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Common factors in emerging market spreads[1]

Emerging market bond debt has become an increasingly important asset class for portfolio managers and, over the last decade, emerged as a key source of funds for emerging market governments. Spreads on emerging market bond debt across countries tend to move in tandem over time, suggesting that one or more common factors drive their movements. Yet despite its relevance to portfolio management, the degree of common variation in spreads on emerging market debt, and the number of underlying factors that might drive this covariation, has received little attention in the asset pricing literature.

This article investigates the extent to which spreads on emerging market sovereign debt react to forces that are common across markets. Similar in spirit to the Litterman and Scheinkman (1991) analysis of the US Treasury yield curve, and to the extensive work in the asset pricing literature on the factors driving equity returns, we use principal factor analysis to determine the number of common factors that drive movements in emerging market bond spreads.

Three broad conclusions are supported by the analysis presented below. First, we find that common forces account for, on average, one third of the total variation in the daily movement of each spread for our primary sample of 15 emerging market issuers. This result is robust to rating differences, as well as differences in sample size. Second, we find that a single common factor explains approximately 80% of the common variation, although there is tentative evidence of a second common factor emerging in recent years. Third, the primary factor may reflect changes in investors' attitudes towards risk, as evidenced by its high correlation with economic variables that are thought to reflect changes in risk premia.

Asset pricing and the portfolio manager

Spreads on emerging market sovereign bonds tend to be highly correlated across countries, a fact that has important implications for portfolio managers. For example, for the sample of 15 emerging market borrowers described below, the average (across countries) correlation between the daily *movement*

[1] Martijn Schrijvers was seconded to the BIS by the Netherlands Bank at the time of this research project. The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS or the Netherlands Bank.

in each spread series with that of the JPMorgan Emerging Market Bond Index Global (EMBI Global) between January 1998 and June 2003 was 0.53.[2] While spreads on some bonds, such as those of Turkey, South Africa and China, had relatively low correlations with the EMBI Global, others, such as those of Brazil, Mexico and Korea, had correlations well above 0.6.

Portfolio allocation hinges on asset price co-movement ...

From the portfolio manager's perspective, the underlying forces driving these spreads, and the degree of heterogeneity in spread movements, are key to achieving the appropriate degree of portfolio diversification. A necessary step in addressing the portfolio allocation decision is to determine both the number and the nature of the common sources of variation for each asset class. For example, a change in the global investing climate can influence investors' risk appetite, and hence be reflected in common movements in spreads across issuing countries. Indeed, as emerging markets become ever more integrated in the global economy, and with the rise of "crossover investors", global, or common, factors may become more important determinants of emerging market bond spreads relative to idiosyncratic factors.[3]

... which can be decomposed into factors

The search for common sources of variation has a long history in the asset pricing literature. Early work relied on analysis of the covariance matrix of securities to determine the common components driving returns (Feeney and Hester (1967), Farrell (1974), Arnott (1980)). More recently, factor models of one form or another have become a standard tool to analyse security returns. At the heart of these factor models is the assumption that the returns on different securities will be correlated only through reactions to one or more of the specified factors. For equity returns, for example, the excess market return is the single factor in the standard CAPM, although many have argued that equity returns are more appropriately modelled with multiple factors.[4] In addition, Ross's (1976) APT model, which is based on a no-arbitrage argument, shows that the systematic portion of equity returns can be expressed as a linear function of a set of "factors". However, this model leaves both the number and the nature of these factors unspecified, prompting a large but inconclusive literature which addresses these issues.[5] For fixed income securities, Litterman and Scheinkman (1991) apply principal factor analysis to the returns on US Treasury notes, and find that three factors can explain a

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[2] This statistic can be misleading because of differences in the weighting of countries in the EMBI Global. An alternative is to calculate the simple average of all the pairwise correlations between the series themselves. This yields an average correlation of 0.29.

[3] Crossover investors have a relatively broad mandate which permits them to switch between developing and developed world assets, thus putting emerging market assets in direct competition with other assets. While many crossover investors are limited to investment grade instruments, they are nevertheless becoming more involved in emerging market securities due to the improved credit quality of some large issuers.

[4] See Fama and French (1992, 1993, 1996) for tests of the CAPM model. Fama and French (1996), for example, show that a three-factor model performs well in explaining the variation in the excess returns on value-weighted portfolios of US equities.

[5] To name but a few in a large literature, see Trzcinka (1986), Brown (1989), Connor and Korajczyk (1993), Mei (1993a,b) and Harvey (1995).

significant portion of the variation in returns across the term structure. They interpret these factors as representing the level of interest rates, the slope of the yield curve and the curvature of the yield curve.

Building on the above literature, we apply principal factor analysis to emerging market sovereign bond spreads to investigate their common sources of variation, and provide tentative answers to the following questions. First, to what extent are movements in emerging market spreads driven by common forces? Second, how many distinct common forces drive their co-movement? Finally, what are these common forces? That is, can the underlying factors be interpreted in an economically meaningful way?

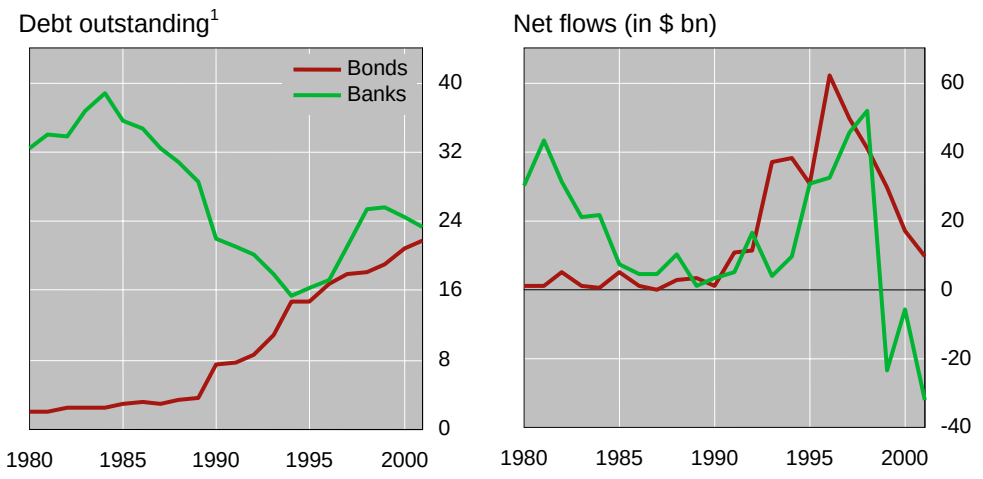
Emerging market debt as an asset class

Although foreign direct investment remains by far the most significant financing source, the international debt securities market has overtaken bank loans and official creditor flows over the last 10 years to become the second largest source of capital for emerging market borrowers. Net financing in the form of bank loans constituted 26% of all medium- and long-term private capital flows to these markets between 1980 and 1985. However, with increased access to direct financing, net intermediated credit fell to only 11% of total financing to emerging markets between 1996 and 2002, while the net issuance of debt securities rose from 2% to 35% over the same period. Currently, bank loans and debt securities have roughly equal shares in total external debt (Graph 1, left-hand panel).

The debt market blossomed following the Brady Plan …

The shift from loans to securities was triggered by the Mexican debt crisis of 1982, after which many outstanding bank loans to emerging markets were restructured into collateralised bonds (so-called Brady bonds) at the end of the 1980s and in the early 1990s. This conversion of loans into Brady bonds was a major impetus behind the rapid rise in outstanding emerging market bond debt,

Structure of emerging market debt



[1] As a percentage of total emerging market external debt outstanding.

Source: World Bank. Graph 1

which had grown to $485 billion by 2002, or by 27% per year on average. Roughly 77% of the sovereign bonds issued in the last 10 years by emerging market governments have been denominated in US dollars, followed by euro (17%) and yen (6%) denominations.

In recent years, bond financing has proved to be more resilient than bank loans. The Asian and Russian crises in the late 1990s, followed by the recent Argentine default, led to a sharp decline in bank financing; the net flow of bank loans to emerging market borrowers turned negative in 1999 for the first time in 20 years (Graph 1, right-hand panel). Conversely, bond flows, while also declining, remained positive. However, the aggregate figures obscure a significant shift in flows from Latin America towards Asia; gross flows to Latin America declined by 48% in 2002, mainly reflecting the deteriorating situation in Argentina during this period.

… and matured as the investor base broadened

The market for emerging market debt has matured considerably in recent years. Market liquidity and transparency have been enhanced as the investor base has broadened. In 1998, hedge funds accounted for 30% of all activity in this market, while high-grade or "real money" investors (eg pension funds and other institutional investors) constituted only 9%.[6] By 2002, the share of hedge funds had declined to 10%, while that of high-grade investors had risen to 32%. Furthermore, an increasing number of countries are now able to issue longer-maturity bonds (eg 10-year maturity), which is beneficial for issuers trying to reduce interest rate sensitivity, and for investors looking for higher-duration investment opportunities. Evidence of the maturing of this market is the decline in the share of Brady bonds in total emerging market debt; countries have repurchased Brady bonds for cost reasons since these bonds typically trade at a discount. The share of outstanding Brady bonds and other repackaged issues in the stock of international debt securities issued by emerging markets fell from 49% in March 1995 to 12% in June 2003.

Common variation in spreads

Although spreads at issuance, which reflect the actual cost of capital, may be the most relevant for the issuer, portfolio managers arguably follow spreads in the secondary market more closely. Secondary market spreads, available with daily frequency, may reflect subtle changes in the global investing climate more accurately than lower-frequency data. Thus our data sample comprises the country-specific components of the EMBI Global index.[7] The primary data

[6] Other participants in this market include mutual funds, Latin American accounts and non-US financial institutions.

[7] The EMBI Global index tracks the total return and spreads for US dollar-denominated debt instruments issued by emerging market sovereign and semi-sovereign entities, and consists of Brady bonds, eurobonds and loans. Because the share of loans in the EMBI Global is negligible (1.6% in the total index), and because the majority of emerging market debt is dollar-denominated, the index can be considered a close approximation of an emerging market bond portfolio. The inclusion of Brady bonds may introduce price distortions because of their specific structure (eg collateralisation). In addition, differences in the average duration of each country-specific component in the EMBI Global may affect the degree to which each spread reacts to global shocks.

sample consists of the *changes in daily spreads* for 15 emerging markets for the period 31 March 1997 to 18 June 2003. For certain purposes (noted below), we rely on a broader country sample (over a shorter time period).

In the remainder of this section, we investigate the *number* of common forces that influence emerging market spreads using principal factor analysis. This empirical technique also allows us to say something about the degree to which common forces, rather than idiosyncratic forces, influence spread movements. Simply put, factor analysis is a statistical method by which the *common variation* in a set of correlated variables is extracted and used to form new data series (or factors) that "summarise" the original series. Data series that are highly covariate need few common factors to explain a significant portion of their common variance. In this section, we focus on the degree to which common factors are relevant, and how their importance differs by rating.

Common variation and the number of factors

Nearly all common variation is explained by a single factor …

Factor analysis indicates that only one significant factor drives the common portion of the variation in daily spread changes for the 15-country sample, a somewhat surprising result given the presumably complex process underlying sovereign debt markets.[8] This single factor explains roughly 95% of the *common* variation in the underlying daily spreads. That said, this common variation accounts for a relatively small share of the variation in daily spread movements. The average (across countries) "uniqueness", or the portion of total variation in each spread *not* explained by the common factor, is

Factor loadings and uniqueness measures

31 March 1997 – 18 June 2003

Country	Loading	Uniqueness
Argentina	0.364	0.867
Brazil	0.744	0.446
Bulgaria	0.733	0.462
China	0.258	0.934
Colombia	0.596	0.645
Ecuador	0.403	0.837
Korea	0.590	0.652
Malaysia	0.335	0.888
Mexico	0.860	0.260
Nigeria	0.321	0.897
Panama	0.764	0.417
Peru	0.625	0.609
South Africa	0.418	0.825
Turkey	0.439	0.808
Venezuela	0.655	0.570
Average	*0.540*	*0.674*

Table 1

[8] The number of relevant factors is determined using the Kaiser criterion, which drops those factors that account for less variance than at least one underlying spread series.

0.67, indicating that, on average, only one third of the total variation in spreads is driven by common forces.[9]

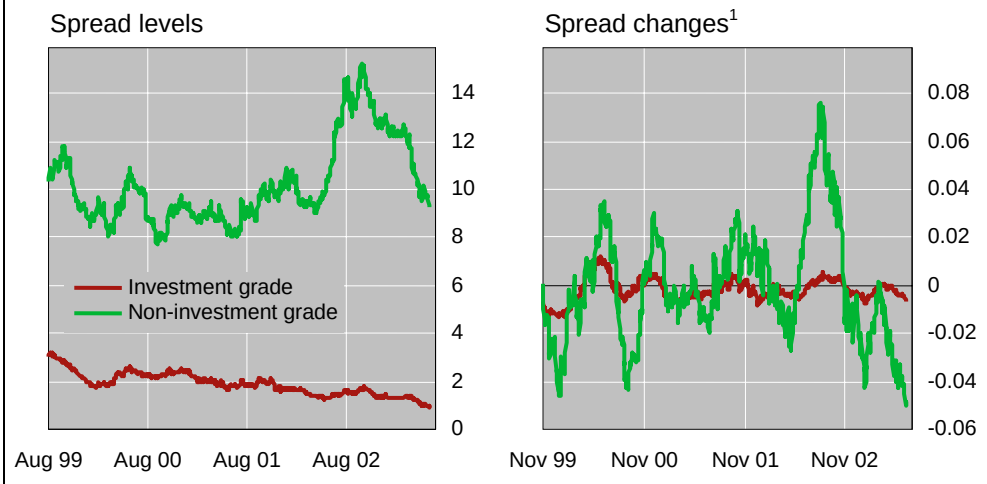
… although idiosyncratic forces remain important

Although the common portion of variation has an apparently simple structure, there remains considerable cross-country heterogeneity in spread movements. Table 1 lists the factor loadings, which are a measure of the degree to which individual spreads move with the common factor, and the uniqueness measures for each of the 15 countries. For only four countries (Mexico, Panama, Brazil and Bulgaria) does the common factor account for more than half the variation in the underlying spread series; that is, they load highly on the common factor and have relatively low uniqueness measures. While there does not seem to be a clear pattern across countries, the average uniqueness for the eight Latin American countries is 0.54, while that for the three emerging Asian countries is over 0.82. This regional difference may be indicative of sample bias, as Latin America is more heavily represented in our sample. Alternatively, it may be driven by differences in the average debt quality, or rating, across these regions.

We separate out investment grade countries

To investigate this issue more systematically, we apply factor analysis separately to groups of investment grade and non-investment grade countries. By dividing the sample (of 25 countries) in this way, we should expect to see lower (average) uniqueness measures (relative to the pooled sample) for each group given the assumption that the underlying factors that drive bond spreads are different across rating classes.[10] In addition, the underlying factors

Emerging market bond spreads by rating class



Note: Period of analysis is 3 August 1999 to 11 June 2003; data based on spreads over US Treasuries (in percentages).

[1] Ninety-day moving average of the simple average across countries.

Sources JP Morgan Chase; BIS calculations. Graph 2

[9] Robustness tests using a sample of 21 countries over the 1998–2003 period yield similar results.

[10] To maximise the number of countries available, this analysis relies on daily spread data from 3 August 1999 to 11 June 2003.

Factor loadings and uniqueness measures by rating class

3 August 1999 – 11 June 2003

Investment grade			Non-investment grade		
Country	Loading	Uniqueness	Country	Loading	Uniqueness
Chile	0.440	0.806	Argentina	0.311	0.903
China	0.560	0.686	Brazil	0.655	0.571
Croatia	0.032	0.999	Bulgaria	0.487	0.763
Hungary	0.366	0.866	Colombia	0.607	0.632
Korea	0.652	0.575	Côte d'Ivoire	0.152	0.977
Malaysia	0.645	0.583	Ecuador	0.259	0.933
Poland	0.632	0.601	Lebanon	0.261	0.932
South Africa	0.546	0.702	Mexico	0.754	0.432
Thailand	0.515	0.735	Morocco	0.329	0.892
			Nigeria	0.234	0.945
			Panama	0.702	0.507
			Peru	0.607	0.631
			Philippines	0.648	0.581
			Russia	0.325	0.894
			Turkey	0.522	0.728
			Venezuela	0.528	0.721
Average	0.488	0.728	Average	0.461	0.753

Table 2

themselves should differ. A country is considered investment grade if it had a Standard & Poor's rating of BBB– or above on its foreign currency denominated debt for at least half of the sample period. This yields the nine investment grade countries and 16 non-investment grade countries which are listed in Table 2.

While spreads differ across rating classes …

Graph 2, which shows the difference in the average spread levels for these groups of countries, as well as the greater average volatility of the non-investment grade debt, hints at the potential importance of this separation. The average spread on non-investment grade debt was, on average, 750 basis points higher than that on investment grade debt between August 1999 and end-May 2002. This difference increased to 1,150 basis points between June 2002 and June 2003, reflecting the deteriorating situation in Argentina and Brazil during this period. Similarly, the *daily change* in spreads on non-investment grade debt was, on average, 7 basis points greater than that on investment grade debt during the earlier period, and 13 basis points greater in the latter period.

… their underlying factors are remarkably similar

However, despite this, there is little evidence of sustained differences in the common forces of variation across rating classes. Factor analysis again indicates that a single common factor explains virtually all of the common variation in each group. Moreover, as shown in Table 2, the average uniqueness measures are similar across rating classes, and imply that the class-specific common factor accounts for, on average, one third of the total variation in each underlying spread. When factor analysis is applied to the

group of 25 countries as a whole, the average uniqueness measure is 0.79, higher than that in each group, but only marginally so.[11]

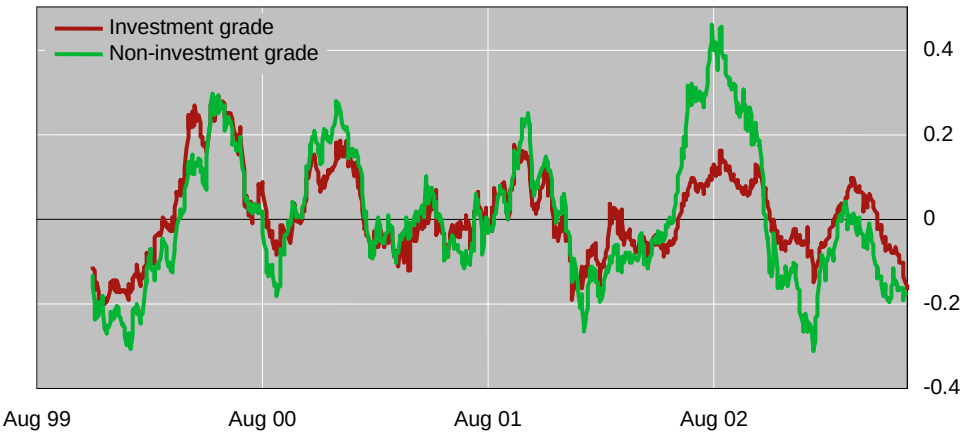
While the different factors driving the investment and non-investment grade spreads move together overall (Graph 3), they appear to diverge starting in mid-2002.[12] In addition, there remains considerable *intra-class* heterogeneity in spread movements. The (moving average of the) non-investment grade common factor rises to 0.35 by end-May 2002, which corresponds to the rise in the underlying spreads on Latin American debt during the Argentine default and the impending crisis in Brazil. By January 2003, however, spreads in Latin America had come down, and this is reflected in the precipitous fall in the non-investment grade common factor.

Differences over time

Global market integration may influence the number of common factors

While the above evidence suggests at most a single common factor, the global macroeconomic environment, and (possibly) the corresponding risk appetite of portfolio managers, changed substantially over the 1997–2003 period with the rise and fall of world equity markets. Thus, there may have been structural changes in the forces driving emerging market spreads that the above (pooled) analysis fails to uncover. The continued integration of emerging markets into the global economy may suggest that emerging market spreads should become more synchronised over time. However, regional issues, such as the Russian and Argentine defaults and the asymmetric effect of the global economic slowdown, may actually have led to a decrease in their co-movement. Indeed, the divergence since mid-2002 of the investment and

Common factors by rating class



Note: Period of analysis is 3 August 1999 to 11 June 2003; 90-day moving averages.

Sources: JPMorgan Chase; BIS calculations. Graph 3

[11] Factor analysis for the pooled sample of 25 countries indicates the presence of *two* common factors, although the second common factor only marginally passes the selection criterion. This issue is discussed in the next section.

[12] These factors have a correlation coefficient of 0.498, but are not statistically different from each other.

Factor number and common variation explained				
Year	Significant factors	Proportion factor 1[1]	Proportion factor 2	Average uniqueness[2]
1997[3]	1	0.816	0.109	0.502
1998	1	0.818	0.092	0.489
1999	1	0.846	0.126	0.633
2000	1	0.863	0.155	0.683
2001	2	0.766	0.212	0.568
2002	2	0.779	0.187	0.625
2003[4]	1	0.780	0.119	0.671

[1] The proportion of common variation explained by the factor. [2] Measured across the 15 countries in the sample. [3] Data for 31 March 1997 to 31 December 1997. [4] Data for 1 January 2003 to 18 June 2003. Table 3

non-investment grade factors discussed above suggests that this may be the case (Graph 3).

In the analysis that follows, we return to the original 15-country sample, repeat the factor analysis separately for each year and report the results in Table 3. For the years up to and including 2000, the common variation is again driven by a single common factor. In fact, the proportion of common variation explained by the first factor is little changed over this period, rising from 0.82 in 1997 to 0.86 in 2000. However, the average of the uniqueness measures across countries rises from around 0.5 in 1997 to 0.68 in 2000. Thus, while common components accounted for, on average, half the total variation in emerging market spreads in the early years of the sample period, idiosyncratic forces became more important vis-à-vis common forces in later years, in keeping with the hypothesis that market participants became more discriminating (see also the *72nd BIS Annual Report* (2002)).

A second common factor has emerged in recent years

Consistent with this changing covariance structure, a second factor is identified for the years 2001 and 2002, although this evidence is tentative at best.[13] The proportion of common variation explained by the first factor dropped to 0.76, while that explained by the second rose to around 0.2. In addition, the average uniqueness fell to 0.56 in 2001 and 0.62 in 2002, still higher than the 1997 and 1998 values, but suggesting that the common sources of variation increased vis-à-vis idiosyncratic forces in the wake of equity market collapses. That said, there does not seem to be a *sustained* change in the underlying covariance structure. Analysis of the first half of 2003, when again a *single* common factor is identified, indicates that the uniqueness measure rose to 0.67, roughly the same as the 1999 and 2000 values.

Assigning economic meaning

The above analysis suggested that movements in emerging market bond spreads are driven to some extent by a single common component, but

[13] While the Kaiser rule does indicate a second common factor in 2001 and 2002, this selection criterion remains somewhat controversial. In addition, the second factor only marginally passes this selection test (relative to the first factor), meaning that these results may be driven by statistical noise rather than changes in economic fundamentals.

provided no guidance as to what economic forces might underlie this common source of variation. This section explores this issue in search of an economically meaningful interpretation of the common factor. By construction, the factor is an *abstract* series that explains (a portion of) the common variation in the daily spread movements. As such, it seems most likely to correspond to developments in the global economy, changes in the willingness of investors to incur risk, or common developments for emerging markets as a group.

Our strategy is to analyse the simple correlation between the common factor series and variables that are hypothesised to reflect these global trends. While it is impossible to identify *precisely* what the common factor represents, such an exercise may prove useful in determining which global trends tend to be the most important. In particular, we focus on the explanatory power of the return of the S&P 500, FTSE and Nasdaq stock indices, long- and short-term US interest rates and the slope of the US yield curve, the price of oil, and several measures of investor risk tolerance. These include the implied volatilities on US Treasuries of various maturities, the VIX, the BBB corporate spread and the high-yield spread.[14] With the exception of the daily implied volatilities, all series are expressed as daily changes.

The common factor correlates with US interest rates …

The common factor is significantly correlated with several of these variables (Table 4). This result is driven both by the high correlation between many of these variables themselves and by the fact that the common factor, by construction, represents a mixture of all common forces driving emerging market debt spreads. Overall, the analysis indicates a negative correlation between the common factor and US interest rate variables, and a positive

Correlation between common factor and economic variables

Equity indices	
Nasdaq	–0.280
FTSE	–0.324
S&P 500	–0.364
US interest rates	
Federal funds futures	–0.171
US three-month Treasury yield	–0.084
US 10-year Treasury yield	–0.365
Slope yield curve	–0.264
Other measures	
Price of oil	–0.023
VIX index	0.419
BBB spread	0.111
High-yield spread	0.401

Note: All variables are in differences. Table 4

[14] The VIX is the Chicago Board Options Exchange Volatility Index, and is a market estimate of future volatility. It is based on a weighted average of the implied volatilities of eight OEX calls and puts. The slope of the US yield curve is the difference in the yields on the 10-year and three-month US Treasury bills.

correlation between the factor and measures of risk tolerance. In particular, the implied negative relationship between daily changes in the federal funds futures rate, an indicator of market expectations of future US monetary policy, and emerging market spreads is somewhat inconsistent with previous empirical work that has relied on lower-frequency data (see the box on page 76).

A possible explanation for this negative relationship can be found in the information content of the slope of the US yield curve, which is often used as a proxy for expected future economic growth. If investors become optimistic about future economic growth in the developed world, triggering an increase in the slope of the yield curve, they may expect emerging markets to benefit from increased product demand, particularly in export-dependent countries. This, in turn, may reduce the probability of sovereign default, and thus lead to a decrease in emerging market sovereign spreads. This effect may be amplified if, in addition, investor risk tolerance and expectations of future growth prospects are procyclical, as the subsequent substitution into riskier assets may further drive down emerging market spreads.

... and variables related to risk tolerance

Consistent with this, two of the variables that correlate highly with the common factor are directly related to investors' risk tolerance. The VIX and the high-yield spread both have correlation coefficients above 0.4, while the BBB spread has a coefficient above 0.1. This hypothesis is further supported by the relatively strong (negative) correlations between the common factor and the equity market indices.[15] A rise in the return on the S&P 500 Index, for example, is associated with a fall in the common factor, and hence a fall in spreads. To the extent that equity returns and changes in risk tolerance are linked, this negative relationship suggests that changes in investors' overall appetite for risk are a significant component of the common variation in emerging market spreads.

Conclusions

Using principal factor analysis, we find that a single common factor drives the common portion of variation in sovereign bond spreads for a sample of 15 emerging market countries. The common factor accounts for, on average, one third of the total variation in daily spread changes, indicating that idiosyncratic elements remain the most significant explanation for spread movements. Although spreads on investment and non-investment grade debt differ (both in levels and in volatility), the common factors for each of these groups are surprisingly similar across a broader sample of 25 countries.

At the same time, we find tentative signs of a changing covariance structure, as evidenced by the decline in the proportion of total variation accounted for by common components and by the emergence of a second common factor sometime after 2000. This is highlighted by the divergence in

[15] Changes in the discount factor (ie the degree of risk aversion) are thought to be responsible for a significant portion of the volatility in equity prices. See Cochrane (2001) for a discussion.

US interest rates and emerging market bond spreads

A noteworthy result from the factor analysis in the main text is the negative correlation between the common factor underlying emerging market sovereign bond spreads and daily changes in US interest rates and federal funds futures. Our findings imply that increases in US interest rates, or expected increases in rates as proxied by federal funds futures, are associated with lower emerging market spreads.[①] This result must be interpreted against the backdrop of a considerable, but inconclusive, literature on the relationship between US monetary policy and emerging market spreads. While some studies find a positive relationship (Arora and Cerisola (2001)), others find a negative relationship (Eichengreen and Mody (1998)), or no relationship at all (Kamin and von Kleist (1999)).

This lack of consensus is driven by the idiosyncratic nature of much of the previous empirical work. Results depend on whether primary or secondary market spreads are used, on the inclusion/exclusion of certain emerging market issuers, on the time period under consideration, and on the regression technique applied to the data (see the table below). In addition, most previous studies relied on low-frequency data, which allows the inclusion of country-specific economic variables as regressors, but necessarily precludes analysis of high-frequency spread movements. The results from the factor analysis in the main text hint at a more nuanced relationship, where long-term changes coincide but short-term patterns are different.

Summary of empirical work on emerging market debt

Authors	Period sample	Data frequency	Dependent variable	Sign[1]
Dooley et al (1996)	1986–92	annual	Log level secondary market prices	+ [2]
Kamin and von Kleist (1999)	1991–97	not relevant	Log level primary market spreads	– / 0 [3]
Eichengreen and Mody (1998)	1991–96	not relevant	Log level primary market spreads	– [4]
Arora and Cerisola (2001)	1994–99	monthly	Log level secondary market spreads	+ [5]
McGuire and Schrijvers (2003)	1997–2003	daily	Changes and levels of secondary market spreads	–

[1] Indicates the relationship between emerging market spreads or yields and some measure of US interest rates. [2] Dooley et al (1996) find a significant negative relationship between 10-year US interest rates and the market price of emerging market securities. [3] Kamin and von Kleist (1999) calculate their own emerging market index and find (in most cases) insignificant coefficients on the one-year US Treasury interest rate. [4] Eichengreen and Mody (1998) use a Bondware emerging market index and find a lower probability of emerging market debt issues if US interest rates are high. [5] Arora and Cerisola (2001) find significant results for 10 out of 11 sample countries.

In order to facilitate comparison between our results and those in previous studies, we applied ordinary least squares (OLS) to the EMBI Global index (and to the individual country components of this index), and included the US interest rate variables described in the main text as regressors. Using the EMBI Global in levels as the dependent variable, the coefficient on the level of US interest rates (either the three-month US Treasury yield or the federal funds futures rate) is indeed positive (although insignificant) for the pooled sample covering the entire 1999–2003 period. Interestingly, however, the same exercise on a year-by-year basis yields very different results. In four out of five years, the coefficient on either the US interest rate or the federal funds futures rate is negative, and is significant three times. Furthermore, the explanatory power increases considerably in the year-by-year equations.

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① Jeanneau and Micu (2002) find a comparable positive relationship between the level of real short-term interest rates in industrial countries and bank lending to emerging markets.

Since the change in spreads is considered a proxy for returns, the above experiment was repeated after first-differencing all the data, the standard practice in the empirical finance literature.[2] Simple OLS regressions on these data yield similar results; expected changes in US monetary policy or US interest rates are negatively correlated with changes in emerging market spreads in the pooled sample as well as in each year, and are everywhere statistically significant. Moreover, these same regressions were repeated separately for each of 20 countries. For 18 of the 20 countries, the coefficients on the US interest rate measures were negative and significant, both in the pooled sample and in the year-by-year regressions. Together, these results suggest that emerging market spreads *do* move in tandem with US interest rates over long periods, but that different processes govern the short-run dynamics.

———————————————

[2] First-differencing the spread series helps to avoid econometric problems caused by unit roots. Kamin and von Kleist (1999) find non-stationarity when testing with levels.

the factors underlying investment and non-investment grade spreads, which probably reflected the deteriorating situation in Argentina in 2001 and the crisis in Brazil in 2002.

There is some evidence that the common factor reflects changes in investors' tolerance for risk. Although it is impossible to ascribe precise economic meaning to the common factor, the high correlation between it and high-frequency measures of risk tolerance suggests that the common variation in emerging market debt spreads is largely explained by changes in attitudes towards risk within the international investment community. Furthermore, to the extent that changes in investor risk tolerance and expectations of future growth prospects are procyclical, this hypothesis is supported by the negative correlation between the factor and US interest rate variables.

References

Arnott, R (1980): "Cluster analysis and stock price movements", *Financial Analysts Journal*, 36, no 3, November/December, pp 56–62.

Arora, V and M Cerisola (2001): "How does US monetary policy influence sovereign spreads in emerging markets?", *IMF Staff Papers*, Washington, pp 474–98.

Bank for International Settlements (2002): *72nd BIS Annual Report*, Basel.

Brown, S (1989): "The number of factors in security returns", *Journal of Finance*, 44, no 5, December, pp 1247–62.

Cochrane, J (2001): *Asset pricing*, Princeton University Press, Princeton.

Connor, G and R Korajczyk (1993): "A test for the number of factors in an approximate factor model", *Journal of Finance*, 48, no 4, September, pp 1263–91.

Dooley, M, E Fernández-Arias and K Kletzer (1996): "Is the debt crisis history? Recent private capital inflows to developing countries", *World Bank Economic Review*, vol 10, pp 27–50.

Eichengreen, B and A Mody (1998): "What explains changing spreads on emerging-market debt: fundamentals or market sentiment?", *NBER Working Papers*, no 6408.

Fama, E and K French (1992): "The cross-section of expected stock returns", *Journal of Finance*, 47, no 2, June, pp 427–65.

——— (1993): "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*, 33, no 1, February, pp 3–56.

——— (1996): "The CAPM is wanted, dead or alive", *Journal of Finance*, 49, no 5, December, pp 1579–93.

Farrell, J (1974): "Analyzing covariation of returns to determine homogenous stock groupings", *Journal of Business*, 47, no 2, April, pp 186–207.

Feeney, G and D Hester (1967): "Stock market indices: a principal components analysis", in D Hester and J Tobin (eds), *Risk aversion and portfolio choice*, Wiley, New York.

Harvey, C R (1995): "Predictable risk and return in emerging markets", *Review of Financial Studies*, 8, no 3, pp 773–816.

Jeanneau, S and M Micu (2002): "International bank lending to emerging market countries: explaining the 1990s roller coaster", *BIS Quarterly Review*, March, pp 52–64.

Kamin, S and K von Kleist (1999): "The evolution and determinants of emerging market credit spreads in the 1990s", *BIS Working Paper* no 68, May.

Litterman, R and J Scheinkman (1991): "Common factors affecting bond returns", *Journal of Fixed Income*, pp 54–61.

Mei, J (1993a): "A semiautoregression approach to the arbitrage pricing theory", *Journal of Finance*, 48, no 2, June, pp 599–620.

——— (1993b): "Explaining the cross-section of returns via a multi-factor APT model", *Journal of Financial and Quantitative Analysis*, 28, no 3, September, pp 331–45.

Ross, S (1976): "The arbitrage theory of capital asset pricing", *Journal of Economic Theory*, 13, no 3, December.

Trzcinka, C (1986): "On the number of factors in the arbitrage pricing model", *Journal of Finance*, 41, no 2, June, pp 347–68.