HONG KONG INSTITUTE FOR MONETARY RESEARCH

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HKIMR Working Paper No.18/2008

September 2008

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Abstract

This study examines the determinants of bond yield spreads for 19 emerging markets in the period 1998-2006. In addition to the usual EMBI index data from credit default swaps (CDS) are also used. Three sources are defined: domestic, external (a particular external source), and global factors. In addition, I consider the connection between volatility and bond yield spreads. All factors are found to be statistically significant. However, volatility is the only factor common to all countries examined whereas clear idiosyncrasies are found according to whether emerging markets are in Latin and South America, Europe, Asia or Africa.

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* Research for this paper was partly carried out while I was a visiting fellow at the Hong Kong Institute for Economic Research in 2007. I am grateful to the HKIMR for their hospitality, to Kenneth Chow for assistance in obtaining some of the data used in the empirical analysis, and to an anonymous referee for comments on a previous draft.

1. Introduction

The issuance of emerging market sovereign bonds surged during the 1990s, triggered by the Brady rescheduling agreement of the late 1980s. Financial crises during the 1990s, most notably the Mexican 'tequila' crisis of 1994-95, the Asian crisis of 1997-98, the Russian crisis of 1998, and the Argentine crisis of 2000-2001, led several economists to investigate the determinants of spreads between emerging market bond yields relative to comparable instruments issued by the U.S. government. As we shall see, opinion is divided about the ability of economic 'fundamentals' to explain movements in these spreads over time. Nevertheless, if fundamentals do matter and, just as importantly, if a set of common economic variables exist that have significant explanatory power in the determination of these spreads, then these are clear policy implications. This is especially true if the significance of macroeconomic factors can be detected at the monthly or quarterly sampling frequencies. A related question is the role played by the possibility that economic shocks influence emerging market bond spreads more or less simultaneously. This raises the possibility of contagion effects. As is well-known, there is no universally accepted definition of contagion, though several metrics have been proposed in the literature. I also address this issue, albeit in an indirect fashion, in this paper. Contagion effects are, of course, relevant since, for example, a post-mortem of the Asian crisis (e.g., BIS 1999) suggests that the transmission of financial shocks across countries, in some instances, took place over a period of several months, in part owing to the perhaps infrequent adjustment of credit ratings (also see Remolona, Scatigna and Wu, 2006).

The aim of this study is to contribute to the literature on the determinants of emerging market bond spreads. One novel feature of this study consists of permitting volatility to directly influence yield spreads. This is done in two ways. First, the volatility index derived from the S&P 500 group of stocks, also known as the VIX, is added. Second, I also estimate a modified pooled panel GARCH model (e.g., as in Cermeño and Grier, 2005) to sovereign bond index spreads for up to 19 emerging market economies. Much of the extant literature relies on univariate time series analysis of bond spreads of the GARCH (1, 1) variety. Unfortunately, as we shall see, none of the multivariate GARCH models considered produced satisfactory results. Part of the problem is the relatively small number of observations in each cross-section. Another potential culprit is the reliance on quarterly data. Alternatively, and given the improvements in the so-called economic fundamentals in many emerging markets (e.g., MacNamara, 2007) especially since the early 2000s, one might well consider the possibility that the nexus between sovereign spreads and their volatility may be asymmetric in nature. This suggests, at least for univariate type specifications, that an EGARCH (1, 1) model might be preferable. Again, such models are not found to perform well. Instead, as discussed below, asymmetric effects possibly emerge elsewhere in the mean portion of the estimated specifications. Nevertheless, and more importantly, a clear link between volatility and yield spreads is established via the VIX.

Second, this paper also employs yields derived from credit default swaps (CDS) for a subset of countries to investigate the role of economic fundamentals in explaining emerging market bond yield spreads. Relatively few studies have considered this possibility (Remolona, Scatigna and Wu, 2006; and Ammer and Cai, 2007, are exceptions), and none to my knowledge in the panel framework. Perhaps most importantly, I also consider forecasts of inflation and economic growth as potential determinants of such spreads. It is surprising that such forward-looking variables have not been considered in the relevant literature. After all, economic theory suggests that sovereign bond spreads ought to contain a forward-looking component and there is, of course, a large literature that considers whether the slope of the yield curve can reasonably predict future inflation, output growth, or even the likelihood of a recession (e.g., see Hamilton and Kim, 2002). Finally, it also pointed out that there is scope for non-linearities in the determination of emerging market bond yield spreads. This is illustrated by permitting certain key macroeconomic indicators to asymmetrically influence yield spreads.

The rest of the paper is organized as follows. Section 2 provides a literature review, focusing on studies that rely on quarterly or monthly data.[1] Section 3 describes the data and provides some stylized facts, as well as outlining the econometric methodology employed in the papers. Section 4 describes the empirical results while section 5 concludes.

2. Literature Review

In theory, the spread between emerging market bonds over U.S. Treasuries seeks to compensate investors in part for assuming a greater default risk.[2] The probability of default is exogenously determined and inherently tied to the sustainability of a given level of debt and, hence, to a set of macroeconomic fundamentals (Ferrucci, 2003). The drawback with this interpretation is that the impact of any contagion style effects may be unaccounted for. One definition of contagion refers to a significant increase in cross-market asset linkages following a shock to an individual country, or groups of countries (Forbes and Rigobon, 2002). Hence, in calmer times, co-movements do not reflect contagion effects. This is a potentially relevant consideration as a significant portion of the sample to be considered consists of the period of the so-called ‘Great Moderation’ in the United States (e.g., Bernanke, 2004). It is also worth noting, of course, that the Forbes-Rigobon definition of contagion is, of necessity, a narrow one.[3]

Generally, two different types of studies have explored which fundamentals determine emerging market bond spreads, namely panel estimation or country-specific estimation. In the main, the latter types of studies rely on univariate time series models of spread behavior. Rowland and Torres (2004), however, is an example of a study that argues in favor of panel estimation. First, panel data helps to identify patterns in the data that are not easily captured using only time series or cross-section data. Hence, it provides a mechanism for addressing estimation problems associated in the omitted or unobserved variables. Second, the inclusion of both time series and cross-section data in panel data models controls for country-specific heterogeneity. Third, panel data estimation incorporates more information, greater variability and can provide more efficient point estimates. In addition, variations in the spread can also be decomposed into variability between groups of countries with similar characteristics, or groups of countries with different characteristics. Finally, panel data models can also be more efficient at estimating

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1 There is a burgeoning literature that relies on daily data (e.g., Benelli and Ganguly, 2007, and references therein). Of course, at the daily frequency the role of conventional macroeconomic fundamentals cannot be easily investigated.

2 Liquidity risk is also present. However, the data used in the paper only includes bonds with a liquid market rendering the measurement of a liquidity premium less relevant for this type of analysis. Moreover, Remolona, Scatigna and Wu (2006) report that default risk is the largest risk component in sovereign spreads.

3 http://www1.worldbank.org/economicpolicy/managing%20volatility/contagion/definitions.html is a source that contains a compendium of different meanings of the concept of ‘contagion’.

inter-temporal relations and may, therefore, be better able to capture the dynamics of some adjustment process. While the panel approach has definite advantages there is disagreement on the preferred way to estimate them. For example, Ferrucci (2003) advocates the pooled mean group estimator (PMG), due to Pesaran, Shin and Smith (1999), for several reasons. First, taking first differences, and taking account of possible cointegration in the data, seems sensible both statistically and on economic grounds. However, the existing literature has not justified why several of the macroeconomic determinants of bond spreads should be cointegrated. Second, the span of data is often short enough so that it is unlikely that proper long run relationships between the variables of interest can be adequately detected.

Time series models do, of course, have some appeal, especially when multivariate extensions to widely used GARCH-type models of conditional volatility are estimated unless, as we shall see, one is unable to restrict what would otherwise result in a dramatic increase in the number of parameters that must be estimated. Also, the time series approach can provide a useful benchmark even when we resort to cross-country estimation, since this facilitates comparisons relative to the extant literature.

It is not practical to review all the contributions to this literature that has experienced a small revival of interest since the early part of the 2000s, when a flurry of studies on the determinants of emerging market bond spreads appeared. Among recent contributions are Ferrucci (2003), Grandes (2003), Rozada and Levy-Yeyati (2005), Andritszky, Bannister and Tarmirisa (2005), and Garcia-Herrero and Ortiz (2004). Well-known earlier studies in the literature include Edwards (1984, 1986) Sachs, Tornell and Velasco (1996), and Eichengreen and Mody (2000).

A difficulty in assessing the state of the literature stems from the terminology used to describe models and their predictors. Some authors refer to a "monsoon effect" (e.g., Masson and Mussa, 1995) to capture the impact of economic or financial crisis might have across several countries at once. Others refer to "spillover" effects (Calvo and Reinhart, 1996), wherein a crisis in one emerging market influences fundamentals elsewhere, resulting in a form of collateral damage. Still others, as mentioned previously, refer to contagion effects (or "pure" contagion) to capture the possibility that a crisis in one emerging market can produce a crisis in another emerging market without going through any of the usual economic fundamentals (e.g., Sachs, Tornell and Velasco, 1996). The nomenclature used to describe the determinants of emerging market bond spreads has continued to expand. Thus, for example, some research has delineated spillover effects in conditional mean versus the spread of volatility shocks. In the latter case a distinction exists between 'heat waves' and 'meteor showers'. The latter refers to volatility spillovers from one country to the next while the former captures volatility with only country-specific shocks. It should be emphasized that conditional volatility type spillover effects tend to be a feature of the data sampled at least at the daily frequency (e.g., Engle and Ito, 1990). More recently, there are references to "push" and "pull" factors, the former representing country-specific forces while the latter captures the role of global factors on bond yields (e.g., Ciarlone, Piselli and Trebischi, 2007). As Dailami, Masson, and Padou (2005) note, conceptually it is difficult to differentiate pull from push factors, especially since there is likely an endogenous relationship between domestic and international sources of influence on the mixed evidence on the importance of global factors, especially the role of U.S. monetary policy, on movements in bond spreads. Some authors find it plays a significant role (e.g., Arora and Cerisola, 2000; Min et al., 2003; Ferrucci et al., 2004) while others have expressed reservations about the importance of U.S. shocks (e.g., Kamin and von Kleist, 1999; Eichengreen and Mody, 2000). As noted above, part of the disagreement could stem from the choice of sample period, sampling frequency, and the methodological approach used to investigate the question of interest.

A further difficulty arises out of attempts to make distinctions between types of crises. There are crises of the pure economic variety, others are banking related, with financial crisis or currency crisis rounding out the list. Difficulties in identifying the pre-crisis sources of these crises are well-known (e.g., Kaminsky, 2003; Pericoli and Sbracia, 2003). Nevertheless, the crises that are likely more germane to the empirical analysis of this paper are likely of the financial variety, as noted in the introduction.

It is also rather difficult to provide a concise list of so-called fundamentals that are reliably related to movements in emerging market bond yield spreads. Such a list would include, in no particular order of importance, nominal exchange rates, interest rates, exports, inflation, oil prices, international reserves, foreign direct investment, the degree of financial development, and the current account. It is also interesting that the literature linking macroeconomic fundamentals to emerging market bond yields does not fully take advantage of the distinctiveness of business cycles in emerging market relative to ones in industrialized economies. Most notably, emerging marketing have, except perhaps in the last few years, occasionally experienced 'sudden stops'. These refer to fairly brief but sharp interruptions in economic activity that have attracted considerable attention in the literature (e.g., see Calvo, 2003; and Christiano, Gust and Roldos, 2002). It is perhaps surprising then that asymmetry, or possible non-linearity, in business cycles in emerging markets has not been more exploited in the empirical literature. Nevertheless, there are significant drawbacks in relying on aggregate real GDP data for many emerging markets and this poses a series problem for anyone attempting to incorporate real economic effects into the analysis.

Turning to the scope of studies of the determinants of bond yield spreads in emerging markets, these, for the most part, tend to focus on the Latin and South American experience not only because the data are relatively more plentiful but also because several of the crisis that warranted attention in the literature originated, or spilled over, into that part of the world. More recently, attention has turned to the experience of economies that joined the group of emerging markets in the second half of the 1990s, principally in Europe and Asia (e.g., Baig and Goldfajn, 1999; Debelle and Ellis, 2005; Sander and Kleinmeier, 2003). Finally, as suggested earlier, there exists a fair diversity of methodological approaches used to investigate the cross-section or time series behavior of term spreads. These range from the 'adjusted' correlations of Forbes and Rigobon (2002), varieties of conditional volatility models (e.g., see Arora and Cerisola, 2001), dynamic conditional correlation analysis (e.g., Chiang, Jeon and Li, 2007), extreme value models (e.g., Longin and Solnik, 2001), through to factor analysis (e.g., Dungey, Fry, Gonzales-Hermosillo and Martin, 2004).[4]

While there is a considerable diversity of opinion about what drives emerging market bond yield spreads, a few broad conclusions can be drawn from the foregoing select overview of the literature. First, even if it is unclear which economic 'fundamentals' matter most, the presence of strong fundamentals does appear to contribute to lowering yield spreads. Second, trade and financial linkages between countries do matter, and so does proximity to the location of the source of a particular crisis. Third, there is reasonably persuasive evidence that a crisis originating in a developed economy can, and does, spillover into emerging markets. Nevertheless, the presence of strong fundamentals can protect, if not shield,

4 A separate literature, from the perspective of this study, are papers that estimate the probability of a crisis using logit, probit estimation or Markov switching models. See Pericoli and Sbracia (2003) for a survey.

an emerging market from crises elsewhere. Finally, contagion type effects, regardless of how these are characterized or defined, are relatively more difficult to identify in bond yield spreads than in currency or equity markets. It is also plain to see from the cited literature that it is easy to fall into the trap of estimating 'kitchen sink' regressions where a large number of relevant determinants, a priori, are thrown into a regression. However, this danger is, arguably, more apparent in univariate investigations of the determinants of emerging market bond yield spreads than in a cross-section or panel setting where there is greater emphasis on common factors.

3. Data and Model Specification

3.1 Data

Since many of the macroeconomic fundamentals (e.g., GDP, price level) are only available at the quarterly frequency, and only since the mid 1990s for several of the countries in the sample, the empirical evidence reported below relies on data covering the 1996Q1-2006Q4 period. An appendix provides some additional details.[5] A total of 19 countries are considered in the empirical study that follows. Eight countries are in Latin and South America (Argentina, Brazil, Colombia, Ecuador, Mexico, Panama, Peru, Venezuela), five are from Europe (Bulgaria, Poland, Russia, Turkey, Ukraine), four from Africa (Egypt, Morocco, Nigeria, South Africa), and two are from Asia (Malaysia, Philippines).[6] To ensure some consistency in the data, many of the macroeconomic fundamentals were taken from 2007 editions of the International Monetary Fund's *International Financial Statistics* CD-ROM. Other data were obtained from a variety of other sources. Forecasts for inflation and real GDP growth were taken from various editions of the International Monetary Fund's world Economic Outlook (available from www.imf.org). A drawback of the WEO data is that they are only available at the annual frequency. Hence, quarterly data were created via interpolation. Alternate forecast data, such as Consensus forecasts, were not available for all countries or for a sufficiently long span of data. Timmermann (2006) discusses the performance of WEO forecasts and finds them to, broadly speaking, perform well.

I was also interested in whether certain institutional and political factors, such as the degree of economic freedom, central bank independence, corruption, and other related governance indicators, might also play a role in influencing the longer run component of any yield spread. As we shall see, some of these factors proved to be crucial determinants of yield spreads. The requisite data were taken either from the Polity IV dataset (www.cidcm.umd.edu/polity), or Siklos (2008). Some data were collected from central bank websites through the BIS's central bank portal (www.bis.org), while the exchange rate classification scheme of Levy-Yeyati and Sturzenegger (2005) was also used. Data on external debt were obtained from the joint BIS-IMF-OECD-World Bank hub (www.devdata.worldbank.org).

5 All data are seasonally adjusted at the source.

6 Unfortunately, there were too few observations for China and India to include them in the empirical analysis.

A popular alternative to estimating models of conditional volatility consists is using an estimate of the implied stock market volatility in the United States, as reported by the Chicago Bond Options Exchange (CBOE), called the VIX, or volatility index. [7] An appealing feature of this index is that it can be treated as being exogenous to emerging market economies. A potential drawback is that while the VIX has proved useful in studies at the daily sampling frequency, the merits of the index are possibly less clear-cut at the quarterly frequency. Data on foreign direct investment was obtained from UNCTAD (www.unctad.org) and are used as an indirect indicator of the 'quality' of investments. Kaminsky and Reinhart (1999) argue that the behavior of domestic credit also plays a fundamental role in influencing the likelihood that a crisis of some kind will take place. Consequently, I also consider a measure of domestic credit growth in the estimated specifications reported below.

The yield spread indicators frequently employed in studies of the kind conducted here is the EMBI+ series while CDS spreads, available for only a subset of countries and used far less frequently in studies of the kind conducted here, are also employed.[8] The EMBI+ is constructed by J.P. Morgan (Morgan, 1999, 2001) and represents a composite indicator of yield spreads for 119 emerging markets that has been used in almost all studies of the determinants of emerging market bond yields.[9] The resulting spread is calculated relative to benchmark U.S. Treasury bond yields. Since the maturity structure of the financial instruments covered in the EMBI+ index is variable, an alternative that might be more useful in helping identify the extent to which yield spreads respond to forward-looking indicators such as macroeconomic forecasts or asset prices (e.g., stock returns) are credit default swap (CDS) spreads. These yields are for instruments with 5 years to maturity which are not only liquid but represent a large fraction of the sovereign CDS market (www.markit.com). A CDS is a derivative contract in which a bondholder buys a guarantee that provides a form of insurance in the event of a default. In the event of a default the buyer receives an amount equal to the difference between the face value of the defaulted bond and what can be obtained in markets based on an expectation of some kind of settlement (i.e., the recovery rate).

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7 Additional details about the construction of the VIX index can be found at http://www.cboe.com/micro/vic/vixwhite.pdf.

8 Other proxies for emerging market yields have also been used by other authors. For example, Arora and Cerisola (2001) use individual country estimates of yield spreads based on Merrill Lynch's IGOV index and U.S. three month Treasury bills. Others (e.g., Ferrucci, 2003) rely on the EMBI global index. As one would expect there are pros and cons to using a particular definition of the yield spread. For example, a longer time series for the EMBI+ is available while, until recently, the EMBI Global Index covered a wider cross-section of countries. The EMBI+ is more heavily represented by Latin and South American countries while the issues covered by the EMBI Global index may not be as liquid as those incorporated in the EMBI+ index. Moreover, the EMBI+ composites control for floating coupons, principal collateral, or rolling interest guarantees. See www.jpmorgan.com.

9 The EMBI+ monitors total returns for external debt instruments across emerging markets. The instruments include a variety of loan types, including Brady bonds, Eurobonds, and local instruments denominated in U.S. currency. Hence, foreign exchange risk is controlled for. The maturity for instruments represented is at least 2.5 years.

3.2 Methodology

As the previous discussion suggests three sets of determinants are thought to influence emerging market bond yield spreads. One set of factors is considered to be primarily of the domestic variety; another set of determinants are external, likely to originate in a key economy such as the U.S. Finally, a third set of variables can be thought of as global in nature in that they are likely to affect all merging markets though, of course, not necessarily in the same fashion. If we define the spread between emerging market bond yields, in country i at time t, relative to benchmark U.S. Treasury bonds as $SPREAD_{it}$, the simplest specification of an estimated relationship can be written as

$$\log SPREAD_{it} = \mu_i + X_{it}^{dom}\beta_i^{dom} + X_{it}^{ext}\beta_i^{ext} + X_{it}^{glob}\beta_i^{glob} + u_{it} \tag{1}$$

where X_{it} are vectors of variables describing the domestic (*dom*), external (*ext*), and global (*glob*) determinants of the spread. It has been commonplace to estimate specifications such as (1) by defining the dependent variable in log form (e.g., see Edwards, 1984) owing to the form of the theoretical relationship between the spread and the probability of default. In the empirical analysis to follow this approach is also adopted. However, as the evidence shown below suggests that the sample is dominated by a period of declining spreads, first differencing of the spread is also considered. The vectors of variable consist of the series previously discussed. Hence,

$$X_{it}^{dom} = (ER_{it},\ \pi_{it}^{gap},\ DC_{it}^{gap},\ WEO_{it}^{j},\ GOV_{it}^{j}),\ X_{it}^{ext} = (FFR_t,\ ED_{it})$$

and

$$X_{it}^{glob} = (OIL_t,\ FDI_{it},\ RES_{it},\ OPEN_{it})$$

ER is an indicator of the type of nominal exchange rate regime in place, π^{gap} is an indicator of the inflation gap, that is, inflation relative to some trend,[10] DC^{gap} is the gap in domestic credit, WEO^{j} are the IMF's annual forecasts of inflation (π), real GDP growth ($\dot{y}$) and the balance of payments as a percent of GDP($\dot{b}$) where $\pi, \dot{y}, \dot{b}$.[11] Finally, GOV^{j} stands for country specific institutional factors proxied by indicators of corruption, property rights, monetary and fiscal independence. External determinants consist of the U.S. Fed funds rate (*FFR*), an indicator of U.S. monetary policy, while ED is an indicator of the gross external debt position of country i, in U.S. dollar terms.[12] Finally, *OIL* is a global indicator of world oil prices, *FDI* represent foreign direct investment flows (in U.S. dollar terms), *RES* are foreign exchange reserves, also denominated in U.S. dollars, while *OPEN* is the standard measure of the openness of an economy, proxied by the sum of exports and imports to GDP.

10 Although many definitions of the trend are available I rely on an HP filter with a smoothing parameter of 1600. The pros and cons of such a filter are by now well-known, of course, but all available filters have their idiosyncrasies and flaws. Nevertheless, the HP filter is arguably the most widely used definition of the trend in a time series.

11 Since the WEO data are annual, these were converted to the quarterly frequency via constant match averaging.

12 Many of the determinants defined in U.S. dollar terms were also converted to percent of domestic GDP or in per capita terms. The discussion of the empirical results will make clear the precise definition used.

There are at least three omissions in equation (1). First, there is no explicit recognition of the possible asymmetric links between some of the determinants of *SPREAD*, most notably in the case of inflation and business cycle indicators. One approach is to estimate equation (1) over, say, crisis and non-crisis samples or, alternatively, high versus low volatility periods (also see below). Such a strategy can potentially be useful, especially if there are legitimate concerns about the exogeneity of elements of X_{it} in (1). Unfortunately, however, there is the difficulty that the choice of volatility periods can be ad hoc or subject to a selection bias problem. A simpler approach is to differentiate between positive and negative values of some of the elements of X_{it} though, here too, there are problems that arise from the fact that a zero threshold may or may not be appropriate. Nevertheless, this strategy is not only computationally convenient but is likely to be most parsimonious under the circumstances.

Second, there is no allowance made for the possibility that risk factors, generally speaking, can also interact with the *SPREAD* variable. These risk factors stem from changes in market views about the future prospects of either individual or groups of emerging market economies. Indeed, it is often argued that one important common influence on emerging market bond yield spreads originates from the impact of volatility in the market for bonds (e.g., as in Baig and Goldfajn, 2001; Edwards and Susmel, 2001). At least two strategies are available to account for the risk element. Some authors, as noted earlier, resort to the Chicago Board Options Exchange (CBOE) volatility index, or *VIX*, which is the ticker symbol for this indicator. This index, used as a proxy for investor risk aversion, is a forward-looking indicator (30 days ahead) and, since it is based on a wide range of S&P500 options, can justifiably be treated as an exogenous variable in a specification such as equation (1). Since the addition of the *VIX* requires only a trivial modification of equation (1) the details are not shown. Alternatively, a popular strategy is to estimate a model of conditional volatility relying on the GARCH family of models. In the panel setting, an important drawback of such models is that the number of estimated parameters rises very quickly with the number of dependent variable. The resulting ‘curse of dimensionality’ has led to proposals of simpler specifications, including the modified panel GARCH model of Cermeño and Grier (2005). In particular, the modified panel GARCH (1, 1) model is based on the usual assumption of cross-sectionally independent errors but adds the assumption of a common GARCH process for all members of the panel. Moreover, as will be argued below, the panel of 19 countries can usefully be sub-divided into at least four distinct blocks. This enables the estimation of distinct sets of conditional volatility estimates in a panel setting while reducing the total number of estimated parameters. More precisely, if we use equation (1) as the benchmark specifications, the panel GARCH (1, 1) model can be written as

$$h_{it} = \gamma + \alpha\, U^2_{it-1} + \beta\, h_{it-1} \tag{2}$$

Where h_{it} is the conditional variance derived from (1), U^2_{it-1} is the ARCH term, and h_{it-1} is the GARCH term (which can also be written as $\sigma^2_{U_{it}}$). Note that the parameters α and β are homogenous across all countries while the parameters in (1) are not.[13] It may be noted that the panel GARCH model is not the only other available strategy. For example, Engle’s (2002) dynamic conditional correlation is yet another approach that could be employed to estimate the multivariate class of GARCH type models.[14]

13 Additional factors, including several of the elements in X_{it}, can be added as exogenous determinants of h_{it} in (2). I have not done so here to simplify the exposition.

14 Another issue, not addressed in this paper, stems from the possibility that some aspects of volatility, particularly as it impacts financial markets, are slow moving (i.e., as when volatility remains high or low for extended periods of rime). One estimation strategy is the component GARCH model of Engle and Lee (1999). More recently, Engle and Rangel (2006) have proposed the Spline-GARCH model to take care of shifts in mean and trend levels of volatility.

Finally, to the extent that some of the determinants of *SPREAD* are attracted to each other in a statistical sense, namely in the form of a cointegrated relationship between some of the elements of X_{it}, then error correction terms have been omitted. These considerations necessitate that equation (1) be estimated in the first difference form as shown below

$$\Delta \log SPREAD_{it} = \Omega_{i0}[\mu_i + X^K_{it-1}\, \beta^K_i - \log SPREAD_{it-i}] + \Omega_{i1}\, \Delta X^K_{i\,t-1} + \in_{it} \quad (3)$$

Where the term in brackets is the error correlation term, and K = *dom, ext, glob*. Dailami, Masson and Padou (2005) resort to a similar specification and point out, among other considerations, that the number of estimated coefficients in a specification such as (3) can be large. Accordingly, they essentially rely on a multivariate version of the Engle-Granger two-step procedure wherein equation (1), or a more parsimonious version of it, is the cointegrated regression and the estimated residuals from that specification are substituted for the term in brackets in equation (3). There are well-known drawbacks with such a procedure. In addition, of course, it is not obvious which elements of X^K are suitably cointegrated nor whether the typical span of data used to estimate such a relationship is adequate to detect cointegration.

4. Empirical Results

4.1 Stylized Facts

Figure 1 plots yield spreads based on both the EMB1+ and CDS data. The top left-hand figure combines all Latin and South American countries, the top right-hand side considers the European block of countries, while the remaining data for emerging markets in Africa and Asia are shown in the bottom left-hand corner of the figure. Available data for nine countries, mostly in Europe and Asia, are shown in the bottom right-hand corner of Figure 1. For the Latin and South American countries, as well as the European group of countries in the sample, the shaded areas represent years when, at least according to Kaminsky (2003) there was a financial crisis affecting some of the countries in the region (e.g., Russia, Argentina). Although there are considerable differences in the spread behavior across countries with perhaps one exception, namely Argentina, spreads show negative trend throughout the second half of the sample, that is, beginning around 2002. Nevertheless, if one tests for common trends in the spreads via cointegration testing (not shown), together with other summary data discussed below, it is clear that the 19 countries considered in the sample can be sub-divided into at least four country blocks. For example, cointegration tests[15] between spreads for the Latin and South American group of countries reveal four cointegrating relationships, while only one such equation can be found for Asia, and the European group of countries. Finally, there is no cointegration in term spreads among African countries in the sample.

15 Inference is based on a Johansen test that assumes only a linear deterministic trend in the data. Depending on the group of countries the estimated VAR contains one or two lags. For the European group of countries the Ukraine was omitted due to too few observations. Results are available on request.

Figure 2 illustrates the diversity of the inflationary experience for two sets of countries. The top portion of the Figure shows deviations in actual inflation from an HP filtered trend for countries whose average inflation rate was high throughout the sample relative to all emerging market economies considered. The bottom portion of the Figure plots the same information for select countries that had comparatively low average inflation rates throughout. Notice that there is considerable diversity in the inflationary experience among high inflation countries, unlike the group of low inflation countries, although there is diversity in the amplitudes away from zero deviations from trend inflation in the latter block of countries. Also noticeable is the asymmetry in the deviations from trend for the individual countries shown. Similar patterns emerge for other key macroeconomic indicators such as the output gap (not shown).

Figure 3 plots the VIX proxy for risk. Practitioners sometimes consider values below 20 as being consistent with calm in financial markets while values exceeding 30 are viewed as signaling considerable turbulence. By this metric the calm that overtakes markets after 2002 is evident and may partly explain the decline in yield spreads shown in Figure 1. The VIX hovers mainly in neutral territory between 1998 and 2003, except in 2002 and, possibly, in later 1998. The latter reflects perhaps the ending of the Asian crisis.

Next, Table 1 provides some summary statistics for a few of the indicators described earlier. Variables such as openness, the degree to which capital is mobile, the autonomy of the monetary authority, and average foreign direct investment flows, also suggest considerable diversity in economic performance across the emerging market economies considered.

Finally, Table 2 presents panel unit root and cointegration test results. Two sets of panel unit root tests are shown: the Im, Persaran and Shin (2003; IPS) test as well as the Levin, Lin and Chu (2002; LLC) test statistics.[16] When a panel of 8 countries, based on CDS data, are considered the two tests contradict each other with the IPS test suggesting that the panel of spreads is non-stationary while the LLC reject the null of a unit root. The same outcome holds for the block of 4 African countries. More often than not, however, the null of a unit root is rejected by both tests across the various blocks, although non-stationary spreads cannot be rejected for the block of the three largest Latin and South American countries, namely Argentina, Brazil and Mexico. In part for this reason, the estimated specification reported below consist of four blocks of countries, namely two from Latin and South America, a European and a non-European block (i.e., Africa with or without Asia).

[16] The literature of panel unit root tests is, of course, a large one. See, for example, Maddala and Kim (1998). Karlsson and Lölethgren (2000) show that the power of the LLC and IPS tests is affected by whether the factors of the cross-section that is stationary is large. This provides further justification for sub-dividing the panel into blocks of countries. It is useful to recall that the LLC test equation is written as

$$\Delta y_{it} = \mu_i + \beta y_{i,t-1} + \sum_{1}^{p} \phi_k \Delta y_{i,t-k} + \gamma t + \varepsilon_{it}$$

while the IPS test equation estimates β_i, γ_i, and $\phi_{i,k}$ in terms of the above specification. Hence, while the IPS test is based on individual unit root processes, the LLC test assumes a common unit root null.

Part B of the Table reports panel cointegration tests between the yield spread and a few key variables that might be linked to it in the long run. For this purpose, I considered a measure of the external indebtedness, the degree of openness, the size of international reserve holdings, and expected inflation. A theoretically motivated long-run relationship between these variables can be found from the literature surveyed previously. The null of no cointegration cannot be rejected for any of the pairs of variables considered, although there is weak evidence, at the 10% level of significance, between the *SPREAD* and either foreign reserve holdings, or inflation forecasts, among the European block of emerging market countries. Accordingly, in the specifications reported below, we estimate versions of (1) and (2) and do not report results based on panel error correction models.[17] In addition, results are discussed for the four blocks of countries identified based on the pre-testing reported above.

4.2 Econometric Estimates

Table 3 present the principal results. All estimates shown rely on the log of *SPREAD* for reasons discussed earlier. Estimates that rely on CDS yields generated similar conclusions and are, consequently, shown in the final column of Table 3. Five of the 8 countries for which CDS data were available are European. Hence, perhaps not surprisingly, the results are comparable to the ones generated using the EMBI+ data for the European block of countries. Note that since the estimates that use the CDS data are based on a fixed effects model this is also a little bit of evidence suggestive of the usefulness of estimating models of emerging market bond yield spreads by country block.

The first column provides estimates for the full group of 19 countries. Domestic, external, global, and volatility all significantly determine bond yield spreads. Most notably, forward looking variables (i.e., WEO forecasts) are highly significant with the exception of growth rate forecasts. Although separate Wald tests (not shown) do not reject the significance of domestic, external, global, and volatility factors, individual coefficient estimates strongly suggest that institutional features, such as the degree to which the monetary authority is autonomous (*MON*), and the choice of exchange rate regimes (*ER*), matter. In particular, a more independent central bank reduces the *SPREAD* while a more flexible exchange rate has the opposite effect. In addition, a more open economy also leads to a modest, but statistically significant, reduction in the term spread. If we treat the countries in our sample as consisting of three distinct regions, we find that the yield spread is, on average, higher in Latin and South America relative to the European and African countries in the sample.

As noted earlier, there are good reasons to estimate versions of equation (1) according to a regional grouping of countries. Therefore, the next four columns of Table 3 show estimates for the main geographical regions represented in our data set. These reveal some interesting regional differences. For example, U.S. monetary policy, as proxied by changes in the fed funds rate, reduce the yield spread

[17] These can be made available on request. The panel cointegration tests are based on an extension of the two-step Engle-Granger procedure due to Kao (1999) with cross-section specific intercepts but common coefficients in the first stage cointegrating test equation.

only in the Latin and South American regions. To the extent that this result reflects not only the relatively strong performance of emerging markets elsewhere, most notably in Asia and Europe, this is a small bit of evidence supportive of what some analysts have termed the 'decoupling' of U.S. from foreign economic policies. The same result holds for changes in oil prices which appear to raise the yield spread only in the Latin and South American region of the world. Nevertheless, there is one important common feature in the data. Rising volatility, as proxied by the VIX, raises the yield spread across all regions almost identically, at least in statistical terms. Clearly, if there is any form of contagion, it is no longer evident from standard macroeconomic indicators. Instead, there is now more likely a form of volatility contagion.

The final column of Table 3 presents one set of results to illustrate the potential for asymmetry, or non-linearity, in the data to influence the yield spread. Although virtually all other coefficients remain largely unaffected by the change we find that positive inflation forecast errors actually reduce the current yield spread. This could either reflect a current rise in domestic interest rates that is subsequently offset, or one that is also possibly offset through changes in the exchange rate.

Attempts to estimate multivariate GARCH (1, 1) models proved to be far less successful (results not shown). Although estimates were obtained for several of the country blocks considered earlier, the ARCH terms usually proved to be highly insignificant. Alternatives, such as higher order ARCH or EGARCH models, were also considered but then the curse of dimensionality proved to be a barrier to estimation. Although the resort to the VIX as a proxy for volatility proved exceedingly robust the inability to obtain comparable results using multivariate GARCH estimation is a disappointment. A variety of estimates that relax or modify the restrictions made in equation (3) proved unhelpful as well. The only consolation is that M-GARCH models have proved to be relatively difficult to estimate, especially for data at the sampling frequency considered in this paper (e.g., see the survey by Bauwens et al., 2006). Moreover, although GARCH and EGARCH models were estimated for individual countries (results not shown) it seems clear that the significance of the VIX in all cross-sections considered implies that there is a strong common element in the transmission of volatility across emerging market bond yield spreads.

5. Conclusions

This paper has considered some of the determinants of emerging market bond yield spread for a sample of 19 countries that covers a period when these spreads were generally on the decline. Three sets of factors were considered, namely domestic factors, external factors, as well as global determinants of bond spreads. Moreover, unlike the extant literature, this study is interested in the role played by forward-looking variables, such as inflation and other macroeconomic forecasts. Also considered, however, are institutional factors such as the degree of central bank autonomy, as well as changing volatility in asset prices globally. Finally, consideration was given to the possibility of non-linearity in the determinants of bond yield spreads in emerging markets.

The results suggest that emerging markets cannot easily be treated as a single block. Indeed, the only consistent common determinant of yield spreads across all the markets considered is volatility proxied by the VIX indicators. Otherwise, there remain considerable idiosyncrasies across the four regions examined in this study with, for example, U.S. monetary policy influencing only the Latin and South American region while openness of the economy impacts yields in African and European emerging market economies.

Some evidence of non-linearity was found but attempts to corroborate the common influence of volatility via the estimation of multivariate GARCH models proved less successful. As a result, there is a clear direction forward for future research. First, a longer span of data might help decide with greater confidence whether some variant of the chosen specification, which nests all the ones used by other studies, ought to be estimated in levels or first differences, as well as whether omitted error correction terms should be added. Second, more research might reveal better or more precise forms of non-linearity than the simplistic specification considered in this study. Data limitations also prevented estimation with interaction terms that likely play a role in influencing the course of yield spreads. Finally, alternative strategies to estimate multivariate conditional volatility models might also prove fruitful. The combination of too few panel observations, together with possibly the necessity to estimate a large number of parameters, proved to be obstacles in obtaining useful results.

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Table 1. Selected Summary Statistics

	Openness	Capital Mobility	Monetary Independence	Foreign Direct Investment
Argentina	18 (4)	89 (22)	83 (12)	-7 (90)
Bulgaria	118 (17)	45 (12)	50 (35)	-21 (36)
Brazil	12 (2)	55 (6)	69 (25)	-0.1 (36)
Colombia	11 (4)	84 (6)	73 (5)	0.3 (68)
Ecuador	65 (18)	96 (6)	57 (12)	12 (29)
Egypt	10 (1)	84 (6)	76 (4)	27 (126)
Malaysia	57 (3)	64 (5)	80 (2)	16 (36)
Mexico	6 (1)	63 (0)	71 (10)	4 (27)
Morocco	24 (4)	50 (0)	84 (4)	10 (134)
Nigeria	1 (1)	54 (6)	68 (8)	13 (27)
Panama	137 (11)	100 (0)	89 (1)	7 (122)
Peru	11 (2)	96 (6)	81 (5)	5 (49)
Philippines	2 (0.5)	75 (0)	77 (2)	-1 (102)
Poland	18 (4)	50 (0)	72 (7)	11 (47)
Russia	3 (1.5)	45 (6)	53 (14)	54 (122)
South Africa	8 (1)	50 (0)	79 (2)	-5 (36)
Turkey	1 (0.5)	63 (0)	42 (11)	36 (75)
Ukraine	21 (1)	50 (0)	57 (23)	23 (69)
Venezuela	5 (2)	75 (0)	51 (9)	-11 (29)

Note: Openness is (total exports + total imports) as a percent of GDP. Capital mobility is a revised indicator due to Edwards (2006). A higher number indicates greater capital mobility, Monetary independence is an indicator from the Heritage Foundation, Foreign direct investment refers to the rate of change in FDI flows from the UNCTAD database. Standard errors and figures are rounded. Additional details about the data and sources are provided in the text and in the appendix.

Table 2. Preliminary Testing

A. Panel Unit Root Tests

Group	Test Statistics IPS	LLC
CDS: All countries	3.20 (0.99) [-0.48]	-2.88 (0.00)
SPREAD: All countries	-2.71 (0.00) [-2.70]	-4.06 (0.00)
SPREAD: Latin America	-1.66 (0.05) [-2.64]	-2.88 (0.00)
SPREAD: Latin America (large)	0.49 (0.69) [-1.94]	-0.5 (0.48)
SPREAD: Europe	-2.08 (0.02) [-2.96]	-2.46 (0.01)
SPREAD: Africa	0.43 (0.67) [-1.99]	-1.47 (0.07)

B. Panel Cointegration

Group	Cointegrating Relationships			
	[SPREAD, ED]	[SPREAD, OPEN]	[SPREAD, RES]	[SPREAD, WED^{π}]
CDS: All countries	0.51 (0.31)	0.74 (0.23)	-0.24 (0.40)	0.96 (0.17)
SPREAD: All countries	N/A	0.91 (0.18)	-0.51 (0.31)	0.92 (0.18)
SPREAD: Latin America	N/A	-0.15 (0.44)	-0.32 (0.37)	1.08 (0.14)
SPREAD: Latin America (large)	-0.61 (0.27)	0.52 (0.30)	-0.57 (0.28)	-0.08 (0.47)
SPREAD: Europe	0.61 (0.27)	-0.66 (0.26)	1.34 (0.09)	1.39 (0.08)
SPREAD: Africa	0.31 (0.38)	-1.01 (0.16)	-1.63 (0.05)	0.73 (0.23)

Note: CDS = credit default swap yields. SPREAD is EMBI+ data as explained in the test and in the appendix. IPS is the Im, Pesaran and Shin test; LLC is the Levin, Lin and Chu test. See Maddala and Kim (1998), for example, for additional details. The IPS test statistic is the W-test statistic while the p-value given in parenthesis is based on the normal approximation. The average augmented Dickey-Fuller t-statistic is also provided in brackets. The panel cointegration test relies on Kao's (1999) version of the Engle-Granger two-step method applied to a panel. p-values are given in parenthesis. The appendix provides a list of all country blocks. Also, see Figure 1 for plots of the spread for individual countries.

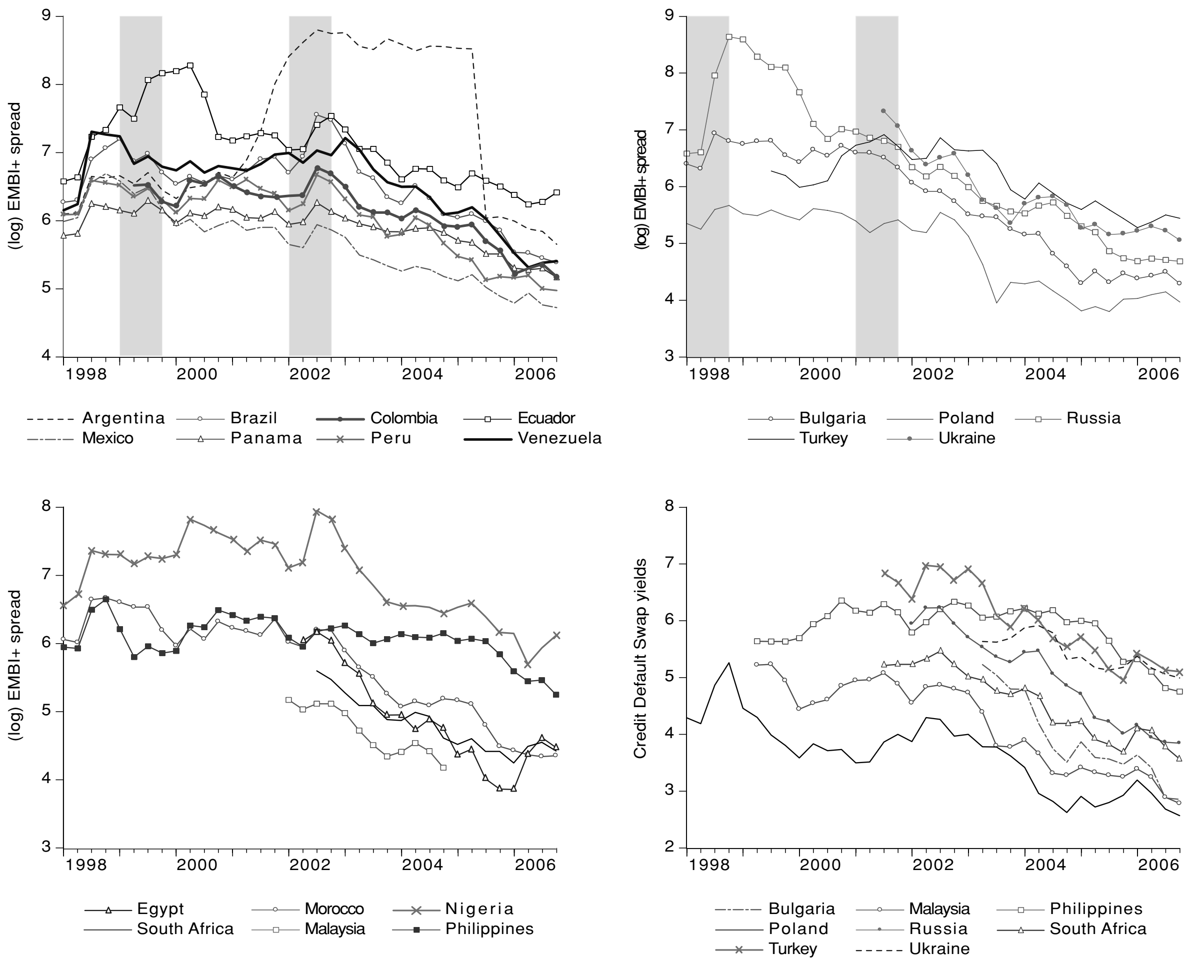
Table 3. Determinants of Emerging Market Bond Yield Spreads

Dependent Variable: log $SPREAD_{it}$

Independent Variables	All Countries	Latin & South America	Africa	Europe	Asia	All Countries	CDS
DOMESTIC							
π^{gap}	-0.001 (0.003)	-0.006 (0.002)*	-0.0004 (0.0007)	0.013 (0.006)**	0.05 (0.03)	0.01 (0.003)*	-0.02 (0.01)**
ER	0.06 (0.02)*	-0.14 (0.03)*	0.23 (0.06)*	-0.11 (0.04)**	0.03 (0.21)	0.07 (0.02)*	0.13 (0.07)**
DC^{gap}	-0.12 (0.09)	0.30 (0.14)**	0.63 (0.15)*	0.15 (0.11)	1.11 (0.54)**	-0.11 (0.09)	0.31 (0.11)*
WEO^{π}	0.001 (0.000)*	0.02 (0.003)*	-0.04 (0.02)**	-0.0002 (0.0003)	0.18 (0.05)*	N/A	-0.005 (0.005)
$(\pi\text{-}WEO^{\pi})>0$	N/A	N/A	N/A	N/A	N/A	-0.011 (0.001)*	N/A
$(\pi\text{-}WEO^{\pi})<0$	N/A	N/A	N/A	N/A	N/A	-0.0005 (0.0003)	N/A
WEO^{y}	0.004 (0.006)	-0.003 (0.006)	0.006 (0.013)	0.002 (0.010)	0.18 (0.05)*	0.005 (0.006)	0.03 (0.01)
WEO^{b}	0.023 (0.005)*	0.02 (0.01)**	-0.006 (0.013)	0.002 (0.010)	0.04 (0.03)	0.022 (0.005)	0.02 (0.01)**
CORR	-0.002 (0.002)	-0.01 (0.003)*	0.013 (0.006)**	0.008 (0.007)*	0.004 (0.019)	-0.0002 (0.002)	0.02 (0.005)*
MON	-0.013 (0.001)*	0.0005 (0.002)	-0.003 (0.010)	-0.011 (0.002)*	-0.09 (0.05)	-0.017 (0.001)*	-0.01 (0.01)
FIS	0.001 (0.01)	-0.02 (0.02)	0.059 (0.015)*	-0.039 (0.008)*	0.32 (0.09)*	0.006 (0.005)	0.03 (0.01)**
PTY	-0.003 (0.002)	-0.012 (0.003)*	0.008 (0.006)	0.008 (0.005)	0.04 (0.02)**	-0.001 (0.002)	0.002 (0.004)
EXTERNAL							
fed funds	-0.16 (0.04)*	-0.14 (0.05)*	-0.035 (0.05)	-0.09 (0.06)	-0.11 (0.08)	-0.13 (0.04)*	0.01 (0.05)
ED	-0.002 (0.002)	-0.35 (0.07)*	-0.77 (0.11)*	-0.09 (0.05)	-1.28 (0.44)*	-0.001 (0.003)	-0.39 (0.08)*
GLOBAL							
OIL	0.11 (0.07)	0.27 (0.10)*	-0.001 (0.137)	0.054 (0.11)	0.18 (0.18)	0.05 (0.07)	-0.38 (0.13)*
OPEN	-0.002 (0.001)*	0.003 (0.005)	0.0391 (0.008)*	-0.009 (0.004)**	0.004 (0.02)	-0.002 (0.001)*	-0.04 (0.01)*
FDI	0.0002 (0.0002)	0.0003 (0.0004)	-0.0004 (0.0003)	0.00 (0.00)	0.001 (0.0001)	0.0002 (0.0002)	-0.000 (0.001)
RES	-0.81 (0.18)*	-0.51 (0.22)**	0.465 (0.269)	-1.31 (0.33)*	-0.67 (0.60)	-0.64 (0.18)*	-0.26 (0.31)
VOLATILITY							
VIX	0.06 (0.004)*	0.05 (0.006)*	0.03 (0.01)*	0.04 (0.01)*	0.02 (0.01)**	0.06 (0.004)*	0.04 (0.01)*
REGIONS							
C	5.72 (0.45)	15.33 (1.97)*	16.02 (2.51)*	10.50 (1.31)*	9.23 (12.42)	5.43 (0.44)*	10.94 (1.91)*
L&SA	0.19 (0.06)*	N/A	N/A	N/A	N/A	0.26 (0.06)*	N/A
EUROPE	-0.41 (0.08)*	N/A	N/A	N/A	N/A	-0.41 (0.08)*	N/A
AFRICA	-0.38 (0.09)	N/A	N/A	N/A	N/A	-0.32 (0.09)*	N/A
SUMMARY STATS							
$\bar{R}^2$	0.64	0.80	0.97	0.91	0.96	0.66	0.93
F (p-value)	47.48 (0.00)	41.49 (0.00)	135.48 (0.00)	78.04 (0.00)	73.05 (0.00)	49.98 (0.00)	105.51 (0.00)
Redundant FE	-	71.68 (0.00)	1.46 (0.23)	28.68 (0.00)	0.17 (0.68)	-	46.61 (0.00)
OBS	534	39	82	155	48	534	181
Cross-sections	19	8	4	5	2	19	8

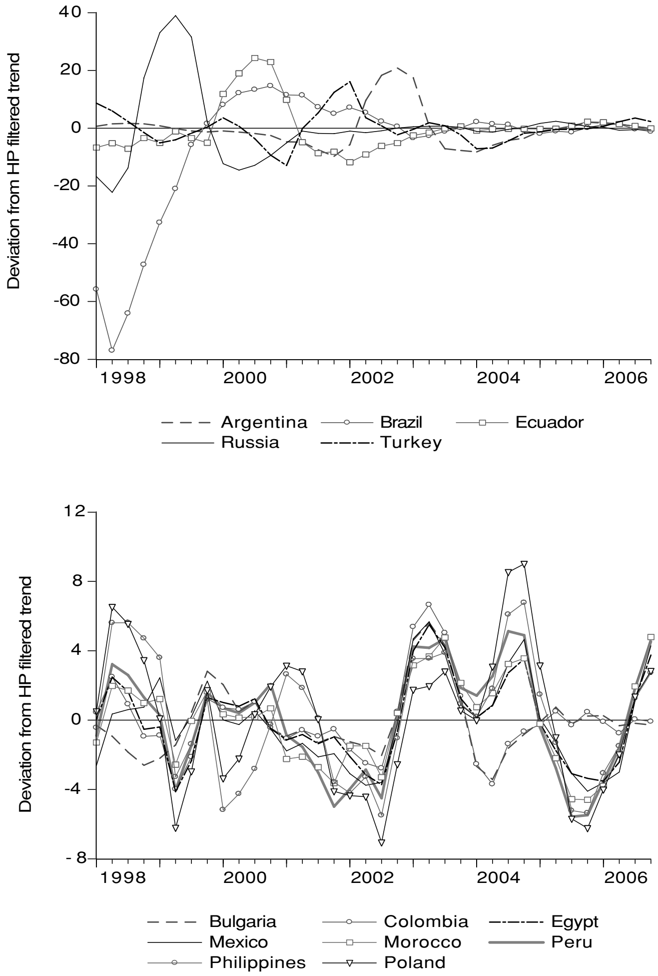
Notes: Gap variables (π, DC) are estimated via an HP filter, as explained in the text. ER is the exchange rate regimes of Levy-Yeyati and Sturzenegger (2005). All other variable definitions are constrained in the appendix. *,** denotes statistical significance at the 1% and 5% levels, respectively. All estimates are GLS estimates using cross-section weights and adjusted standard errors.

Figure 1. Emerging Market Spreads



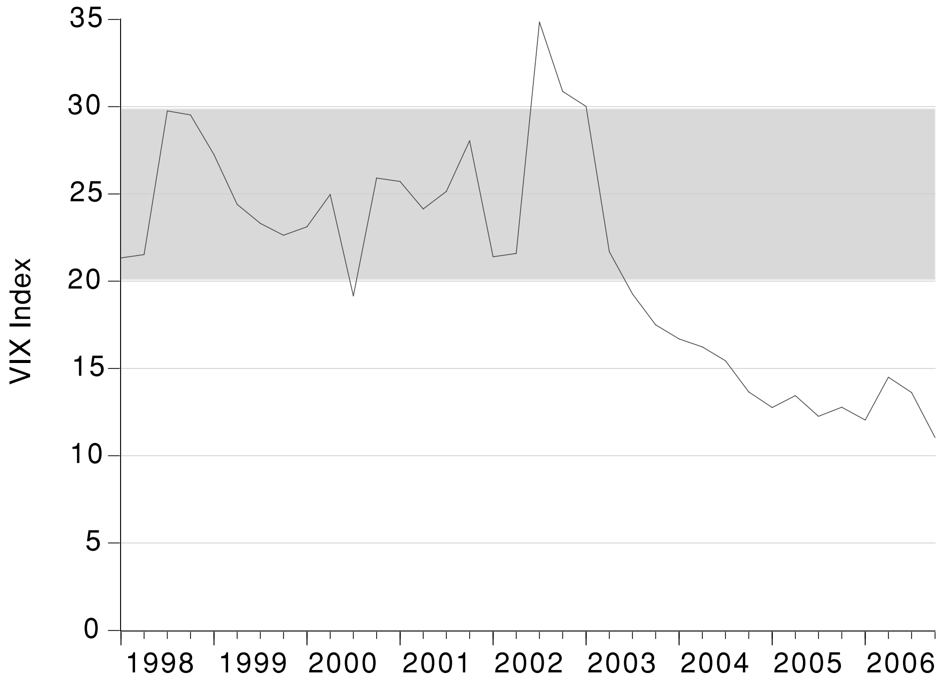
Note: Data sources and definitions are provided in the appendix.

Figure 2. Inflation Gaps for Selected Emerging Market Economies



Note: Inflation (annual rate of change evaluated as 100 times (log P_t – log P_{t-4})) less an HP filter (with smoothing parameter 1600) applied to inflation.

Figure 3. Volatility Index



Note: Source and variable definition given in the text and in the appendix.

Appendix

Country and Region List

Latin and South America
Argentina (large)
Brazil (large)
Colombia
Ecuador
Mexico (large)
Panama
Peru
Venezuela

Europe
Bulgaria
Poland
Russia
Turkey
Ukraine

Africa
Egypt
Morocco
Nigeria
South Africa

Asia
Malaysia
Philippines

Series Definitions ⇒ data transformations	Sample	Sources (original sampling frequency)
(1) ER – country name (19 countries)	(F)	Levy-Yeyati & Sturzenegger (2005) index of exchange rate regimes (Index 1 to 5) (M)
(2) INFGAP1 - country name (19 countries)	(P)	Annual inflation – HP filtered annual inflation (λ =14,400) starting with 97.01 observation (percent) (M)
(3) SPREAD – country name (19 countries) ⇒ lspread; d(spread)[2]	(P)	EMBI+ based spread[4] (b.p.), last monthly observations used for quarterly. (M)
(4) FX – country name[1] (19 countries) ⇒ DLFX_*[100*(ln X_t-ln X_{t-4})]	(F)	Domestic currency price of U.S. dollars (DCU) (M)
(5) RES – country name[3] (19 countries) ⇒ DLRES_*[100*ln RES_t – ln RES_{t-4})]	(F)	Millions of U.S. dollars (M)
(6) S – country name (12 countries)	(P)	Stock index = 100 (various years) (M)
(7) SSPREAD – country name (19 countries) ⇒ lsspread; d(sspread)	(P)	EMBI based spread (b.p.) (D) Converted to quarterly via CMA (see below)
(8) POP – country name (19 countries)	(F)	Population (millions) (A) Converted to annual via Constant Match Average (CMA)
(9) EX – country name* (14(Q) + 5(A))	(P)	Exports F.O.B. (Q + A) Millions US$ Converted to annual via CMA
(10) IM – country name* (14(Q) + 5(A))	(P)	Imports F.O.B. (Q + A) Millions US$ Converted to annual via CMA
(11) ED – country name (18 – (COLOMBIA)) ⇒ dln, d	(P)	Gross External Debt Position US$ millions (Q)

(12) GDP – country name* (14(Q) + 5(A))	(P)	Nominal GDP (see notes for details) (Q)
(13) RGDP – country name (11(Q) + 6(A))	(P)	Real GDP (2000 = 100)
(14) WEO B – country name P – country name Y – country name (19 countries)	(F)	WEO forecasts (A) B = balance of payments P= inflation Y =economic growth Converted to quarterly via CMA
(15) OIL (19 countries) ⇒ dln = 100 (ln X_t – ln X_{t-4})	(F)	Average crude price from IFS: spot price average index (M)
(16) CDSUS – country name (8 countries) BG – MA – PH – PO – RO – SA – TU – UK ⇒ lcdsus; dcdsus	(P)	Credit default swap (CDS)rates
(17) VIX (US)	(F)	VIX constructed from daily rate (D)
(18) FDI – country name (19 countries) ⇒ dln; d	(F)	FDI flows in millions of current US$ (A) Converted to quarterly via quadratic match average
(19) CORR – FIS – MON – country name PTY -	(P)	Indices governance; corruption, monetary independence, fiscal policy quality, property rights converted to quarterly via quadratic match average (A)

Notes: (F) means full sample, 1994 – 2006; (P) means partial data available (e.g., 1998 – 2006). Raw data: (M) – monthly; (Q) – quarterly; (A) – annual; (D) – daily. All data converted to quarterly in generating econometric estimates.

1. For Panama, ER=1 throughout (=1 US$); for Argentina ER=1 (=1 US$) until 2002.
2. l variable-name, dl variable-name, d variable-name means lag, lag change, or first difference of variable created for the empirical analysis.
3. For Ukraine, RES value negative in May 1994 set arbitrarily to zero (observation not used in the empirical analysis).
4. Data for Malaysia ends December 2004; for Philippines no data for 1998 October – 1999 March. Interpolation used to fill gap; for South Africa no data for 2002 September – 2002 November. Interpolation used to fill gap.
5. Other sources provided in the text.