationary (I(1)) or mutually cointegrated (Pesaran et al. 2001). The potential cross-section dependence is dealt with the estimation of Eq. (4) by employing cross-sectionally augmented (CCE) PARDL (CCE-PARDL) procedure (Pesaran and Tosetti, 2011; Chudik and Pesaran, 2015). The CCE-PARDL equation is obtained by the augmentation of Eq. (4) by the cross-sectional averages of the variables. The PARDL and CCE-PARDL mean group (PARDL-MG and CCE-PARDL-MG) procedures impose the same long-run relationship but allow the short-run coefficients and ECM to differ across countries. The short-run PARDL-MG and CCE-PARDL-MG coefficients are the simple averages of individual estimators.

Table 3 reports the results of the PARDL-MG and CCE-PARDL-MG analyses for the whole, pre-crisis and crisis periods. For all the PARDL equations in Tables 3 and 4, we started with a maximum lag of 5 and the likelihood ratio (LR) tests of sequential lag length reduction (LR(p:p-1)) suggested the choice of PARDL(1,1,1,1).

The upper part of Table 3 reports the common long-run coefficients. For the whole sample (Eq. 3.1), the long-run coefficients are essentially the same with those reported by Table 1. The negative and statistically significant coefficients of error correction (ec) terms in Table 3 suggest that sovereign spreads adjust to achieve the long-run equilibrium.[14] The impact of sovereign ratings appears to be considerably lower in the short-run than in the long-run. This may be plausible with a postulation that expectations and thus behaviour of rational agents are already contained by the long-run coefficients and thus the short-run coefficients mainly reflect the impact of surprises not represented by the existing variables. This may also be consistent with an explanation that portfolio reallocations following a rating event take some time and reserve managers can opt for a gradual reallocation in order not to suffer from fire-selling etc. The impacts of common global shocks proxied by the cross-sectional averages of ratings and spreads appear to be significant both in the long-run and short-run.

### 3.2. Global financial crisis and the determinants of EMBIG spreads

In this section we investigate whether the recent global financial crisis (GFC) of 2008-2009 led to a change in the determinants of sovereign spreads. Fig. 2 plots the Spearman's rank correlations (inverted scale) between credit ratings and EMBIG spreads for the years between

1998–2012. The correlation tends to increase after the Asian crisis of 1997–1998 and remains high (around 0.8–0.95) until the recent GFC. With the GFC, the correlation declined sharply to 0.68 in 2008 and continued to weaken afterwards.

Fig. 3 plots daily cross-section means of sovereign ratings and EMBIG spreads during the period. The EMBIG data for Argentina found to be an outlier especially during the Argentinian crisis of 2002, therefore the figures in the right panel does not contain Argentina. From Fig. 3a, it may be inferred that there is a strong opposite movement of credit ratings and EMBIG spreads and until the GFC this (negative) correlation tended to be much higher during the periods of financial stress than tranquil periods.[15] This observation provides a support to Kaminsky and Schmukler (2002) finding that credit ratings have stronger effects during episodes of financial stress. After the Asian crisis of 1997-1998 and the Russian crisis of 1999, mean credit ratings steadily fluctuate around 11 (BB+, likely to fulfill obligations, ongoing uncertainty) corresponding to EMBIG spreads fluctuating around 500 basis points (bps). On the other hand, after 2002, during the ample global liquidity and international financial tranquility, the credit ratings follow an upward trend with a corresponding downward trend in the EMBIG spreads until the GFC.

The GFC of 2008-2009 led to a decline in mean ratings but the corresponding increase in the spreads appears to be substantially much higher. After the GFC, the upward trend in the ratings continued, whilst the mean spreads, fluctuating around 300 bps, suggests a considerable decrease in the relationship between them. This observation is also compatible with Comelli (2012), who finds that the impact of country-specific variables weakened during the recent GFC. These results can be interpreted as that international investors give more importance to domestic fundamentals during EME crises, while during GFC, the effect of global factors on EMBIG spreads increase.

The results by Table 3 suggest that the long-run impacts of ratings and VIX substantially decrease after the recent GFC. The international interest rate variable (libor) coefficient, on the other hand, remains almost the same after the crisis. The short-run responses, on the other hand, appear to be quite different after the GFC. The short-run impacts of VIX, libor and ratings all considerably increase after the GFC. Consequently, unexpected changes in global financial conditions and ratings may be interpreted to yield much higher immediate effect on the spreads after the GFC. Lastly, both in the long-run and short-run, the coefficients of cross-sectional mean of ratings turn to negative after the GFC, indicating that the "spill-over" effect among the EME started to dominate the "flight-to-quality" effect following the GFC.

### 3.3. Asymmetric impacts of investment and speculative grade ratings on EMBIG spreads

Sovereign credit ratings are in general divided into two risk groups as investment and speculative grade ratings.[16] The simple correlation (negative) between the spreads and the ratings appears to be higher for speculative grade episodes (SGE) than investment grade episodes (IGE) (Fig. 3.b and 3.c). For the SGE, the mean ratings tend to show a strong upward trend after 2002 until the GFC. We observe a similar but downward movement in the EMBIG spreads decreasing to a level around 300 bps. During the GFC, the spreads jump to very high level of around 1000 bps despite a modest decrease in ratings. After the GFC the average ratings of these countries jump to around 10 (just two notches below the investment grade) and EMBIG spreads fluctuate steadily around 400 bps. The picture for the IGE, however, is somewhat different. The upward trend in the ratings began just after the Asian and the Russian crises,

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[15] September 15, 2008, on which Lehman Brothers announced its bankruptcy, is taken as the beginning date of global financial crisis. Consequently, January 5, 1998 - September 12, 2008 and September 15, 2008 - December 14, 2012 periods are, respectively, defined as pre-crisis and crisis periods.

[16] Grades higher than or equal to BBB-, BBB- and Baa3 are classified as "investment grade" respectively by Standard & Poor's, Fitch's and Moody's. In this study, an episode is defined as "investment grade" when, at least, two of these agencies agree on this.

**Table 3**
The determinants of EMBIG spreads: PARDL_MG and CCE_PARDL_MG results.

| Sample | Whole | Whole | Pre-crisis | Pre-crisis | Crisis | Crisis |
|---|---|---|---|---|---|---|
| Equation | (3.1) | (3.2) | (3.3) | (3.4) | (3.5) | (3.6) |
| **Long-run (ec)** | | | | | | |
| $rat_{it}$ | −1.387 (0.110)*** | −1.835 (0.142)*** | −1.393 (0.149)*** | −1.581 (0.129)*** | −0.704 (0.167)*** | −0.829 (0.132)*** |
| $vix_t$ | 1.472 (0.049)*** | 0.438 (0.067)*** | 1.456 (0.058)*** | 0.329 (0.074)*** | 0.708 (0.033)*** | 0.037 (0.024) |
| $libor_t$ | 0.115 (0.016)*** | 0.059 (0.014)*** | 0.284 (0.030)*** | 0.010 (0.034) | 0.242 (0.018)*** | 0.027 (0.012)** |
| $csm\_embig_t$ | | 0.752 (0.063)*** | | 0.965 (0.065)*** | | 0.735 (0.032)*** |
| $csm\_rat_t$ | | 3.227 (0.222)*** | | 3.344 (0.384)*** | | −1.791 (0.152)*** |
| **Short-run dynamics** | | | | | | |
| $ec_{t-1}$ | −0.010 (0.002)*** | −0.008 (0.002)*** | −0.013 (0.004)*** | −0.012 (0.003)*** | −0.027 (0.003)*** | −0.019 (0.004)*** |
| $\Delta rat_{it}$ | −0.315 (0.119)*** | −0.289 (0.073)*** | −0.154 (0.140) | −0.454 (0.214)*** | −0.365 (0.396) | −1.258 (0.639)** |
| $\Delta vix_t$ | 0.139 (0.009)*** | 0.001 (0.033) | 0.096 (0.010)*** | 0.001 (0.037) | 0.178 (0.011)*** | 0.001 (0.010) |
| $\Delta libor_t$ | 0.112 (0.026)*** | 0.020 (0.035) | 0.048 (0.031) | 0.003 (0.018) | 0.092 (0.032)** | 0.0241 (0.031) |
| $\Delta csm\_embig_t$ | | 0.975 (0.222)*** | | 0.972 (0.378)*** | | 0.9880 (0.063)*** |
| $\Delta csm\_rat_t$ | | 0.536 (0.151)*** | | 0.761 (0.323)*** | | −0.213 (0.142) |
| constant | 0.042 (0.006)*** | −0.027 (0.007)*** | 0.048 (0.016)*** | −0.063 (0.018)*** | 0.138 (0.013)*** | 0.146 (0.034)*** |
| Statistics | N = 23 | N = 23 | N = 23 | N = 23 | N = 23 | N = 23 |
| | NT = 77082 | NT = 77082 | NT = 52184 | NT = 52184 | NT = 24898 | NT = 24898 |
| | LR(4:3) = 0.01 | LR(4:3) = 0.03 | LR(4:3) = 0.02 | LR(4:3) = 0.03 | LR(4:3) = 0.05 | LR(4:3) = 0.04 |
| | LR(3:2) = 0.02 | LR(3:2) = 0.05 | LR(3:2) = 0.02 | LR(3:2) = 0.06 | LR(3:2) = 0.05 | LR(3:2) = 0.03 |
| | LR(2:1) = 0.12 | LR(2:1) = 0.13 | LR(2:1) = 0.06 | LR(2:1) = 0.11 | LR(2:1) = 0.20 | LR(2:1) = 0.33 |

Notes: The values in parentheses are the standard errors. *** and **, respectively, denote significance at 1% and 5 % levels. N and NT are, correspondingly, the numbers of countries and effective observations for the sample. LR (p:p-1) is 10 ∗ likelihood ratio (LR) statistic to test the validity of sequential reduction from PARDL (p) to PARDL (p-1).

much earlier than for the SGE. The average EMBIG spreads were around 200 bps during the earlier phase of the ample global liquidity and were just around 100 bps thereafter until the GFC. During the GFC, spreads jump to around 600 bps. Opposite to the SGE, credit ratings tend to decrease after the GFC with average EMBIG spread fluctuates around 200 bps. From Fig. 3, it may be inferred that, the episodes of turmoil and tranquil along with IGE and SGE all matter for both the levels and fluctuations of EMBIG spreads and their relations with the ratings.

Eqs. (4.1) and (4.2) in Table 4 present the estimation results for episodes of speculative and investment grade ratings, respectively. The long-run impact of ratings appears to be substantially higher for IGE than SGE. The long-run effect of global conditions, as represented by vix and libor coefficients, remains almost the same under IGE and SGE. The coefficients of csm_rat may be interpreted as reflecting that the spillover effect dominates the flight-to-quality impact especially in the SGE.

A transition from a speculative grade to an investment grade, or vice versa, may be important for the evolution of the EMBIG spreads. This is because many institutional investors such as retirement and insurance funds are subject to internal rules that allow them to invest solely in securities with investment-grade ratings. Furthermore, many regulations such as the Basel rules are often based on credit ratings leading to increase the importance of a distinction between different rating groups.

To investigate the reaction of EMBIG spreads to transitions from one risk group to another by one or more major rating agency, the general CCEP model is augmented with dummy variables for rating transitions by each of the three rating agencies.[17] Rating changes of the major agencies may not be contemporaneous. In this context, d_si1 takes the value of 1, when a country is upgraded to an investment grade from just one agency, whilst the other two ratings of the country remain at speculative grade. Similarly, d_si2 takes the value of 1 on the day when a country get an investment grade rating from a second rating agency leaving the country with just one speculative grade rating and d_si3 takes the value of 1 on the day when all the three credit rating agencies classify the country as investment grade. On the other hand, d_is1 takes the value of 1 when only one of the agencies downgrades the country to speculative grade. In the

same vein, d_is2 is unity when a second agent downgrades the country to a speculative grade rating and d_is3 takes the value of 1 on the day when all the three agencies agree to define the rating as speculative.

The results presented by Eq. (4.3) of Table 4 suggest that a rating downgrade from investment to speculative status by even only one rating agency substantially increases EMBIG spreads beyond the level suggested by the rating change alone. The confirmation of this downgrade by the second and the third agencies leads to a further significant increase in the spreads. Given the regulatory and risk management rules, global institutional investors often face constraints for investing in countries with speculative grade. Consequently a downgrade to a speculative grade sharply shrinks the potential investor base and often leads to capital outflow. Therefore, the results for downgrades may not be unexpected. Financial markets, however, tends to be much cautious for upgrades from speculative grade to investment grade. An upgrade to an investment grade rating by a single rating agency appears to have a significant additional effect on spreads. An upgrade by a second agency also leads to a decrease in EMBIG spreads. A third agency may be interpreted as being late to have a significant impact when joins the other two, which already upgraded the country to investment status. The results by Eq. (4.3) also suggest that EMBIG spreads are more sensitive to transitions from investment to speculative grade ratings than transitions from speculative to investment grade ratings.

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[17] Econometric theory is yet to provide a support to the use of PARDL-MG and CCE-PARDL-MG procedures in the presence of interaction dummy variables. Therefore we prefer to use CCEP procedure in the models with interaction dummy variables in Tables 4 and 5.
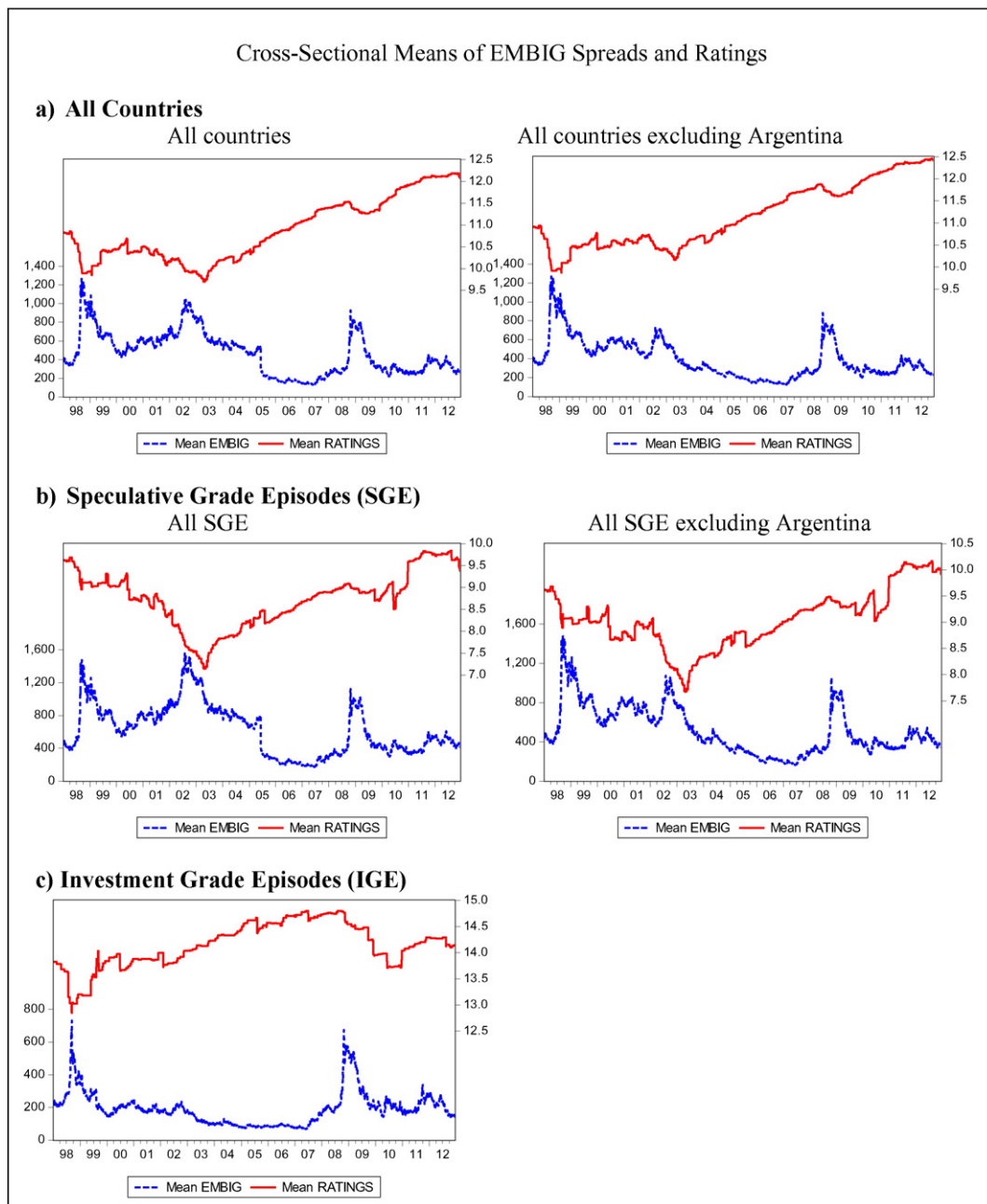


Fig. 2. Credit ratings and EMBIG spreads: Spearman's rank correlations.

**Fig. 3.** Cross-sectional means of EMBIG spreads and ratings.

Consequently, financial markets appear to be more sensitive to negative rating changes than positive changes. Above all, the results show that having an investment-grade rating even from just one rating agency makes a real difference for that country's borrowing costs.

Table 5 presents the results of the panel fixed effects and CCEP estimations for Eq. (1) augmented with the interactions of the variables with crisis dummy variables. In the equations the dummy variable "crisis" takes unity for the GFC and post-GFC periods and zero otherwise. The results by Eqs. (5.1) and (5.2) suggest that the impact of ratings considerably decreases after the recent GFC. The international interest rate variable (libor) coefficient, on the other hand, increases significantly whilst the VIX coefficient decreases after the crisis. These results are essentially similar to those reported by Table 3 and thus may be interpreted as lending a support to the robustness of our results to different procedures.

Consistent with the results already presented by Table 4, the rating coefficients are much higher (in absolute value) for IGE (Eqs. 5.3 and 5.4) than SGE (Eqs. 5.5 and 5.6) before the GFC. After the GFC, the rating

coefficients significantly change for both IGE and SGE, but in opposite directions. After the GFC, the impact of the ratings substantially decreases (increases) for IGE (SGE). Consequently, the impacts of ratings for IGE and SGE tended to converge[18] after the GFC.

The impact of VIX appears to decline for both IGE and SGE after the GFC. The libor coefficients, on the other hand, increase considerably for both IGE and SGE especially in the PFE Eqs. (5.3) and (5.5). As discussed in the earlier sections, the coefficients of the global financial conditions variables vix and libor decline substantially with the inclusion of the cross-sectional means in the CCEP Eqs. (5.4) and (5.6).

These results may be explained by the important developments in the global economic landscape after the GFC. The global economy witnessed a double-speed recovery from the GFC with sluggish growth in advanced

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[18] The ratings coefficient declined (in absolute value) from 3.8 to 2.1 (Eq. 5.3) or from 2.7 to 1.8 (Eq. 5.4) for the IGE. For the SGE, the coefficient increased from 1.6 to 2.3 (Eq. 5.5) or from 1.5 to 2.4 (Eq. 5.6).

**Table 4**
Credit ratings, rating transitions and EMBIG spreads.

| Equation | (4.1) | (4.2) | | (4.3) |
|---|---|---|---|---|
| Sample | SGE | IGE | | All |
| | Long-run | | constant | 1.619 (0.05)*** |
| $rat_{it}$ | −0.199 (0.118)* | −4.293 (0.077)*** | $rat_{it}$ | −1.738 (0.008)*** |
| $vix_t$ | 0.201 (0.071)*** | 0.208 (0.077)*** | $vix_t$ | 0.093 (0.003)*** |
| $libor_t$ | 0.087 (0.016)*** | 0.004 (0.019) | $libor_t$ | 0.020 (0.001)*** |
| $csm\_embig_t$ | 0.853 (0.068)*** | 0.677 (0.075)*** | $csm\_embig_t$ | 0.913 (0.002)*** |
| $csm\_rat_t$ | −3.850 (0.325)*** | 4.499 (0.297)*** | $csm\_rat_t$ | 1.130 (0.010)*** |
| | Short-run dynamics | | $d\_si1_{it}$ | −0.135 (0.034)*** |
| $ec_{t-1}$ | −0.009 (0.003)*** | −0.013 (0.006)*** | $d\_si2_{it}$ | −0.117 (0.035)*** |
| $\Delta rat_{it}$ | −0.286 (0.131)*** | 0.369 (0.220) | $d\_si3_{it}$ | −0.059 (0.041) |
| $\Delta vix_t$ | −0.039 (0.010)*** | −0.026 (0.042) | $d\_is1_{it}$ | 0.366 (0.177)** |
| $\Delta libor_t$ | 0.027 (0.045) | −0.003 (0.062) | $d\_is2_{it}$ | 0.515 (0.092)*** |
| $\Delta csm\_embig_t$ | 0.678 (0.051)*** | 1.213 (0.292)*** | $d\_is3_{it}$ | 0.693 (0.133)*** |
| $\Delta csm\_rat_t$ | 0.557 (0.120)*** | −0.430 (0.219)* | | |
| constant | 0.094 (0.031)*** | −0.001 (0.001)*** | | |
| Statistics | NT = 42544 | NT = 34538 | | R² = 0.90 |
| | LR(4:3) = 0.02 | LR(4:3) = 0.02 | | F = 20339 |
| | LR(3:2) = 0.03 | LR(3:2) = 0.09 | | N = 23 |
| | LR(2:1) = 0.08 | LR(2:1) = 0.01 | | NT = 77105 |

Notes: The values in parentheses are robust standard errors. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively. N and NT are, correspondingly, the numbers of countries and observations for the sample. LR(p:p-1) is 10 ∗ likelihood ratio (LR) statistic to test the validity of sequential reduction from PARDL (p) to PARDL (p-1).

**Table 5**
GFC and determinants of EMBIG spreads for IGE and SGE.

| Sample | All | | Investment grade | | Speculative grade | |
|---|---|---|---|---|---|---|
| Equation | (5.1) | (5.2) | (5.3) | (5.4) | (5.5) | (5.6) |
| constant | 7.428 (0.048)*** | 1.154 (0.049)*** | 12.116 (0.183)*** | −0.214 (0.185) | 6.807 (0.049)*** | 5.957 (0.105)*** |
| $rat_{it}$ | −2.084 (0.013)*** | −1.753 (0.009)*** | −3.790 (0.062)*** | −2.649 (0.045)*** | −1.644 (0.013)*** | −1.464 (0.010)*** |
| $vix_t$ | 1.000 (0.010)*** | 0.073 (0.004)*** | 0.887 (0.011)*** | 0.222 (0.009)*** | 0.953 (0.012)*** | −0.048 (0.006)*** |
| $libor_t$ | 0.057 (0.006)*** | −0.001 (0.002) | 0.124 (0.005)*** | −0.027 (0.004)*** | −0.085 (0.006)*** | 0.029 (0.003) |
| $Crisis * rat_{it}$ | 0.264 (0.007)*** | 0.214 (0.007)*** | 1.653 (0.046)*** | 0.838 (0.037)*** | −0.687 (0.018)*** | −0.906 (0.017)*** |
| $Crisis * vix_t$ | −0.619 (0.021)*** | −0.060 (0.004)*** | −0.455 (0.018)*** | −0.120 (0.010)*** | −0.650 (0.029)*** | 0.002 (0.002) |
| $Crisis * libor_t$ | 0.219 (0.018)** | 0.029 (0.002)*** | 0.130 (0.015)*** | 0.045 (0.005)** | 0.325 (0.021)** | −0.013 (0.005)*** |
| Crisis | 1.620 (0.084)*** | 1.817 (0.066)*** | −2.312 (0.143)*** | 4.893 (0.191)*** | 3.533 (0.121)*** | −6.121 (0.173)*** |
| $csm\_embig_t$ | | 0.922 (0.003)*** | | 0.836 (0.010)*** | | 0.917 (0.007)*** |
| $csm\_rat_t$ | | 1.364 (0.021)*** | | 2.958 (0.050)*** | | −0.821 (0.038)*** |
| $Crisis * csm\_embig_t$ | | 0.075 (0.005)*** | | 0.061 (0.012)*** | | 0.127 (0.012)*** |
| $Crisis * csm\_rat_t$ | | −1.079 (0.025)*** | | −2.948 (0.054)*** | | 3.112 (0.061)*** |
| Statistics | R² = 0.83 | R² = 0.90 | R² = 0.88 | R² = 0.93 | R² = 0.74 | R² = 0.89 |
| | F = 13111 | F = 20577 | F = 10455 | F = 15116 | F = 5402 | F = 13081 |
| | N = 23 | N = 23 | N = 18 | N = 18 | N = 16 | N = 16 |
| | NT = 77105 | NT = 77105 | NT = 34584 | NT = 34584 | NT = 42521 | NT = 42521 |

Notes: The values in parentheses are robust standard errors. *** and ** denote significance at 1% and 5% levels, respectively. N and NT are, correspondingly, the numbers of countries and observations for the sample.

economies and rapid growth in EME. The rapid recovery from the GFC was not restricted to investment-grade EME but also contained some other EME with relatively better domestic fundamentals albeit graded as SGE. Unconventional monetary policies in advanced economies after the GFC, including the zero lower bound interest rate policy and quantitative easing, improved the so-called "push" factors. Credible monetary policies along with fiscal discipline, reserve accumulation and financial system reforms in many EME not only reduced their exposure to the GFC but also provided an important "pull" factor.[19] These improvements in both domestic pull and global push factors surged capital inflows to EME, the bulk of which was short-term, after the GFC. With the ample global liquidity, especially before the "taper tantrum" not only the investment grade countries but also the speculative grade countries with better domestic fundamentals observed a surge in capital inflows. Consequently, the sovereign ratings has become much more important for SGE after the GFC.

## 4. Concluding remarks

Credit ratings (CR) and global financial conditions both matter for EMBIG spreads. Our results support the robustness of this postulation to different empirical modelling procedures including PARDL-MG and CCE-PARDL-MG. This paper, however, also finds that the determinants of EMBIG spreads are not invariant to investment and speculative grade episodes, the transitions between them and to the recent global financial crisis.

The impact of CR is found to be substantially higher for investment grade episodes (IGE) than speculative grade episodes (SGE). A rating downgrade from investment to speculative status substantially increases EMBIG spreads beyond the level suggested by the rating change alone. This is not surprising since investment rules of many institutional investors allow only to invest in bonds with investment grade. Consequently, a downgrade to a speculative grade sharply shrinks the investor base. Similarly, an upgrade to investment grade also leads to an additional decrease in EMBIG spreads, albeit its effect is lower than the effect of transitions from investment to speculative ratings.

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[19] See, Kose et al. (2012) for the growth performance of EME during and after the GFC.

According to the results, having an investment grade rating even from just one CR agency makes a real difference for that country's borrowing costs.

The impact of CR is found to significantly decrease after the recent global financial crisis (GFC). Given the fact that CR agencies have been extensively criticised during and after the GFC, this may lend a support to an argument that their credibility and influence have decreased recently. However, our findings suggest that the impact of ratings decreases only for IGE. Their impact, on the other hand, is found to be substantially increased for SGE after the GFC. Therefore, a postulation which does not differentiate the SGE and IGE after the GFC may be misleading. The convergence of the reaction of EMBIG spreads to CR by IGE and SGE after the GFC may, indeed, be explained by the important developments in the global economic landscape including the double-speed recovery from the GFC with sluggish growth in advanced economies and rapid growth in EME and unconventional monetary policies in advanced economies. The rapid recovery from the GFC was not restricted to investment grade EME but also contained some other EME with relatively better domestic fundamentals albeit graded as speculative. The improvements in both domestic pull and global push factors surged capital inflows, the bulk of which was short-term, to EME after the GFC. With the ample global liquidity, especially before the "taper tantrum" not only the investment grade EME but also the speculative grade EME with better domestic fundamentals observed a surge in capital inflows. Consequently, the country ratings became much more important for SGE after the GFC. An important policy question, in this context, whether the convergence of the impacts of ratings for SGE and IGE after the GFC will survive under expected monetary tightening by the Fed.

According to Calvo (2002), with international financial integration, EME have become more vulnerable to exogenous shocks coming from global capital markets which is referred to as "globalisation hazard". The importance of global factors in the determination of the spreads, however, may not relegate the importance of domestic fundamentals. Stronger domestic fundamentals leading to higher CR decreases external borrowing costs of EME. The transmission of external shocks to EME is often magnified by domestic fundamentals. Consequently, domestic fundamentals are crucially important for growth even under the case that the spreads are mainly determined by global conditions.

## Acknowledgment

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