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Abstract

Since 2002, spreads on emerging market sovereign debt have fallen to historical lows. Given the close links between sovereign spreads, capital flows to emerging markets, and economic growth, understanding the factors driving these spreads is very important. We address this issue in two stages. First, we use factor analysis to study the extent to which emerging market bond spreads are driven by global factors, as opposed to country-specific macroeconomic fundamentals. Using data on different U.S. asset classes, we identify a common factor, linked to global financial conditions. Second, we use this common factor in a panel estimation framework to analyze the degree to which the fall in spreads is driven by better macroeconomic policies. Our results show that the common factor is *not* responsible for the reduction in spreads. Instead, emerging markets have benefited considerably from better macroeconomic policies, including lower inflation and lower debt. Therefore, a reversal of the benign global conditions need not necessarily have a substantial negative impact on financing conditions for emerging markets.

JEL classification: E43, F34, G12, G15
Bank classification: Development economics; Financial stability; International topics

Résumé

Depuis 2002, les écarts sur les obligations émises par les pays à marché émergent se situent à des creux historiques. Étant donné les liens étroits qui existent entre les écarts sur les emprunts souverains, les flux de capitaux vers les marchés émergents et la croissance économique de ces derniers, il est très important de comprendre les déterminants de ces écarts. Nous abordons cette question en deux étapes. Nous recourons d'abord à une analyse factorielle pour évaluer dans quelle mesure les écarts sur les obligations de pays à marché émergent dépendent de facteurs mondiaux, par opposition aux variables macroéconomiques fondamentales propres à chaque pays. L'examen des données relatives à différentes classes de titres américains permet de dégager un facteur commun, lié aux conditions financières internationales. Nous intégrons ensuite ce facteur commun à un cadre de régression sur données de panel, en vue de cerner l'influence de l'amélioration des politiques macroéconomiques sur le rétrécissement des écarts. Nous constatons que le facteur commun *n'est pas* responsable de la baisse des écarts. Celle-ci s'explique plutôt par l'application de meilleures politiques macroéconomiques dans les marchés émergents, notamment par la réduction de l'inflation et de la dette. Il se peut, par conséquent, qu'un renversement des conditions financières favorables à l'échelle internationale n'ait pas d'effet négatif important sur les conditions de financement offertes aux marchés émergents.

Classification JEL : E43, F34, G12, G15
Classification de la Banque : Économie du développement; Stabilité financière; Questions internationales

1 Introduction

The role and importance of emerging markets have changed substantially over the recent years. Emerging markets are no longer dependent on foreign capital, as they were in the 1970s and 1980s. In the face of rising energy and non-energy commodity prices, emerging markets have accumulated large current account surpluses and, in many cases, substantial holdings of foreign reserves. This has brought important benefits: Many of the past problems of these economies were caused by their dependence on volatile capital flows from the developed world to finance current-account deficits, as exemplified by the Asian and the Russian crises. Today, however, the large importers of capital are industrialized countries, while many emerging markets are suppliers of capital.

Perhaps the biggest sign of change has been in the emerging debt markets. The traditional gauge of risk of emerging market debt is the JP Morgan's 'Emerging Market Bond Index Global' (EMBI Global), which tracks the price of dollar-denominated emerging market debt since the early 1990s. In 2007, the EMBI Global yielded the thinnest spread ever recorded over riskless U.S. Treasury bonds. Two, not mutually exclusive, explanations for this are: first, many emerging markets have strengthened their macroeconomic policy frameworks and have undertaken significant structural reforms. Consequently, macroeconomic outcomes in terms of growth and inflation have improved greatly. As a result, the risk of default and risk premia have reduced, and spreads on emerging market debt have fallen. The second explanation acknowledges the improvements in macroeconomic policies and outcomes, but also points to the fact that risk spreads have fallen for virtually all asset classes, not just for emerging market debt. This could indicate that other factors besides country fundamentals are responsible for the sharp fall in risk premia.

Against this backdrop, we examine factors influencing movements in emerging market yield spreads. We use principal factor analysis to examine the degree to which spreads in different asset classes exhibit similar patterns. Principal components analysis (PCA) – a technique related to principal factor analysis – has been used by other authors to analyze financial data. For instance, Litterman and Scheinkman (1991) analyzed the term structure of U.S. interest rates; Avellaneda and Zhu (1997) looked at the term structure of implied volatility of foreign-exchange options, and Gourieroux et al. (1997) and Laloux et al. (1999) analyzed the CAC 40 and the Standard and Poor's 500 index, respectively. Lastly, Slok and Kennedy (2004) use PCA to identify a com-

mon trend in risk premia on stock and bond markets in developed and emerging market countries since the beginning of 1988. They find that their principal components are strongly correlated with the OECDs leading indicator of industrial production, and a measure of global liquidity.

While several studies have used PCA and/or factor analysis to analyze financial data, the evidence for emerging markets is considerably thinner. Scherer and Avellaneda (2000) find two common factors in the changes in sovereign debt spreads for a sample of Latin American Brady bond debt from 1994 to 2000, and Westphalen (2003) finds evidence of a common factor in changes in sovereign debt spreads on bonds denominated in several currencies, after controlling for country risk. Fuentes and Godoy (2005) investigate principal components in various emerging market countries, aiming at providing explanations for the different factors, based on historic events (such as debt defaults). The two studies closest to ours are McGuire and Schrijvers (2003) and Ciarlone et al. (2007). The former uses PCA to study common developments in risk premia in 15 emerging market countries over the period 1997 to 2003. The first factor, which the authors call 'investor risk aversion', explains the bulk of the common variation.[1] Ciarlone et al. (2007) use factor analysis to examine emerging markets spreads, and find that the common factor is able to explain a substantial share of the reduction in emerging market spreads over the past few years. We improve upon these studies in a number of ways. First, we argue that the principal factor should be calculated using data on different U.S. asset classes, and not only emerging market spreads. Second, we provide evidence that the principal factor derived from emerging market spreads is related, but not identical, to that derived from credit spreads in other asset classes. And third, we use panel estimation methods, which pool the data and allow more precise estimation of the factors driving emerging markets spreads than country-specific regressions. And lastly, our sample includes a longer time period and a broader set of emerging markets than previous studies.

To preview the conclusions, we find evidence that emerging markets spreads are correlated with global financial developments and the evolution of energy- and non-energy commodity prices. Further, we find that while these factors have contributed to the fall in spreads, their contribution is relatively small. Instead, our results suggest that the most important elements driving the compression in spreads are improvements

[1] We discuss 'risk aversion' in section 2.2. The Deutsche Bundesbank (2004) calculates a risk aversion indicator, employing principal component analysis using risk premia on investment and speculative grade corporate bonds in developed countries, and sovereign risk premia for some Asian and Latin American countries.

in the overall economic situation of most emerging markets, exemplified by lower inflation, lower debt, and higher exports- and reserves-to-GDP ratios. These findings provide an explanation why emerging markets remained largely unaffected by the recent turmoil in global financial markets.

The remainder of the paper is organized as follows. Section 2 presents stylized facts on emerging markets' sovereign bond spreads during 1994-2007, and discusses possible explanations for the compression observed during this period. Section 3 outlines the empirical methodology. Section 4 presents the estimation results, and section 5 discusses the key findings.

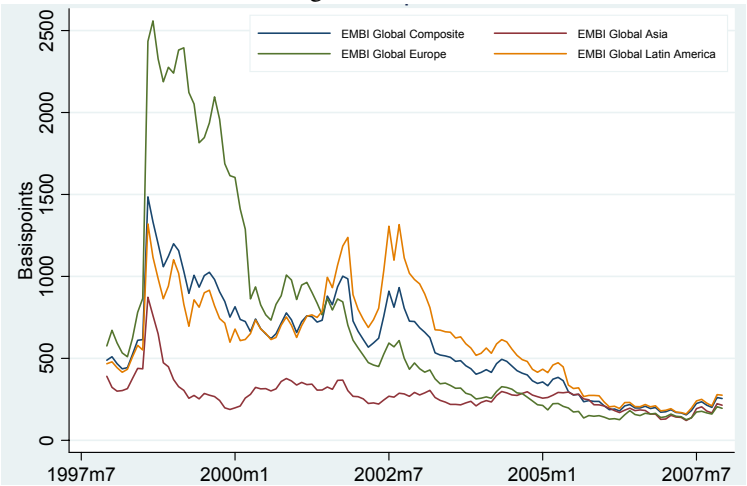
2 Spreads on emerging market bonds

Sovereign spreads for emerging markets have fallen considerably over the last 5 years. The most comprehensive measure of spreads on sovereign debt issued by emerging markets is the EMBI Global (henceforth: EMBI), produced by JP Morgan-Chase. It comes in several variants: a 'Composite' index, which summarizes developments in all emerging markets; indices for different geographical regions, and country-specific indices. All are based on total returns for US-dollar denominated debt instruments issued by EM sovereign and quasi-sovereign entities, like Brady bonds, loans and Eurobonds.[2] According to the EMBI, sovereign spreads have fallen for emerging market economies since 1999 in virtually all regions of the world: figure 1 graphs EMBI Global indices for Latin America, Europe and Asia, and the EMBI Global Composite. In 2007, the EMBI Global Composite fell to the lowest level ever recorded, and even though emerging markets spreads have increased during the credit turmoil starting in summer 2007, they have remained well below their historical averages.

The compression in sovereign spreads has occurred in an environment character-

[2]The use of secondary market bond spreads is in line with the growing literature on sovereign spreads. It avoids the critique of Eichengreen and Mody (1998) that studies based on primary spreads suffer from selectivity bias, as the creditworthiness of primary issuers will vary with financing conditions. The use of EMBI spreads is not without drawbacks, however: for instance, it uses relatively strict criteria for countries to be included (for this reason, only five countries were included in the original EMBI; but the EMBI Global – the measure we use – has less stringent liquidity criteria). Another drawback of using this measure is that new issuances of external debt have recently started to decline, as many emerging markets have seen improvements in their finances and have started issuing local-currency debt. Thus the relevance of using the EMBI Global is undermined to the extent that external debt has become less important compared to local-currency debt for some countries. However, the measure is still the most widely-used, most consistent gauge of emerging market sovereign debt. Note lastly that for the panel estimations we use *country-specific* EMBI spreads, not regional EMBI indices (which can heavily weighted towards a few countries).

Figure 1: **EMBI Global indices**



Source: JP Morgan

ized by structural changes in emerging market financing. A shift to longer maturities, lower external debt levels, and better debt management policies has led many emerging markets to reduce their debt servicing burdens. The consequences of these developments are impressive. Emerging markets were thought of suffering from 'original sin' until recently, i.e. they were unable of borrowing abroad long-term in their own currency (Eichengreen et al., 2003b). However, many have now tried to overcome 'original sin', both through more bond issuance denominated in their own currencies in international financial markets, as well as through the development of their domestic bond markets. This is a welcome shift, because if countries are only able to borrow in foreign currency, a currency crisis almost automatically becomes a dollar-denominated debt crisis (Eichengreen et al., 2003a).[3]

Does this mean that emerging markets have entered a virtuous circle, in which lower credit spreads lead to lower debt servicing costs, which lower the probability of sovereign default, hence improving country ratings, leading to lower spreads and, consequently, lowering debt servicing costs etc.? To answer this question, an understanding of the factors driving the reduction in emerging market spreads is required. The literature has identified two main, not mutually exclusive, explanations for the de-

[3]Issuing debt in local currency has the additional advantage that it increases liquidity and resilience of local debt markets. Government securities are often viewed as benchmarks for corporate bonds, and by issuing local currency debt and developing local financial markets, governments can help local companies borrow for longer periods and at better terms.

cline in emerging market spreads: improvements in country fundamentals, and benign global (financing) conditions. Each of these is briefly discussed below.

2.1 Improvements in macroeconomic fundamentals

Since the Asian crisis, many emerging markets have strengthened their macroeconomic policy frameworks and undertaken growth-enhancing structural reforms. Key economic policy changes include the adoption of more flexible exchange rate regimes, lower inflation through the adoption of inflation targeting (and the associated increase in anti-inflationary credibility), fiscal and current account surpluses, and – in many cases – accumulation of foreign exchange reserves.

Table 1 summarizes these improvements by comparing average performance in 1997 and 2006 for all countries in our sample. While some indicators, such as inflation, are a clear sign of better macroeconomic policies, other indicators, such as budget deficit-to-GDP, may simply reflect a strong cyclical development in the face of high commodity prices. But even in this area, improvements are clearly visible, as a number of countries have improved their management of the fiscal impact of volatile commodity prices, for instance, by setting up sovereign wealth funds. These improvements are also reflected in country ratings: the average credit rating of the countries included in the EMBI Global index rose from BB- to BB+ between 2000 and 2007.

Lastly, these improvements in macroeconomic fundamentals are often accompanied by better and more timely data provision (IMF, 2006). This allows investors to better evaluate a country's riskiness, which reduces uncertainty. This could have contributed to the compression in sovereign spreads.

2.2 Favourable global (financial) conditions

The second explanation argues that emerging markets benefit from low spreads not (primarily) because of better economic policies, but because global and cyclical factors have been favourable. More specifically, it has been argued that high prices for energy and non-energy commodities (see figure 2), and favourable global financial conditions – characterized by low interest rates and low stock market volatility in advanced economies (figure 3), as well as an abundant supply of liquidity – have fuelled the compression of spreads. Hence, it has been argued that the compression in

Table 1: **Macroeconomic Fundamentals in Emerging Markets**

Yearly average	1997	2006
Inflation	77.71	5.13
GDP growth	1.95	6.39
Budget deficit-to-GDP ratio	-1.60	1.28
Reserves-to-GDP ratio	38.44	58.96
Exports-to-GDP ratio	6.24	9.23

Source: own calculations. The debt ratios and the ratios budget deficit-, reserves- and exports-to-GDP are multiplied by 100 for expositional clarity. Countries included: Argentina, Brazil, Bulgaria, China, Chile, Colombia, Ecuador, Hungary, Malaysia, Mexico, Morocco, Panama, Peru, Philippines, Poland, Russia, South Africa, Thailand, Turkey, Venezuela.

Figure 2: Oil and commodity price index

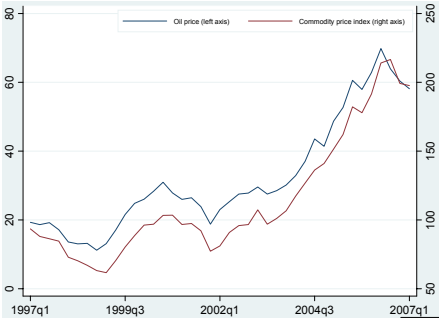
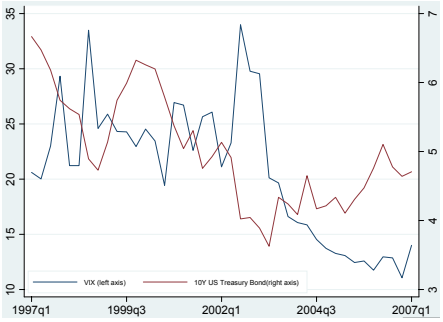


Figure 3: Financial conditions (US long-term interest rates, VIX)



emerging market spreads is primarily driven by exogenous factors, such as changes in international investors' ability to hold risky assets.[4]

Global financial conditions can impact emerging market spreads, since spreads capture two elements: first, the risk stemming from the possibility of default; second, the degree of willingness or ability of investors to hold a risky asset. The latter may be unrelated to the actual default risk of that country, and may reflect factors like the financial position of investors or liquidity risk in financial markets at that time. Put differently, even if investors' expectations about countries' default risks are constant, the share of risky emerging market assets in an investor's portfolio is not likely to be constant, due to portfolio constraints, for instance.[5] And note lastly that leveraged carry traders,

[4]For a similar line of reasoning see, for example, Herrera and Perry (2002); Grandes (2003); Herrero and Ortiz (2004); Calvo and Talvi (2004); and Rozada and Yeyati (2006).

[5]Note the distinction between investors' ability or willingness to hold risk and 'risk aversion'. Risk aversion is a parameter in the utility function. Being part of the intrinsic profile of economic agents, it

who borrow at the short-end of the yield curve to invest in emerging market bonds, are also dependent on financial conditions for financing their transactions (Hartelius et al., 2008).

2.3 Implications

These two explanations have very different implications for policymakers. With regards to the first, the accomplishment of suitable macroeconomic policies along with the resulting improvements in macroeconomic fundamentals would seem to suggest that emerging markets are now less vulnerable to sudden shifts in global financial conditions. However, if global financial developments have caused the compression in emerging market spreads, then they could haven fallen below levels that would adequately cover risk.[6] Secondly, a high sensitivity of emerging market spreads to developments in advanced economies could imply that in the event of a tightening of credit conditions in advanced economies, the cost of financing for emerging markets can rise substantially, even if their macroeconomic fundamentals remain unchanged.

3 Methodology

A seminal work in the literature on lending behaviour in international markets is Edwards (1984), which provides a framework for the determinants of the sovereign risk premium. His model assumes that emerging market economies are small borrowers in perfectly competitive financial markets. Under this assumption, the spread over a risk-free interest rate is a function of the probability of default of a country. In reduced-form models, this probability of default is exogenously determined. It is linked to the sustainability of a given level of external debt through solvency or liquidity indicators, which relates the probability of default to macroeconomic fundamentals.

Edwards (1984) derived the following log-linear relationship of sovereign spreads:

should not change frequently over time. However, *for a given risk aversion*, the willingness or ability to hold risk can change, reflecting – for instance – changes in the composition of an investor's balance sheet, which make holding risk more or less attractive over time (see also Gai and Vause, 2004; Coudert and Gex, 2006; Illing and Aaron, 2005). To measure changes in investors' ability and willingness, we use the VIX as a proxy for uncertainty on financial markets. Alternatively, various risk indicators exist, including JP Morgan's Liquidity, Credit and Volatility Index (Coudert and Gex, 2006), which has been used in studies of financial crises in emerging markets (Dungey et al, 2003).

[6] A similar development may have occurred prior to the Asian financial crisis (Kamin and Kleist, 1999).

$$log(s_{it}) = \alpha_i + \sum_{k=1}^{K} \beta_k X_{kit} + \varepsilon_{it} \tag{1}$$

where s_{it} is the yield spread of country i at time t, α_i is an intercept coefficient, β_k are slope coefficients, X_k denote K macroeconomic fundamentals, and ε are i.i.d. error terms.[7] This basic regression form has been used in various previous studies.[8] In this study, we want to analyze the effect of (benign) global conditions, along with macroeconomic fundamentals, on sovereign spreads. To this end, we employ principal factor analysis.

Factor analysis is a statistical technique used to reduce the dimensionality of data, and to detect structure in relationships between variables (Tsay, 2005). Its aim is to identify factors that account for most of the variation in the covariance or correlation matrix of the data. Underlying this technique is the premise that unobservable internal characteristics (or attributes) exist, in which the sample elements differ.[9] The advantage of factor analysis is that it relies on a minimal set of assumptions to identify patterns in the data (to some extent this distinguishes factor analysis from state space models, where the identification assumptions play a very important role).

Formally, factor analysis stipulates that p observed random variables can be expressed as linear functions of m hypothetical common factors ($m < p$), plus an error term. Consider $x_1, x_2, ...x_p$ random variables and $f_1, f_2, ...f_m$ factors, then

$$\begin{aligned} x_1 &= \lambda_{11} f_1 + \lambda_{12} f_2 + ... + \lambda_{1m} f_m + e_1 \\ x_2 &= \lambda_{21} f_1 + \lambda_{22} f_2 + ... + \lambda_{2m} f_m + e_2 \\ &\vdots \\ x_p &= \lambda_{p1} f_1 + \lambda_{p2} f_2 + ... + \lambda_{pm} f_m + e_p \end{aligned} \tag{2}$$

[7] In the context of more sophisticated theoretical models, Feder and Just (1977), Eaton and Gersovitz (1980), and Sachs (1981) derive similar relationships.

[8] See, for example, Ciarlone et al. (2007), Ferrucci (2003), Arora and Cerisola (2001), Min (1998), etc.

[9] These characteristics are commonly referred to as 'latent factors' or 'internal variables', and are assumed to account for the variation and co-variation (or correlation) across a range of observed phenomena. A reason why emerging markets spreads could contain a common factor is found in the *immunization theory* (Macauley, 1938; Fisher and Weil, 1971), which claims uncertainty has the same impact on all rates in the economy, irrespective of their type and maturity. This concept should hold for different interest rates within one economy, but also between economies, provided that we can sufficiently quantify factors such as currency risk. Perignon et al. (2007) outline the limitations of principal factors in bond returns. Their argument is that a multi-country dataset captures both local and common influences, and therefore factor analysis tends to pick 'too many' factors. In our case, however, we only identify one common factor.

where λ_{jk} are called *factor loadings*, and e_j are error terms, also referred to as specific factors ($j = 1,2,....p$; $k = 1,2,.....m$). In this paper, x represents quarterly series of the levels of EMBI Global spreads, and the sample elements are given by twenty emerging markets.[10] In matrix form, equation (2) is given by:

$$X = \Lambda F + E. \tag{3}$$

A simple way to think about a principal factor is that it represents a pattern in the data that is observed in all countries or variables over which the principal factor is estimated. As such, *by construction* the pattern is not specific to one series, but represents a development that is common to all elements in the sample. This is an important improvement over studies that proxy global developments with one or more individual data series, such as U.S. Federal Funds rates, U.S. 10-year government bonds, or the slope of the yield curve. By extracting common movements from multiple financial series *at the same time*, we effectively exploit a much richer data environment than would be possible using individual data series.

Most studies on emerging market debt that estimate a principal factor model use emerging market spreads as the underlying series, and argue that the principal factor thus identified represents 'global' developments. Following this line of reasoning, the principal factor found in emerging market spreads is argued to proxy 'global conditions'. In our view, this interpretation is not necessarily true. Assume that all emerging countries simultaneously switch to inflation targeting, and consequently experience a large fall in inflation. This lowers the default risk, and thus the spreads on emerging market bonds. This is clearly a development that is not driven by benign global conditions, but by improvements in macroeconomic policies. However, by using a principal factor approach on emerging market bonds, it is impossible to (precisely) attribute this reduction in spreads to global financial conditions. Given that macroeconomic outcomes have improved for a wide range of emerging markets (table 1), we need a way to analyze the effects of benign global conditions, without running a principal factor model on emerging markets spreads directly.

The route we explore is the following. First, we estimate two principal factor models.

[10] We include all countries, for which consistent data is available for the EMBI Global between 1998-2007. Our sample comprises: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Ecuador, Hungary, Malaysia, Mexico, Morocco, Panama, Peru, Philippines, Poland, Russia, South Africa, Thailand, Turkey, and Venezuela.

- The first model uses data on different U.S. bond classes. The factor we extract from these series will be labeled 'global factor'.
- The second model uses individual countries' EMBI series. The factor we extract from these series will be labeled 'emerging market factor'.

In our view, the 'global factor' is a better representation of global financial developments, since it is not 'contaminated' by economic change in emerging markets. Clearly, the global factor is also likely to reflect, at least in part, idiosyncratic U.S. shocks. This is not a drawback of our analysis, however, for two reasons: first, given the importance of the U.S. economy for the global economic outlook, U.S.-specific shocks are likely to affect emerging economies as well. Second, since a large share of emerging market debt is denominated in U.S. dollars, our global factor *should* incorporate U.S. shocks, to the extent that they affect financial markets. Lastly, by estimating two factor models we can compare the series that we believe is the correct measure of global financial conditions – the 'global factor' to the series other studies have typically used (the 'emerging market factor'), and analyze the sensitivity of our results to the construction of the liquidity measure.

Having identified these two principal factors, we then analyze their main determinants. Third, we use the principal factors in a panel setting to examine their relevance in explaining the compression in emerging markets spreads. We start by pooling all countries together, then disaggregate the data along various dimensions.

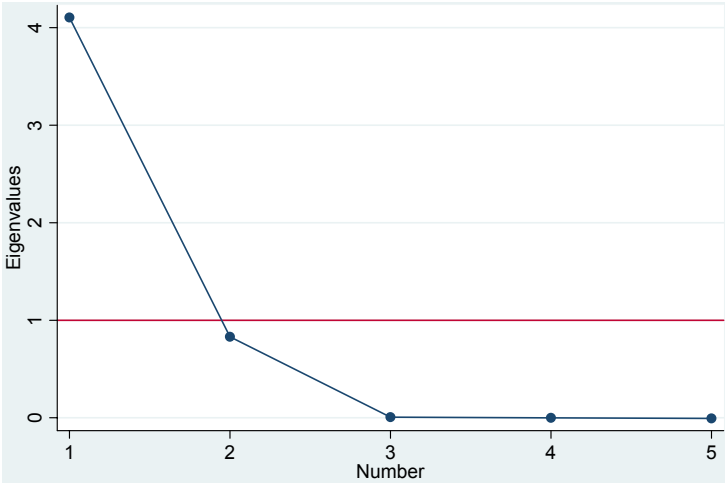
4 Estimation and results

4.1 Principal factor analysis

The first step of our analysis is to estimate the two principal factors. We include the following indices:

- Investment Grade bonds,
- High Yield bonds,
- and bonds rated AAA, AA, A, and BBB (all bond-equivalent yields-to-maturity).

Figure 4: **Screeplot 'Global factor'**

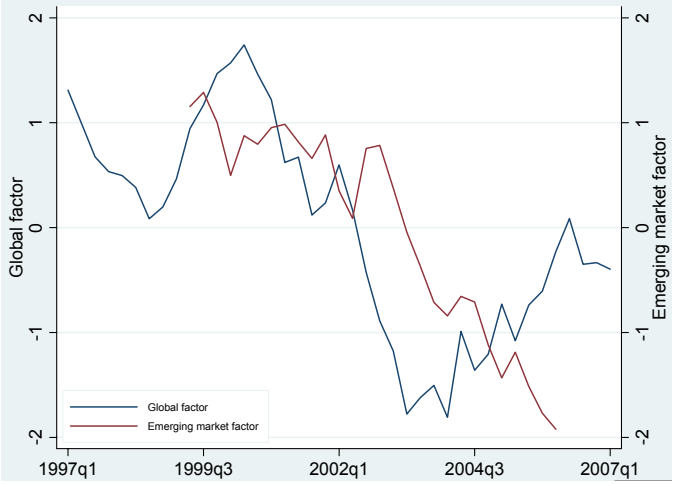


Like the emerging market bonds tracked by the EMBI, these bonds are all U.S. dollar denominated. To determine how many principal factors should be retained, a common methodology is to plot the eigenvalues of the principal factors, starting with the largest ones (a so-called 'screeplot'). This shows the relative importance of the principal factors. The screeplot is given in figure 4. Typically, principal factors with an eigenvalue < 1 are discarded, as they contain little common information (the Kaiser-Guttman criterion). Based on this, we retain the first principal factor, which we label 'Global factor'.

Interesting insights can be gained by comparing this 'Global factor' to a principal factor estimated using emerging market spreads directly. Using a similar approach, we estimate a principal factor model using the EMBI series of all countries in our sample. We label this factor 'Emerging market factor' (see appendix A.2 for details on the construction). Figure 5 displays the 'Global factor' and the 'Emerging market factor'. As can be seen, the two series are quite different, with the correlation between the two being only 0.51. This suggests that there are 'distinct developments' found in spreads for emerging markets. This is a first indication that improvements in emerging markets' macroeconomic fundamentals may have played an important role in explaining the compression of emerging markets spreads.

While a principal factor model is able to identify key patterns in the data, it does not provide a straightforward economic interpretation. It would be desirable if we had an intuition of what drives the 'Global factor', and compare it to the determinants of

Figure 5: **Comparing the 'Global factor' to the 'Emerging Market factor'**



Note: The 'Global factor' is estimated over different U.S. asset classes; the 'Emerging Market' factor is estimated over the EMBI series of all countries in our sample.

the 'Emerging market factor'. Table 2 provides correlations of the two factors with key economic indicators. We report correlations with the IMF's commodity price index, oil prices, the S&P 500, the NASDAQ, U.S. short- and long-term interest rates, proxied by yields on 3-month and 10-year bonds, the U.S. yield curve, and the VIX.[11] Lastly, as a proxy for the strong global economy, we include a measure of world GDP growth. Not surprisingly, the 'Global factor' is strongly correlated with all financial market variables. The 'Emerging market factor', on the other hand, seems to be primarily correlated with commodity prices and oil, but also with the VIX, which is often regarded as a measure of investors' ability to hold risk.

To investigate whether similar improvements can be witnessed in all emerging countries, we split the data on emerging market spreads into different categories. First, we split the data into three geographic regions: Latin America, Europe, and the rest of the world (ROW). We estimate a principal factor model for each region, and plot the first factor (see left panel of figure 6). As can be seen, spreads in all regions follow the same basic pattern, yet differences exist – e.g. the main fall in spreads for Europe occurred from late 2003 onwards, whereas the compression in spreads for the other two groups started earlier.

[11]The VIX is the implied volatility measure of the Chicago Board Options Exchange Volatility Index. This popular measure of the implied volatility of S&P 500 index options is often used to proxy uncertainty in financial markets.

Table 2: **Correlations of principal factors with key economic variables**

	Global factor	Emerging markets factor
Commodity price index	-0.36	-0.92
Oil price	-0.35	-0.90
SP500	0.65	-0.09
NASDAQ	0.69	0.12
US 3M bond	0.79	0.11
US 10Y bond	0.93	0.39
US Yield curve	0.57	-0.06
VIX	0.38	0.88
World GDP growth	-0.90	-0.57

Second, we compare principal factors in EMBI spreads across different degrees of risk.[12] We divide the sample into countries that have – on average over the entire sample – a rating of BBB or better, and countries whose rating is below BBB. We call them 'Low risk' and 'High risk' countries, respectively.[13] The middle panel of figure 6 shows the first principal factor estimated over low- and high-risk countries separately. We see that the difference between the two groups is fairly small (the correlation between the two principal factors series is 0.98). Additional insights can be gained by comparing macroeconomic performance across the two groups. Figure 7 plots the median inflation, long-term debt (ratio of GDP), exports-to-GDP, and S&P ratings for the high-risk and low-risk countries. The general trend during the sample period is very similar; that is, both set of countries have witnessed falling inflation and long-term debt/GDP ratios, and strong exports growth. Keeping these developments in mind, the strong correlation between the two principal factors series does not seem surprising.

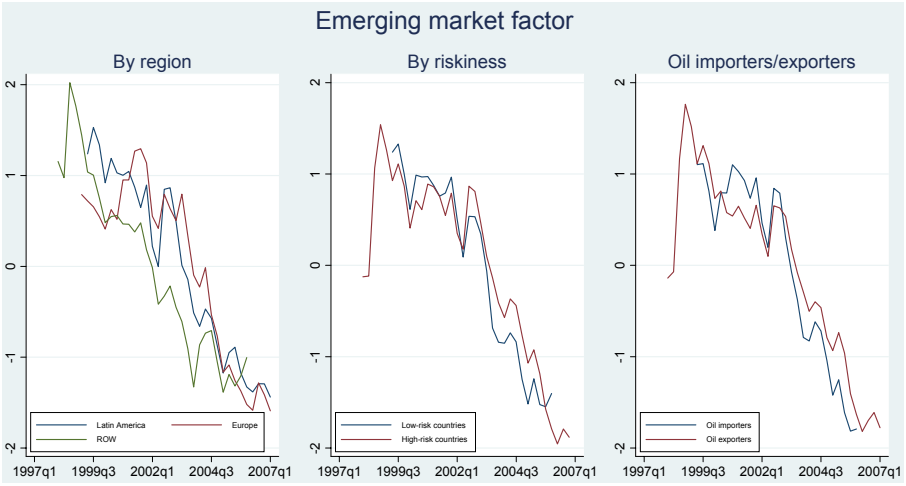
Third, to examine the degree to which strong energy commodity prices matter, we split the sample into oil exporters and oil importers.[14] As the right panel of figure 6 shows, the differences between oil exporters and oil importers are not very large (the correlation is 0.96). Although the emerging market factor as a whole is correlated with oil prices, the fact that (energy) commodity prices are not reflected in larger differences between oil exporters and oil importers suggests that strong commodity prices are not the main drivers behind the compression in emerging markets spreads. Comparing

[12]We thank Patrick McGuire for this suggestion.

[13]The low-risk group comprises Chile, Hungary, Malaysia, Poland, and Thailand; the high-risk group comprises Argentina, Brazil, Bulgaria, China, Colombia, Ecuador, Mexico, Morocco, Panama, Peru, the Philippines, Russia, South Africa, Turkey, and Venezuela.

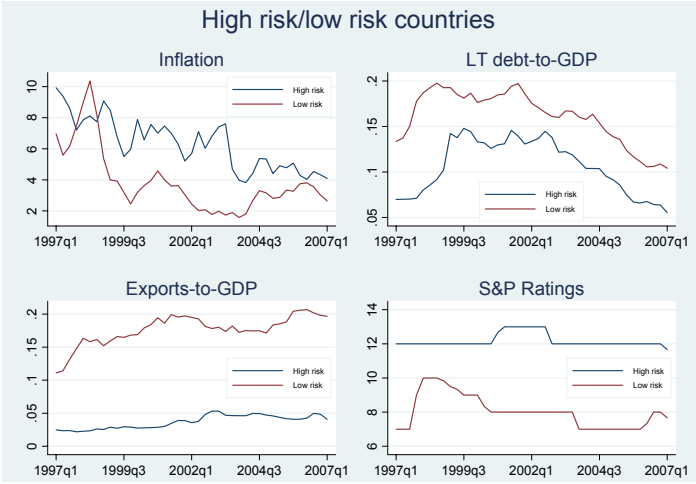
[14]Oil exporters in our sample are Argentina, Columbia, Ecuador, Malaysia, Mexico, Russia, and Venezuela; oil importers are Brazil, Bulgaria, China, Chile, Hungary, Morocco, Panama, Peru, Philippines, Poland, South Africa, Thailand, and Turkey.

Figure 6: **Emerging market factor**



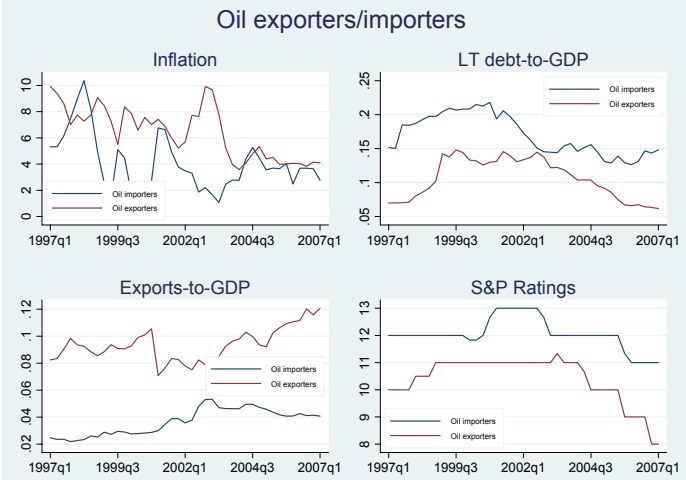
macroeconomic performance for the two groups lends further support to this observation (see figure 8). Here again we see that the general trend in long-term debt, inflation, and sovereign ratings is pretty similar across the two groups of countries. Further, we see that inflation rates have actually converged for oil exporters and importers.

Figure 7: **High-risk versus low-risk countries**



Taken together, the evidence from the principal factor model suggests that although emerging market spreads are affected by global financial conditions, there is also clear evidence of an 'emerging market component' (i.e. emerging markets spreads are not

Figure 8: **Oil exporters versus importers**



driven by global financial markets *only*). Differences seem to exist between the common factor found in U.S. asset classes and in emerging markets spreads, and we find some heterogeneity among emerging markets. This suggests that developments in emerging markets are likely to be driven by local factors, rather than benign global conditions. To test this formally, we employ panel regressions.

4.2 Panel regressions

Panel estimation has the advantage of pooling the data, which increases the size of the sample, and allows more precise estimation of common coefficients. Since our focus is on a specific set of countries, rather than drawing the countries randomly from a large population, econometric theory suggests that a fixed effects model is the appropriate specification.[15] In the most general form, we estimate the following specification:

$$log(EMBI_{i,t}) = \beta_{1,i} + \beta_{2,i} PF_t + \sum_k \beta_k X_{k,i,t} + \sum_l \beta_l Y_{l,t} + \varepsilon_{i,t}, \tag{4}$$

where $EMBI_{i,t}$ denotes the EMBI series for country i, and the first global principal factor is given by PF_t. $X_{k,i,t}$ are k country-specific exogenous variables, and $Y_{l,t}$ denotes l global variables – i.e. variables that are identical for all countries, such as the price of

[15] See Baltagi (1995). We also estimated a random effects model, but it was rejected by the Hausman test.

oil. $\varepsilon_{i,t}$ is a normally-distributed error term. Note that equation (4) allows the intercept to vary between countries. This captures time-invariant country-specific effects, such as institutional features of the political system or the rule of law, which have not changed during our sample period.

While early literature on the determinants of emerging market sovereign spreads mainly focused on country fundamentals, the importance of 'push' factors such as global risk-free interest rates has been explored only relatively recently. In line with the more recent literature, we estimate the regressions with the following country-specific and global variables (note that not all variables are included in all regressions).

Country-specific variables: GDP growth, inflation, and the ratios of short- and long-term debt-to-GDP, exports-to-GDP, reserves-to-GDP, and the fiscal balance-to-GDP.[16] Lastly, we add a variable indicating when a country experienced a currency or banking crisis. This variable is defined as 1 during currency or banking or sovereign debt crises (0 otherwise).[17]

Global variables: oil prices and world GDP growth. Many indebted emerging market economies are oil exporters, so high oil prices can improve their creditworthiness substantially.[18] World GDP growth is included because a strong world economy increases export possibilities for emerging markets.

Unit root tests are reported in appendix A.1. Note that estimating the panel by ordinary least squares yields inconsistent estimates, if EMBI spreads and some of the macroeconomic variables are simultaneously determined. To test whether instrumental variables estimation was necessary, we use the Davidson-MacKinnon (1993) exogeneity test. The results indicate that instrumental variables techniques are required. We therefore use two-stage least-squares, and instrument GDP growth, inflation and the ratios of the budget deficit-, long- and short-term debt-, exports- and reserves-to-GDP by their lagged values (2 lags).[19] As before, our sample runs from 1998Q1 to 2007Q2.

[16] We also experimented with local stock market indices and variables proxying financial integration with the United States, but these did not have a significant impact. The importance of forward-looking variables has been examined by Hartelius et al. (2008), who include rating outlooks and the 3-month Fed Funds ahead future. They find that forward-looking variables only add modest explanatory power.

[17] Our dating of crisis periods is taken from Kaminsky (2003), Table 4. For countries that are not included in her sample, we created our own crises dummies based on information contained in IMF country reports.

[18] The same holds for commodity prices in general. Substituting oil prices for commodity price indices, we obtained qualitatively similar results.

[19] J-tests to test for the validity of instruments showed no signs of weak instruments. Detailed results are available upon request.

Table 3: **Panel regressions, dependent variable: EMBI spreads**

	Model 1a	Model 1b	Model 1c	Model 1d	Model 1e
Constant	0.48*	0.08	0.63***	0.72***	1.03***
PF Global	0.04**			0.04**	
PF EMBI		0.27***			
GDP	-0.02***	0.00	-0.02***	-0.01	0.00
CPI	0.01***	0.01***	0.01***	0.01***	0.01***
LT debt	1.33***	0.99***	1.35***	1.02***	1.04***
ST debt	-1.17***	-0.97***	-1.19***	-1.04***	-1.00***
Exports	-4.56**	1.43	-6.02***	-0.10	-2.40
Reserves	-0.48***	-0.23*	-0.55***	-0.29**	-0.39***
Budget	0.25***	0.15***	0.27***	0.17***	0.19***
Crisis	0.15	0.18**	0.14	0.16*	0.17*
Oil price				-0.01***	-0.01***
World GDP					-4.77**
R^2 (within)	0.64	0.73	0.64	0.71	0.70
R^2 (between)	0.32	0.05	0.39	0.14	0.32
R^2 (overall)	0.39	0.17	0.43	0.27	0.41
Obs.	571	576	576	576	571
Countries	20	20	20	20	20

Note: Variables included are: the global factor, the emerging markets factor, GDP growth, inflation, the ratio's of long- and short-term debt-to-GDP, exports-to-GDP, reserves-to-GDP and the budget deficit-to-GDP, and a dummy indicating a crisis. */**/*** denotes significance at the 10/5/1 percent level.

The results of the instrumental variable estimations are given in table 3. Model 1a uses the global factor and country-specific exogenous variables to explain spreads. As can be seen, changes in emerging market spreads are positively related to the global factor, which means that the fall observed in the world factor series translates into a compression of emerging markets spreads. As regards the other variables, all except short-term debt have the expected sign: higher GDP growth, lower inflation or lower long-term debt-to-GDP ratios imply a reduction in spreads. Higher exports-to-GDP or reserve-to-GDP ratios reduce vulnerability, and translate into lower spreads, as do lower budget deficits-to-GDP.

The models 1b and 1c are similar to model 1a, but differ in the use of the principal factor. For comparison, model 1b employs the 'Emerging market factor', i.e. the principal factor found in EMBI spreads. As can be seen, the statistical fit is considerably worse, as R^2 (overall) drops from 0.39 to 0.17. More importantly, note that the 'between' R^2 drops from 0.32 to 0.05, which indicates that the emerging market factor is less able to explain the variation between countries (although it captures the variation within countries over time somewhat better, as indicated by the higher 'within' R^2). This supports our use of the global factor. Model 1c checks the robustness of our findings to the inclusion of the global factor. As it turns out, the differences between model 1a and model 1c are very small. This indicates that the compression in spreads can be explained without having to rely on global economic developments.

As shown in table 2 above, the global factor is highly correlated with financial market indicators, but less so with commodity prices. Given that emerging markets have benefited from strong commodity prices, it might be worth investigating the impact of this development further. Models 1d adds the oil price as a proxy for commodity prices, and model 1e adds oil prices and world GDP growth (recall that the global factor is highly correlated with world GDP growth, so there is no need to add it to model 1d). Both variables are significant and have the right sign; note that the results for the other coefficients are hardly affected. This indicates that while emerging markets have benefited from the strong global economy, benign global conditions are not likely to drive our results.

A common drawback of all models so far is that they do not explicitly account for 'institutionalized' macroeconomic improvements. Low budget deficits, for instance, can reflect a shift in government borrowing behaviour, but they might also simply be a reflection of strong cyclical economic behaviour. Similar considerations hold for exports, and even a reduction in debt is more easily accomplished when the domes-

Table 4: **Panel regressions, dependent variable: EMBI spreads**

	Model 2a	Model 2b	Model 2c
Constant	2.46***	2.21***	1.87***
PF Global	0.15***		
PF EMBI		0.26***	
GDP	-0.02***	-0.01**	-0.02***
CPI	0.00*	0.01***	0.01**
LT debt	1.12***	0.88***	1.28***
ST debt	-1.09***	-0.76**	-1.53***
Exports	-1.48	-1.76	-3.46
Reserves	-0.29	-0.25	-0.52***
Budget	0.12**	0.12***	0.19***
Crisis	0.11	0.11	0.09
Regulation	-0.04***	-0.04***	-0.03***
IT	-0.13	0.03	-0.33***
R^2 (within)	0.52	0.60	0.62
R^2 (between)	0.17	0.24	0.34
R^2 (overall)	0.22	0.30	0.36
Obs.	576	571	576
Countries	20	20	20

Note: Variables included are: the global factor, the emerging markets factor, GDP growth, inflation, the ratio's of long- and short-term debt-to-GDP, exports-to-GDP, reserves-to-GDP and the budget deficit-to-GDP, and a dummy indicating a crisis. 'Regulation' is the 2008 regulation index from the Heritage Foundation (higher values indicate less regulation), and 'IT' is a dummy variable taking the value 1 when a country introduces inflation targeting. */**/*** denotes significance at the 10/5/1 percent level.

tic economy is strong. Whether these improvements reflect true shifts in government policies, as opposed to external factors such as high oil prices, is not clear. There are not many indicators that truly capture improvements in economic institutions, but two visible institutional improvements found in many emerging economies are (i) the introduction of inflation targeting and (ii) progress in deregulating the economy. To capture these institutional improvements, we add two variables proxying structural policies: a dummy variable IT taking the value 1 when a country introduces inflation targeting (0 otherwise); and the 2008 regulation index from the Heritage Foundation, which we instrument with the corruption and property rights index. As can be seen in table 4, these institutional improvements tend to be associated with a reduction in spreads. Note also, however, that the general fit of the regression worsens. It seems that the restrictions imposed by introducing these variables – effectively forcing them to have the same coefficient for all countries in our sample – does not help to explain the variation in the data.

Table 5: **Panel regressions using regional principal factors, dependent variable: EMBI spreads**

	Model 1a	
	High risk	Low risk
Constant	0.60**	-0.13
PF World	0.02	0.16***
GDP	-0.01*	-0.06***
CPI	0.00*	0.01
LT debt	1.35***	0.80***
ST debt	-0.69	-0.33
Exports	-6.33**	-0.90
Reserves	-0.71***	-0.16
Budget	-0.80	0.11**
Crisis	0.24*	-0.24
R^2 (within)	0.66	0.60
R^2 (between)	0.18	0.50
R^2 (overall)	0.33	0.48
Obs.	439	137
Countries	15	5

Note: Variables included are: the global factor, the emerging markets factor, GDP growth, inflation, the ratio's of long- and short-term debt-to-GDP, exports-to-GDP, reserves-to-GDP and the budget deficit-to-GDP, and a dummy indicating a crisis. */**/*** denotes significance at the 10/5/1 percent level.

Lastly, we disaggregate the panel to check the robustness of our findings, and to investigate possible heterogeneities in our sample. We use the distinction between 'low risk' and 'high risk' countries introduced in section 4.1, and estimate model 1a for each group of countries separately (table 5). Results suggest that 'high risk' countries seem to be less susceptible to global economic developments: while the global factor is significant for low-risk countries, emerging market spreads for high-risk countries seem to be primarily associated with reductions in vulnerability (less debt and higher exports- and reserves-to-GDP ratios). This supports the results of Fuentes and Godoy (2005) that spreads from countries with 'sound fundamentals' may exhibit a different pattern that spreads of more crisis-prone sovereigns.

5 Discussion

Since 2002, emerging market spreads have fallen to historically low levels. This has prompted academics and policymakers to investigate the sustainability of these

Table 6: **Effects of a one-standard deviation shock to global and country-specific factors on EMBI spreads**

Model	1a	1b	1c	1d	1e
PF Global	**0.04**			**0.04**	
PF EMBI		**0.27**			
GDP	**0.09**	0.00	**0.09**	0.04	0.00
CPI	**0.92**	**0.92**	**0.92**	**0.92**	**0.92**
LT debt	**1.09**	**0.81**	**1.10**	**0.83**	**0.85**
ST debt	**0.23**	**0.19**	**0.23**	**0.20**	**0.20**
Exports	**0.37**	0.12	**0.49**	0.01	0.20
Reserves	**0.20**	**0.09**	**0.23**	**0.12**	**0.16**
Budget	**0.40**	**0.24**	**0.43**	**0.27**	**0.31**
Regulation					
IT					
Oil price				**0.16**	**0.16**
World GDP					**0.05**

Coefficients that are significant at least at the 10 percent level are shown in bold.

favourable developments. In theory, spreads could fall because of 'push' or 'pull' factors, reflecting benign developments in global financial and commodity markets, and/or sound country fundamentals, driven by structural reforms and better macroeconomic policies. Which of the two factors has been more important? While benign conditions in global financial and commodity markets can reverse very quickly, country fundamentals typically do not deteriorate 'overnight'. Thus, it is important to understand the reasons for the compression in spreads, as this can provide information about the sustainability of benign financing conditions for emerging markets.

We have conducted a principal factor analysis to study emerging market spreads, as measured by EMBI Global indices. By extracting principal factors from EMBI spreads, we estimated the degree of co-movement between all countries in our sample. We have argued that the principal factor captures global conditions, as opposed to country-specific economic fundamentals. We find that commodity prices and financial market conditions are the key variables driving the principal factor (these factors drive the global, as well as the regional, principal factors). We use this principal factor in panel and country-specific regressions to analyze the degree to which the fall in EMBI spreads is driven by better macroeconomic policies. Our results indicate that the principal factor is *statistically* important in explaining the compression in spreads. But how important is the principal factor *economically*?

Table 6 summarizes the results of model 1a-1e in terms of the effects of a one-

standard deviation shock to the exogenous variables. The reductions in inflation and long-term debt have the biggest effect, followed by improvements in budget deficit- and export-to-GDP ratios. All can be interpreted as better macroeconomic fundamentals, as they all reduce vulnerability to external shocks. In contrast, the benefits from global conditions – proxied by the 'global factor'– seem relatively small. Similarly, models 1d and 1e show that the effect of high oil prices and strong world GDP growth are small, relative to other variables. This suggests that global economic developments have been a less important element in the reduction in EMBI spreads, or put differently: our results lend support to the hypothesis that strong macroeconomic fundamentals were a key factor in allowing emerging markets to attract financing at favourable rates. Similar findings are reported for sovereign credit ratings in Butler and Fauver (2005), and for gross debt issuance by Fostel and Kaminsky (2007), although the latter study finds that favourable global economic conditions have started to play an important role since 2003. The implication is that if emerging market spreads are primarily driven by macroeconomic fundamentals, then these results provide an explanation why emerging markets have hardly been affected by the recent financial turmoil in industrialized countries.

Some caveats are worth noting. We attempt to capture the effects of benign global conditions in two ways – i.e. using a global factor in model 1a, as well as adding oil prices and world GDP growth directly in model 1e – but additional benefits of these benign global developments could occur through other channels as well. For instance, it is probably easier for emerging markets to reduce and restructure their debt, if fiscal revenues are high because of high oil prices. In this regard, the 'real test' for emerging markets may not be the credit turmoil that started in summer 2007, because commodity prices have stayed high or increased even further. The 'real test' may occur if the world economy slows down substantially, which would likely put commodity prices under pressure. It remains to be seen how EMBI spreads would react, if emerging economies had to deal with the (fiscal) impact of lower commodity prices.

A Appendix

A.1 Stationarity tests

Many emerging market data is only available at relatively short periods and low frequencies. This may pose econometric challenges. An assumption underlying principal factor analysis, as well as conventional panel estimation techniques, is that the data series are stationary.

There is little theoretical reason for non-stationarity in EMBI spreads in the long-run, yet it has been found that strict statistical evidence may suggest otherwise (in particular for shorter samples, see Hartelius et al., 2008). Similarly, other economic variables in our sample may exhibit nonstationary behavior (see appendix A.4 for information on data transformations). We evaluate stationarity based on the following types of panel unit root tests: Im, Pesaran and Shin (2003), and the two Fisher-type tests using ADF and PP tests presented in Maddala and Wu (1999) and Choi (2001). All tests have as null hypothesis the presence of individual unit root processes. We run all of the tests on the levels, and allow for an intercept and a trend.

The results from the panel unit root tests are reported in table 7. As can be seen, the presence of a unit root is generally rejected.[20]

Stationarity of the observable series is one of the assumptions underlying the estimation of a principal factor model. We also check the robustness of the estimation of the principal factor model to the stationarity assumption in three ways.

- First, we estimate a static principal factor model, and maximum likelihood-factor model. The differences are very small (the correlation between the two factors for the global factor is 0.99 and for the emerging market factor 0.95).
- Second, we estimate the principal factor model in first differences. The correlation between the global factor derived from this model and that derived from the principal factor model in levels is 0.85. The corresponding correlation for the emerging market factor is 0.91.

[20] Augmented Dickey-Fuller tests reject the null of a unit root in the global factor series at the 1 percent level and for the (shorter) emerging market factor at the 10 percent level. Note also that including a time trend in our panel does not change our results qualitatively. In light of the potentially lower power of unit root tests, we also tested for cointegration between the principal factors and the individual EMBI series, and found no evidence of cointegration.

Table 7: **Panel unit root tests tests on levels, allowing for trends and intercepts (null hypothesis: presence of a unit root process)**

Individual unit root process	EMBI	Budget def.	CPI	Exports
Im, Pesaran, Shin (2003)	-2.44	-6.74	-3.57	-3.36
p-value	0.01	0.00	0.00	0.00
ADF - Fisher Chi-square	86.24	228.78	79.14	302.11
p-value	0.00	0.00	0.00	0.00
PP - Fisher Chi-square	48.06	955.80	69.89	263.66
p-value	0.18	0.00	0.00	0.00
Lags (based on SIC)	0-3	0-5	0-8	0-5

Individual unit root process	GDP	ST debt	LT debt	Reserves
Im, Pesaran, Shin (2003)	-9.06	-1.78	-2.90	-0.67
p-value	0.00	0.04	0.00	0.25
ADF - Fisher Chi-square	160.99	67.66	205.99	50.58
p-value	0.00	0.01	0.00	0.12
PP - Fisher Chi-square	64.07	33.11	69.04	55.27
p-value	0.01	0.77	0.00	0.05
Lags (based on SIC)	0-7	0-4	0-6	0-4

- Third, we estimate a dynamic factor model by adding lagged values of the U.S. financial series for the global factor and lagged values of EMBI series for the emerging market factor (see Lütkepohl, 2005 for a discussion of dynamic factor models). Again, the differences were small (the correlation between the static and the dynamic factor series are 0.98 for both the global factor and the emerging market factor).

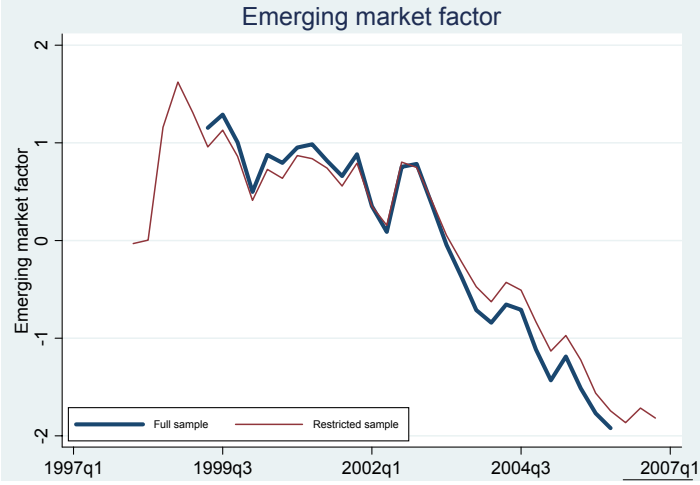
Taken together, and in light of the low power of unit root tests, we interpret the robustness of our findings as evidence that our estimates of the principal factors satisfy the assumptions underlying the econometric techniques.

A.2 Estimating a principal factor model for EMBI spreads

In the main text we describe the estimation of the 'global factor'. Estimation of the 'emerging market factor' is slightly more challenging due to limited data availability. For a number of countries, EMBI data is not available for the entire period 1997-2006.

In order to have the longest sample period possible, we decided to restrict the sample slightly. By leaving out three countries (Chile, Hungary, and Thailand), we were

Figure 9: **Full sample vs. restricted sample**



able to increase the sample period from 1999Q2-2006Q1 to 1998Q1-2006Q4, increasing the number of observations for the panel models 1b and 2b. As figure 9 reveals, the differences between the full sample and the restricted sample are relatively small (the correlation between the series is 0.99). We use the restricted sample for the emerging market factor only and not for the global factor.

A.3 Loading factors

Typically, important information can be gained by looking at the loading factors in factor models, i.e. the relative 'importance' of the identified factor for the different variables. This information is given in table 8. Given that our global factor is constructed for U.S. asset classes, the information content is somewhat less clear (left part); more interesting is the emerging market factor (right part). It can be seen that all countries except Argentina[21] exibit a positive loading factor, and that for many countries the loading factor is quite high. This suggests that a large share of the variation in individual EMBI series is captured by the emerging market factor.

[21] This is due to the crisis in Argentina. When we estimate two factors, the second factor captures a lot of the volatility induced by the Argentinian crisis, as it has a very high loading factor for Argentina.

Table 8: **Loading factors of the global and emerging market factor**

	Global factor		Emerging market factor		
Asset class	Load. factor	Uniqueness	Country	Load. factor	Uniqueness
AAA	0.96	0.08	Argentina	-0.16	0.98
AAA	0.96	0.07	Brazil	0.82	0.32
AAA	0.99	0.02	Bulgaria	0.96	0.07
BB	0.98	0.04	Chile	0.96	0.08
High Yield	0.56	0.69	China	0.85	0.28
			Colombia	0.90	0.19
			Ecuador	0.83	0.30
			Hungary	0.58	0.66
			Malaysia	0.98	0.03
			Mexico	0.96	0.07
			Morocco	0.98	0.04
			Panama	0.94	0.12
			Peru	0.94	0.12
			Philippines	0.44	0.81
			Poland	0.96	0.07
			Russia	0.90	0.19
			S. Africa	0.99	0.03
			Thailand	0.95	0.10
			Turkey	0.84	0.29
			Venezuela	0.87	0.25

A.4 Data sources

Our analysis covers 20 emerging market economies: Argentina, Brazil, Bulgaria, Chile, China, Columbia, Ecuador, Hungary, Malaysia, Mexico, Morocco, Panama, Peru, the Philippines, Poland, Russia, South Africa, Thailand, Turkey, and Venezuela. These are all countries for which the EMBI Global provides consistent data between 1998Q1 and 2007Q4.

The country-specific components of JP Morgan's EMBI Global index are our measure of sovereign spreads. We use monthly and quarterly data for the following: EMBI Global series taken from JP Morgan, macroeconomic data on reserves, inflation, exports, and GDP in local currency from the IMF's IFS database and the World Bank. Note that we use annual GDP data for China, Ecuador, Panama, and Venezuela, due to data availability, and interpolate the series using a linear conversion. U.S. bond data for the 3 month and the 10 year Treasury bills are from Datastream, and the U.S. yield curve is proxied by the difference between the two series. Data on U.S. bond yields (AAA to High Yield) are from Bloomberg.

As regards data transformation, short-and long-term debt-to-GDP ratios, reserves-to-GDP ratio, and exports-to-GDP ratios are computed using nominal values in U.S. dollar. EMBI series are transformed into logs, and to smooth seasonally-unadjusted exports, we used the HP-filtered export series.

References

Arora, V. and Cerisola, M.: 2001, How does U.S. monetary policy influence sovereign spreads in emerging markets?, *IMF Staff Papers* **Vol. 48, No. 3**.

Avellaneda, M. and Zhu, Y.: 1997, An E-ARCH model for the term-structure of implied volatility of FX options, *Applied Mathematical Finance* **4**, 81–100.

Baltagi, B. H.: 1995, *Econometric analysis of panel data*, John Wiley, Chichester.

Butler, A. W. and Fauver, L.: 2005, Institutional environment and sovereign credit ratings, *Financial Management* **35**(3).

Calvo, G. and Talvi, E.: 2004, Sudden stops, financial factors and economic collapse in Latin America: Learning from Argentina and Chile, *NBER Working Paper No. 11153* .

Choi, I.: 2001, Unit root tests for panel data, *Journal of International Money and Finance* **20**, 249–272.

Ciarlone, A., Piselli, P. and Trebeschi, G.: 2007, Emerging markets spreads and global financial conditions, *Banca d'Italia Temi di discussione* **637**.

Coudert, V. and Gex, M.: 2006, Can risk aversion indicators anticipate financial crises?, *Banque de France Financial Stability Review* **9**, 67–87.

Davidson, R. and MacKinnon, J.: 1993, *Estimation and Inference in Econometrics*, Oxford University Press, New York.

Deutsche Bundesbank: 2004, Indicators of international investors' risk aversion, *Monthly Bulletin* **56**(10), 69–73.

Dungey, M., Fry, R., Gonzalez-Hermosillo, B. and Martin, V.: 2003, Characterizing global risk aversion for emerging markets during financial crises, *IMF Working Paper* **WP/03/251**.

Eaton, J. and Gersovitz, M.: 1980, LDC participation in international financial markets: Debt and reserves, *Journal of Development Economics* **7**, 3–21.

Edwards, S.: 1984, LDC foreign borrowing and default risk: an empirical investigation, 1976-80, *American Economic Review* **74:4**, 726–34.

Eichengreen, B., Hausmann, R. and Panizza, U.: 2003a, Currency mismatches, debt intolerance and original sin: Why they are not the same and why it matters, *NBER Working Paper* **10036**.

Eichengreen, B., Hausmann, R. and Panizza, U.: 2003b, The pain of original sin, *in* B. Eichengreen and R. Hausmann (eds), *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*, University of Chicago Press, Chicago.

Eichengreen, B. and Mody, A.: 1998, What explains changing spreads on emerging-market debt: Fundamentals or market sentiment?, *NBER Working Paper* **6408**.

Feder, G. and Just, R.: 1977, A study of debt servicing capacity applying logit analysis, *Journal of Development Economics* **4**, 25–38.

Ferrucci, G.: 2003, Empirical determinants of emerging market economies' sovereign bond spreads, *Bank of England Working Paper* **No. 205**.

Fisher, L. and Weil, R. L.: 1971, Coping with the risk of interest rate fluctuations: Returns to bondholders from naive and optimal strategies, *Journal of Business* **44**, 408–431.

Fostel, A. and Kaminsky, G.: 2007, Latin America's access to international capital markets: Good behavior or global liquidity?, *Central Bank of Chile Working Paper* **442**.

Fuentes, M. and Godoy, S.: 2005, Sovereign spread in emerging markets: A principal component analysis, *Central Bank of Chile Working Paper* **333**.

Gai, P. and Vause, N.: 2004, Risk appetite: concept and measurement, *Bank of England Financial Stability Review* **December**, 127–136.

Gourieroux, C., Scaillet, O. and Szafarz, A.: 1997, *Economètrie de la Finance: Analyses Historiques*, Economica, Paris.

Grandes, M.: 2003, Convergence and divergence of sovereign bond spreads: Theory and facts from Latin America, *Paris, France: Delta, ENS/EHESS* .

Hartelius, K., Kashiwase, K. and Kodres, L. E.: 2008, Emerging market spread compression: Is it real or is it liquidity?, *IMF Working Paper* **WP/08/10**.

Herrera, S. and Perry, G.: 2002, Determinants of Latin spreads in the New Economy era: The role of US interest rates and other external variables, *Mimeo, World Bank* .

Herrero, A. G. and Ortiz, A.: 2004, The role of global risk aversion in explaining Latin American sovereign spreads, *Mimeo, Bank of Spain* .

Illing, M. and Aaron, M.: 2005, A brief survey of risk-appetite indexes, *Bank of Canada Financial System Review* **June**, 37–43.

Im, K., Peseran, M. H. and Shin, Y.: 2003, Testing for unit roots in heterogeneous panels, *Journal of Econometrics* **115**, 53–74.

International Monetary Fund: 2006, *Global Financial Stability Report*, Washington, D.C.

Kamin, S. B. and Von Kleist, K.: 1999, The evolution and determinants of emerging market credit spreads in the 1990s, *BIS Working Paper* **68**.

Kaminsky, G.: 2003, Varieties of currency crises, *NBER Working Paper No. 10193* .

Laloux, L., Cizeau, P., Bouchaud, J.-P. and Potters, M.: 1999, Noise dressing of financial correlation matrices, *Physical Review Letters* **83**(7), 1467–1470.

Litterman, R. and Scheinkman, J.: 1991, Common factors affecting bond returns, *Journal of Fixed Income* **June**, 55–61.

Lütkepohl, H.: 2005, *New Introduction to Multiple Time Series Analysis*, Springer, Berlin.

Macauley, F. R.: 1938, *Some theoretical problems suggested by the movements of interest rates, bond yields, and stock prices in the United States since 1856*, Columbia University Press, New York.

Maddala, G. and Wu, S.: 1999, A comparative study of unit root tests with panel data and a new simple test, *Oxford Bulletin of Economics and Statistics* **61**, 631–652.

McGuire, P. and Schrijvers, M. A.: 2003, Common factors in emerging market spreads, *BIS Quarterly Review* **December**, 6578.

Min, H. G.: 1998, Determinants of emerging market bond spread: do economic fundamentals matter?, *World Bank Policy Research Working Paper* **No. 1899**.

Prignon, C., Smith, D. R. and Villa, C.: 2007, Why common factors in international bond returns are not so common, *Journal of International Money and Finance* **26**, 284–304.

Rozada, M. G. and Yeyati, E.: 2006, Global factors and emerging market spreads, *Inter-American Development Bank, Research Department Working Paper* **552**.

Sachs, J.: 1981, The current account and macroeconomic adjustment in the 1970s, *Brooking Papers on Economic Activity* **1**, 201–68.

Scherer, K. P. and Avellaneda, M.: 2000, All for one... one for all? a principal component analysis of the Latin American Brady Bond debt from 1994 to 2000, *Courant Institute of Mathematical Sciences and New York University Working Paper* .

Slok, T. and Kennedy, M.: 2004, Factors driving risk premia, *OECD Economics Department Working Papers* **385**.

Tsay, R.: 2005, *Analysis of Financial Time Series*, Wiley-Interscience, New Jersey.

Westphalen, M.: 2003, The determinants of sovereign bond credit spreads changes, *FAME Working Paper* .