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ABSTRACT

We study the nature of sovereign credit risk using an extensive sample of CDS spreads for 26 developed and emerging-market countries. Sovereign credit spreads are surprisingly highly correlated, with just three principal components accounting for more than 50 percent of their variation. Sovereign credit spreads are generally more related to the U.S. stock and high-yield bond markets, global risk premia, and capital flows than they are to their own local economic measures. We find that the excess returns from investing in sovereign credit are largely compensation for bearing global risk, and that there is little or no country-specific credit risk premium. A significant amount of the variation in sovereign credit returns can be forecast using U.S. equity, volatility, and bond market risk premia.¸

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Sovereignty: **Supreme power . . .**
Freedom from external control . . .
Autonomy.

— Miriam-Webster Dictionary.

1. INTRODUCTION

Is sovereign credit risk primarily an idiosyncratic or country-specific risk? Or is sovereign credit more systematic and driven primarily by regional and global economic forces external to the country?

This issue is of key importance since the nature of sovereign credit risk determines the characteristics of returns in sovereign debt markets and directly affects the ability of investors, banks, and other financial institutions to diversify the risk of global debt portfolios. Portfolio theory implies that the correlation structure of sovereign credit risk should play a central role in determining global portfolio positions and influencing the flow of capital across countries. Furthermore, the nature of a sovereign's credit risk may affect both its ability to access global debt markets and the risk premium it must then pay to obtain capital. Also, this issue has fundamental implications for how the international lending community should deal with distressed debtor nations.

Despite its importance, relatively little research on this topic has appeared in the literature. Previous theoretical work focuses primarily on the incentives faced by sovereign debtors to repay their debt. Examples include Eaton and Gersovitz (1981), Grossman and Van Huyck (1988), Bulow and Rogoff (1989a, b), Atkeson (1991), Dooley and Svenson (1994), Cole and Kehoe (1996, 2000), Dooley (2000), and many others. A number of empirical studies focus on the factors that determine individual sovereign credit spreads. These include Edwards (1984, 1986, 2002), Berg and Sachs (1988), Boehmer and Megginson (1990), Duffie, Pedersen, and Singleton (2003), and Zhang (2003). Other important empirical work focuses on the investment returns associated with Brady bonds and emerging market debt, such as Erb, Harvey, and Viskanta (1996, 1997, 1999), and Dahiya (1997). Some recent research provides evidence that sovereign credit spreads are related to common global factors.[1] In particular, Pan and Singleton (2007) show that the credit spreads for Mexico, Turkey, and Korea share a strong common relation to U.S. stock market volatility as measured by the VIX index.

[1]For example, see Kamin and von Kleist (1999), Eichengreen and Mody (2000), Geyer, Kossmeier, and Pichler (2004), Rozada and Yeyati (2005), and Remolona, Scatigna, and Wu (2007).

This result is important since it demonstrates how common dependence of this type could induce significant correlations among sovereign credit spreads.

To shed light on the underlying nature of sovereign credit risk, we begin by examining the correlation structure of credit spreads for an extensive set of sovereigns and investigating the underlying sources of commonality. The data for the study consist of market quotations for sovereign credit default swap (CDS) contracts on the external debt of 26 developed and less-developed countries. Sovereign credit default swaps function as insurance contracts that allow investors to buy protection against the event that a sovereign defaults on or restructures its debt.[2] As such, sovereign CDS spreads directly reflect the market's assessment of the sovereign's credit risk. An important advantage of using sovereign CDS data is that it allows us to "factor out" the component of sovereign bond returns due to changes in interest rates and focus instead on the returns due exclusively to sovereign credit risk. Furthermore, the sovereign CDS market may often be more liquid than the corresponding sovereign bond market, resulting in more accurate estimates of credit spreads.[3] Also, CDS spreads are often implicitly spreads on bonds that are less encumbered by covenants and guarantees.

A number of surprising results emerge from the analysis. First, most of the variation in sovereign credit spreads is due to common regional and global factors; idiosyncratic country-specific variation represents only a minority fraction of the total variation in sovereign credit spreads. In particular, a simple principal components analysis reveals that more than 30 percent of the variation in sovereign CDS spreads is explained by a single global factor that affects almost every country in the sample. This first factor has a correlation of -70 percent with U.S. stock market returns and 66 percent with changes in the VIX volatility index. Furthermore, more than 50 percent of the variation in sovereign CDS spreads is explained by just three common factors. A multivariate cluster analysis based on the correlation matrix also indicates that there is a strong regional or geographical structure to sovereign credit risk.

Next, to explore the determinants of sovereign credit risk, we regress changes in CDS spreads on four categories of explanatory variables: local economic variables, global financial market variables, global risk premia measures, and net investment

[2]Typically, sovereign financial distress results in a restructuring or rescheduling of debt. For convenience, we refer to this process simply as sovereign default throughout the paper.

[3]While CDS spreads generally approximate the spreads of the underlying bonds, there are several reasons why the two need not be identical. For example, there are cash flow differences between bonds and CDS contracts that can induce differences in spreads (see Duffie and Liu (2001), Duffie and Singleton (2003), and Longstaff, Mithal, and Neis (2005)). Also, there can be bond- or contract-specific liquidity effects that create time-varying differences or basis risk between CDS and sovereign bond spreads.

flows into global funds. In general, all four categories have significant explanatory power for CDS spread changes. On average, however, changes in a sovereign's credit spread appear to be more closely related to global factors than to changes in the sovereign's own local economy. We also find that after controlling for other factors, sovereigns included in the actively-traded CDX emerging market index tend to have higher correlations with each other. This result, in conjunction with the evidence that a number of sovereigns have credit spreads that vary with global investment flows, argues that liquidity and trading patterns may represent an important influence on the behavior of sovereign credit spreads.

If sovereign credit spreads are driven primarily by global factors, what are the implications for the returns from investing in sovereign credit markets? To explore this issue, we examine whether sovereign credit returns contain a risk premium after controlling for these global factors. Not surprisingly, sovereign credit investments generate positive excess returns during the study period since there were no defaults in the sample. However, after regressing excess sovereign credit returns on U.S. equity and bond market factors, we find that the alphas from investing in sovereign credit are almost all insignificant. Thus, there is little evidence of any unique sovereign credit risk premium. Whatever risk premium there may be in sovereign credit returns appears to be primarily compensation for bearing the risk of the global factors that drive sovereign credit spreads.

Finally, we examine whether excess returns from sovereign credit can be forecast using ex ante risk premium measures from other global markets. We find that nearly 15 percent of the variation in the monthly excess returns of the portfolio of all sovereigns in the sample can be explained using ex ante risk premium measures from the U.S. equity, volatility, and bond markets. For the portfolio of Latin American sovereigns, more than 27 percent of the ex post variation is predictable. These results provide strong additional evidence that global risk premia are key determinants of expected sovereign credit returns.

In summary, for the 2000-2007 period covered by our study, the evidence indicates that sovereign credit spreads are driven primarily by external factors; the country-specific component of sovereign credit risk is relatively modest. Common financial market factors and time-varying risk premia induce significant correlation between sovereign credit spreads. Thus, the portfolios of lenders and investors in the sovereign debt markets may be less diversified than is generally believed. Furthermore, the absence of a unique sovereign credit risk premium in sovereign credit returns raises questions about viewing this market as a separate asset class; a diversified portfolio of U.S. stock and bond positions reproduces a substantial portion of the historic excess returns in the sovereign debt market.

The remainder of the paper is organized as follows. Section 2 describes the data. Section 3 examines the correlation structure of sovereign CDS spreads. Section 4 explores the sources of commonality in sovereign credit spreads. Section 5 examines the implications for sovereign credit returns and risk premia. Section 6 summarizes the results and presents concluding remarks.

2. THE DATA

The data for this study consist of monthly sovereign credit default swap (CDS) premia for each of the countries in the sample. As discussed in Duffie (1999), Longstaff, Mithal, and Neis (2005), Pan and Singleton (2007), and others, a CDS contract functions as an insurance contract against the event that an entity such as a firm or a sovereign defaults on its debt.

To illustrate how a CDS contract works, consider the case of the People's Republic of China. On May 31, 2007, the market premium or spread for a five-year CDS contract on China was 12.875 basis points. This means that a buyer of credit protection would pay 12.875 basis points a year (paid semiannually on an actual/360 daycount basis). If there was no default, the buyer would pay this annuity for the full five-year horizon of the contract. If there was a default, however, the buyer of credit protection (after paying any accrued premium) could sell the defaulted debt to the protection seller at its par value of 100, after which the contract would terminate. In general, this default-linked cash flow is triggered by the default of a specific reference obligation of the underlying entity. Upon default, however, the protection buyer typically has the right to put to the protection seller any of a list of bond or loans with equivalent seniority rights.[4]

The pricing data for five-year sovereign credit default swaps used in this study are obtained from the Bloomberg system which collects CDS market quotation data from industry sources. The sample covers the period from October 2000 to May 2007. Not every country is included in the sample for the full period, however, since new sovereign CDS contracts are routinely added to the Bloomberg system throughout this period. To be included in the sample, we require that sovereign CDS data be available in the Bloomberg system no later than August 2004. This insures that there are at least 32 monthly observations for each sovereign CDS contract. This criterion results in a total of 26 different countries in the sample. In each case, the reference obligation for the CDS contract is designated as senior external or international debt of the sovereign.[5]

[4]For a detailed discussion of the contractual provisions of sovereign CDS contracts (such as physical delivery, standard specified currencies, credit events triggering payments, etc.), see Pan and Singleton (2007).

[5]Specifically, the reference obligation is a U.S. dollar-denominated issue for 23 of the sovereigns and a Euro-denominated issue for two of the sovereigns. No information is available about the reference obligation for the CDS contract for China. The contract,

Table 1 provides summary information for the sovereign CDS premia. All premia are denominated in basis points (free of units of account) but are paid in U.S. dollars based on U.S. dollar-denominated notional amounts for the CDS swap contracts. The average values of the premia range widely across countries. The lowest average is 7.50 basis points for Japan; the highest average is 753.02 basis points for Brazil. Both the standard deviations and the minimum/maximum values indicate that there can also be significant time-series variation in the sovereign CDS premia. For example, the cost of credit protection for Venezuela ranges from 119.22 to 2,012.50 basis points during the sample period.

3. CORRELATION AMONG SPREADS

Before presenting the empirical analysis, it is useful to first have a framework to help put the results into perspective. From Duffie and Singleton (1999), Dai and Singleton (2003), Pan and Singleton (2007), and others, standard arbitrage arguments allow us to express credit spreads in terms of risk-neutral default probabilities and loss given default. Specifically, credit spreads can be expressed (approximately) as $\lambda_Q L_Q + l$. Here, λ_Q is the risk-neutral default arrival rate, L_Q is the risk-neutral loss given default, and l represents compensation for illiquidity. As we will discuss later, a sovereign CDS spread should equal the credit spread that a sovereign floating-rate note would need to pay to sell for par (abstracting from basis risk). Thus, this intuitive representation can also be extended to sovereign CDS spreads.

Although simple, this framework provides a useful way of thinking about the sources of correlation in sovereign credit spreads. In particular, correlations between sovereign CDS spreads could arise through the correlations between the arrival rates of credit events λ_Q, through the correlation between loss rates L_Q, through the common variation in the liquidity portion l of sovereign spreads, or some combination of these.

Focusing on the first of these three components, variation in the risk-neutral arrival rates of credit events λ_Q could reflect changes in the economic fundamentals of the sovereigns in the study. For example, the existence of a global business cycle could induce correlation in the arrival rates across countries through their shared linkages to global fundamentals. On the other hand, variation in risk-neutral arrival rates could also reflect changes in the premium for financial-distress risk.

In similar fashion, the variation in the risk-neutral recovery rate L_Q could reflect changes in the economic, political, institutional, and legal environment that affect the bargaining power of creditors and their ability to extricate investment capital following

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however, explicitly references Chinese Government international debt, and the only current Chinese international bond issues for the five-year horizon are U.S. dollar-denominated issues.

a sovereign credit event. However, the variation in L_Q could also reflect changes in the associated risk premium.

In allowing for a liquidity component l in spreads, this framework is consistent with a broad interpretation of liquidity and how it affects sovereign credit spreads. First, investors incur trading costs on illiquid securities and want to be compensated for this through higher returns (see Amihud, Mendelson, and Pederson (2005) and the references therein). Further, investors are subject to margin requirements (Liu and Longstaff (2004)) and, hence, their funding problems can lead to market illiquidity (Brunnermeier and Pederson (2007)). Such funding and demand pressures have been found to affect convertible bond prices (Mitchell, Pedersen, and Pulvino (2007)), mortgage backed securities (Gabaix, Krishnamurthy, and Vigneron (2007)), option prices (Gârleanu, Pedersen, and Poteshman (2007)), stock liquidity (Hameed, Kang, and Viswanathan (2007)), among other effects.[6] This notion of liquidity is also consistent with the flights to quality or liquidity observed in markets, often in conjunction with currency crises or credit events (Longstaff (2004)). For example, imagine that heightened concerns about the risk of a liquidity shock reduced the willingness of the international lending community to commit capital to, say, the emerging market sector of the sovereign debt markets. In this situation, there could potentially be direct effects on the liquidity component l of emerging market sovereign CDS spreads, as well as spillover effects on the rest of the sovereign CDS market. Given these various perspectives, we will use the term liquidity in a very general sense throughout this paper.

3.1 The Correlation Matrix

Table 2 presents the matrix of pairwise correlations of monthly changes in CDS premia. Since the time series of observations for the countries are not equal in length, the correlation between each pair of countries is based on the months in which the data overlap.

As shown, many of the pairwise correlations are very high. For example, the correlation between China and Thailand is 0.89, the correlation between Brazil and Columbia is 0.82, and the correlation between Russia and Bulgaria is 0.79. On the other hand, the correlation between Japan and Israel is only -0.09.

3.2 Principal Components Analysis

The next step is to examine whether the patterns of correlations between sovereign CDS spread changes shown in Table 2 can be explained in terms of a smaller number of common factors. To this end, Table 3 reports summary results from a principal components decomposition of the correlation matrix of CDS spread changes. The first part of the table reports results based on the correlation matrix formed from

[6]See also Gromb and Vayanos (2002), and Acharya and Viswanathan (2007).

the pairwise correlations between countries shown in Table 2 (all observations).[7] The second part of the Table 3 reports results for the correlation matrix obtained from using only the months for which all of the countries have data (overlapping observations).[8]

The results when all observations are used indicate that there is a significant amount of commonality in the variation of CDS spreads across sovereigns. The first principal component captures nearly a third of the variation in the correlation matrix. Furthermore, the first three principal components collectively explain more than 53 percent of the variation in the correlation matrix. All together, the first five principal components capture nearly two-thirds of the variation.

The results when only the overlapping observations are used imply an even greater level of commonality in the movements of CDS spreads. The first principal component now accounts for more than 47 percent of total variation by itself, while the first three principal components account for more than 65 percent.

Figure 1 plots the first three principal components based on all observations. As shown, the first principal component consists of a roughly uniform weighting of the credit spreads for most of the sovereigns in the sample. In essence, the first principal component resembles a "parallel shift" factor in the spreads of sovereign CDS. The primary exceptions are Israel and Qatar which both tend to have very low correlations with the credit spreads of the other sovereigns.

To explore further the interpretation of the first principal component, we compute a time series for the first principal component. This is done by taking a weighted average of the changes in the 26 sovereign credit spreads, where the weight for sovereign i equals the i-th principal component weight divided by the sum of all the principal component weights (where the sum is taken over all sovereigns with available data for that date). The correlation of this first principal component index with U.S. stock market returns is -0.697, and the correlation with changes in the VIX index is 0.659. The correlation between stock market returns and changes in the VIX index is -0.787. Thus, the principal source of variation across almost all sovereign credit spreads appears to be very highly correlated with the U.S. market as measured with by U.S. stock market returns or by U.S. equity market volatility. These results are consistent with Pan and Singleton (2007) who likewise find a strong relation between sovereign credit spreads and the VIX index.

The second principal component places significant positive weight on Chile, China, Japan, Korea, Malaysia, the Philippines, Thailand, and Venezuela, and negative weight on almost all of the other countries. Thus, this principal component could be viewed roughly as a spread between "Asian" and "non-Asian" sovereigns. This

[7]The resulting correlation matrix is positive definite despite the unequal number of observations used in computing these pairwise correlations.

[8]The overlapping sample consists of the final 32 monthly observations for each country.

dichotomy isn't perfect, of course, since it categorizes Chile and Venezuela as "Asian" countries. The third principal component also resembles a spread. Specifically, this principal component puts significant positive weight on Israel, Pakistan, Panama, the Philippines, Qatar, and the Ukraine, and negative weights on many of the other countries in the sample.

3.3 Credit Cluster Analysis

Given the evidence of significant commonality in sovereign credit spreads, the next step is to try to understand the nature and structure of these commonalities. As one way of doing this, we use the methodology of cluster analysis to search for structure in the pairwise correlations reported in Table 2.

In this cluster analysis, the algorithm attempts to sort the countries into groups where the members of each group are as similar as possible. At the same time, the algorithm attempts to form the groups to be as dissimilar from one another as possible. In effect, the algorithm tries to create groupings in a way that maximizes the average correlation between countries in the same group, while minimizing the average correlation between countries in different groups.[9] Since the composition of clusters depends on the choice of the number of clusters to be formed, we use a simple rule of thumb that the number of clusters be roughly $N/4$, where N is the number of individual items to be grouped. For the 26 countries in the sample, this rule of thumb suggests categorizing countries into about six clusters.

Table 4 reports the composition of the clusters, along with the average correlation of countries within each cluster and the average correlation of the countries in each cluster with the countries outside of that cluster. Although we present the clusters in order of the number of countries each contains, there is no particular significance to this ordering in cluster analysis. Similarly, the cluster analysis algorithm does not place any restrictions on the number of items that can appear in any cluster (other than the obvious requirement that a cluster has to contain at least one element).

Table 4 illustrates that there is a strong regional structure to sovereign credit risk. In particular, five of the seven sovereigns in Cluster 1 are in Eastern Europe and the Mediterranean: Bulgaria, Poland, Russia, the Slovak Republic, and Turkey. Four of the six sovereigns in Cluster 2 are Asian countries: China, Japan, Korea, and Thailand. Three of the five sovereigns in Cluster 3 are in Eastern Europe: Croatia, Hungary, and Romania. All three of the sovereigns in Cluster 4 are in Latin America: Columbia, Panama, and Peru. Cluster 6 consists only of countries in the Mideast,

[9]The cluster analysis is done using Ward's method in which clusters are formed so as to minimize the increase in the within-cluster sums of squares. The distance between two clusters is the increase in these sums of squares if the two clusters were merged. A method for computing this distance from a squared Euclidean distance matrix is given by Anderberg (1973, pages 142-145).

Israel and Qatar.

The regional structure of sovereign credit risk is also evident from the magnitude of the correlations within each cluster. Specifically, the average correlation of sovereigns within the same cluster ranges from about 40 to 60 percent across the six clusters, indicating a very high level of commonality in their credit risk. In contrast, the average correlation of the sovereigns in a cluster with sovereigns outside of that cluster ranges from about 10 to 28 percent.

Table 4 also reports the average CDS spread levels for the sovereigns in each cluster. As shown, there is little evidence that the clustering is based on credit spread levels (which also argues against the clustering being based on credit ratings). In particular, the average credit spreads for clusters 1, 4, and 5 are all in the range of 240 to 300 basis points.

4. SOURCES OF COMMONALITY

In an effort to identify some of the fundamental sources of commonality in sovereign credit spreads, we study the extent to which a set of local and global economic variables explain the variation in credit spreads of individual sovereigns. Since there is virtually an unlimited number of variables that could be related to sovereign credit risk, however, it is necessary to be selective in the variables considered. Guided by the framework discussed earlier, we focus primarily on market-determined variables that may be related to variation in the risk-neutral default-arrival process λ_Q, the loss-given-default process L_Q, and/or the compensation for liquidity risk l in the sovereign credit market.

4.1 Explanatory Variables

4.1.1 Local variables

There are a number of possible economic forces that might determine the credit spread of a sovereign nation. Foremost among these is the state of the local economy, which could be related to both the default-arrival process λ_Q as well as the loss-given-default process L_Q. This theme appears throughout the literature in papers such as Grossman and Van Huyck (1988) which seek to explain why defaults are associated with bad states of the economy, and why defaults are often partial rather than complete.

To capture information about the state of the local economy, we include the local stock market return (denominated in units of the local currency), percentage changes in the exchange rate of the local currency against the dollar, and percentage changes in the dollar value of the sovereign's holdings of foreign reserves. Details about the definitions, timing, and source of the data for these variables are provided in the Appendix (and similarly for all of the other explanatory variables described in the paper).

4.1.2 Global financial market variables

Far from being autarkies, the sovereigns included in the study typically have extensive economic relationships with other countries. Thus, the ability of one of these sovereigns to repay its debt and, therefore, the default-arrival process λ_Q, may depend not only on local variables, but also on the state of the global economy. Furthermore, this dependence could become increasingly more important as the trend towards globalization continues. In addition, shifts in the relative liquidity of markets over time as shocks induce investors to reallocate capital across different asset classes (for example, from stock to bonds, from investment grade to high yield, from developed to emerging markets, etc.) could create correlations between asset class prices even in the absence of correlated fundamentals.

To capture broad changes in the state of the global economy and/or shifts in the relative performance of different asset classes, we include a number of measures from the U.S. equity and fixed income markets. There are several reasons for this approach. First, the U.S. is not one of the sovereigns included in our sample. Second, there is extensive evidence that shocks to the U.S. financial markets are transmitted globally. For example, Roll (1988) shows that of 23 stock markets around the world, 19 declined by more than 20 percent during the October 1987 U.S. stock market crash. This is also consistent with the evidence in Goetzmann, Li, and Rouwenhorst (2005) and others. Thus, the prices of securities in U.S. financial markets presumably incorporate information about economic fundamentals or market liquidity that is relevant to a broad cross-section of countries. Finally, as the largest economy in the world, the U.S. has direct effects on the economies and financial markets of many other sovereigns.

As the equity market variable, we include the excess return on the CRSP value-weighted portfolio. To reflect variation in the U.S. fixed income markets, we include the change in the five-year constant maturity Treasury (CMT) yield reported by the Federal Reserve. Including this variable in the study is important since changes in the CMT yield can signal changes in U.S. economic growth, and in turn, the global business cycle. Furthermore, these changes may also incorporate a flight-to-liquidity element due to the variation in the perceived safety of U.S. Treasury bonds as a "reserve" asset in international financial crises. Thus, this variable might also reflect variation in a liquidity component l if it were incorporated into sovereign credit spreads.

We also include changes in the spreads of U.S. investment-grade and high-yield corporate bonds as additional financial market variables. Specifically, we include the change in the spreads between five-year BBB- and AAA-rated bonds and between five-year BB- and BBB-rated bonds. The former captures the range of variation in investment-grade bond yields, while the latter reflects the variation in the spreads of high-yield bonds.

4.1.3 Global risk premia

Standard results imply that the risk-neutral values of the default-arrival process λ_Q, the loss-given-default process L_Q, and the liquidity component l can differ from their values under the objective measure if sovereign credit spreads include risk premia. Recent research on corporate credit spreads suggests that these spreads may include premia for bearing risks such as jump-to-default risk, recovery risk, the risk of variation in spreads or distress risk, liquidity risk, etc. Although sovereign credit risk differs in many respects from corporate credit risk, sovereign spreads could include similar components. If so, then changes in these risk premia could induce time variation in the values of λ_Q, L_Q, and l, which in turn, could help drive movements in sovereign credit spreads.

In the absence of direct measures of the various potential risk premia in sovereign credit spreads, we adopt the approach of using risk premia estimates from other global markets as explanatory variables. Intuitively, one might expect that there would be some commonality in the properties of risk premia across markets. This is because, in principle, risk premia arise from investor's attitudes towards bearing risk and the covariance of those risks with their consumption streams. Thus, assets with similar covariance properties might well have correlated risk premia.

As a proxy for the variation in the equity risk premium, we use monthly changes in the earnings-price ratio for the S&P 100 index. Although admittedly simplistic, this proxy does have the important advantage of providing a model-free measure and is often used in asset-pricing contexts.

As another risk premium proxy, we use monthly changes in the spreads between implied and realized volatility for index options. As discussed by Britten-Jones and Neuberger (2000), Pan (2002), and many others, the difference between implied and realized volatility may represent a premium for bearing the volatility risk of an option position. Specifically, we compute a rolling 20-day estimator of the realized return on the S&P 100 index using the Garman and Klass (1980) open-high-low-close estimator applied to daily index data. We subtract the month-end value of this estimator from the month-end VIX index value. Differencing the two series gives the monthly change in the volatility risk premium proxy.[10] Finally, we use monthly changes in the expected excess returns of five-year Treasury bonds as a proxy for changes in the term premium. The expected excess returns are based on the model estimates presented in Cochrane and Piazzesi (2005), but updated through the end of our sample period using Fama-Bliss and Bloomberg discount-bond term structure data.

4.1.4 Global investment-flow variables

Another potential influence on the credit spreads of sovereign debtors is the flow of

[10]As a robustness check, we also perform the analysis using the volatility risk premium estimator of Bollerslev, Gibson, and Zhou (2004) and Bollerslev and Zhou (2007). The results from this estimation are very similar to those we report. We are grateful to Hao Zhou for providing the volatility risk premium data to us.

investment capital around the world. To illustrate this, suppose that investors choose to increase their diversification by holding more foreign equity and debt securities in their portfolios. The resulting investment flows could be associated with significant valuation effects for international assets such as sovereign debt because of enhanced risk sharing, the local economic benefits of improved access to global sources of capital, or simply the improvement in the liquidity of these securities. Thus, while it might be natural to map these effects into changes in the compensation for liquidity l, these effects might also map into variation in the default-arrival process λ_Q.

There is an extensive literature discussing the potential effects of investment flows on security values. In a sovereign debt context, Sinyagina-Woodruff (2003) considers the effects of shifts in investor confidence and their willingness to supply capital (herding behavior). Others such as Obstfield (1986), Sachs, Tornell, Velasco, Giavazzi, and Szekela (1996), and Burnside, Eichenbaum, and Rebelo (2000) describe the role that speculative attacks by strategic investors may play in currency crises (such as the 1997 Asian crisis).

As measures of the flow of investment capital to foreign markets, we use the net flows (inflow minus outflow) to mutual funds investing primarily in international bonds and equity, respectively. These net flows are expressed as percentages of the total assets of each fund category. This data is obtained from the Investment Company Institute and described in the Appendix.

4.1.5 Spreads of other sovereigns

As proxies for any other external economic factors that might influence the credit spread for a particular sovereign, we also include in its regression two measures of the changes in the CDS spreads of the other sovereigns in the sample. Specifically, we divide the countries in the sample into four categories based on their geographical location: Latin America, Asia, Europe, and the Middle East/Other (details provided in the Appendix). For each of the sovereigns in the sample, we compute the average CDS spread for the other countries in the same region (the regional spread), and the average CDS spread for the countries in the other three regions (the global spread, but excluding the specific region). We regress the changes in these spreads on the other explanatory variables and use the orthogonalized residuals from these regressions as additional explanatory variables in the analysis.

4.2 Regression Analysis

For each of the 26 sovereigns in the sample, we regress the monthly changes in the CDS spread on the explanatory variables described above. Table 5 reports the t-statistics (based on the White (1980) heteroskedasticity-consistent estimate of the covariance matrix) and adjusted R^2 for each of the regressions.

Focusing first on the local variables, Table 5 shows the state of the local economy has significant effects on a sovereign's credit risk. Not surprisingly, the sign of the local stock return coefficient is almost uniformly negative across countries, indicating that good news for the local stock market is also good news for sovereign credit spreads. The local stock market return is significant (at the five-percent level) for 14 of the sovereigns in the sample.

The results for the other two local variables are not quite as strong. The sign of the exchange rate coefficient is roughly equally split between positive and negative across countries. Of the five significant coefficients, however, four are positive. A positive sign for this variable implies that the sovereign credit spread increases as the sovereign's currency depreciates relative to the U.S. dollar. Similarly, the coefficient for the change in foreign currency reserves is roughly evenly split between positive and negative, and is only significant for three of the sovereigns.

The results for the global financial market variables are striking. Table 5 shows that the most significant variable in the regressions is the U.S. high-yield spread. The high-yield spread is significant for 16 of the sovereigns. Interestingly, this variable is not just significant for the sovereigns with high CDS spreads (which generally are rated below investment grade), but is significant for a number of investment-grade sovereigns with relatively small CDS spreads. The sign of the coefficient for this variable is positive for 25 of the 26 sovereigns.

The U.S. stock market is also an important explanatory variable for sovereign CDS spreads. Table 5 shows that even after including the local stock market return, the U.S. stock market return is significant for seven of the sovereigns in the sample. The sign of the coefficient for the U.S. stock market return is negative for 24 of the 26 sovereigns. The other two global financial market variables appear to have only limited explanatory power for sovereign CDS spreads.

The regression results also indicate that there is a relation between the sovereign CDS spreads and the global risk premia included as explanatory variables. In particular, the equity premium proxy is significant for five of the sovereigns, the volatility risk premium proxy is significant for six of the sovereigns, and the term premium proxy is significant for three of the sovereigns.

Turning next to the global investment-flow variables, Table 5 shows that the either the global-bond-flow variable, the equity-flow variable, or both, is significant for seven of the countries in the study. The sign of the coefficient for the bond-flow variable is roughly evenly split between positive and negative. The sign of the coefficient for the equity-flow variable is positive for 16 of the 26 sovereigns.

Finally, Table 5 shows that there are strong interrelationships between sovereign credit spreads even after including the local economic, and global financial market, risk premia, and investment-flow variables in the regression. All but one of the sovereign credit spreads in the sample are positively related to the regional credit spread, and the regression coefficient is significant for 13 of the 26 sovereigns. The coefficient for the global credit spread is positive for 18 of the 26 sovereigns, and is significant for 7. These results are consistent with the presence of regional or global factors that affect all sovereign credit spreads, but are not captured by the other explanatory variables. As one possibility, the regional and global spreads could reflect the variation in a liquidity component present in the CDS spreads for all sovereigns.

The adjusted R^2s for the regressions are also intriguing. In general, these R^2s are fairly high, indicating that the explanatory variables capture much of the variation in sovereign credit spreads. The mean and median values of the adjusted R^2s are 46 and 52 percent, respectively. These adjusted R^2s range from 9 to 78 percent.

Finally, the last column of Table 5 reports a measure of what fraction of the total variation explained by the regression is due solely to the local variables. To calculate this ratio, we first regress the changes in spreads on just the local variables, and then divide the R^2 from this regression by the R^2 from the full regression. Since the local variables are not orthogonal to the remaining variables, this ratio likely overstates the proportion of the total variation due solely to the local variables. Thus, this local ratio should be viewed more as an upper bound. As shown, the fraction of the total explanatory power of the regression due solely to the local variables varies significantly across sovereigns. On average, however, this ratio is only about 0.37. Similarly, the median value of the ratio is 0.37. Thus, at most, the local variables provide only a little more than one-third of the total explanatory power of the regression.[11]

4.3 Cluster and Regional Level Analysis

So far, we have focused on sovereign credit risk at the individual country level. To provide some perspective on the nature of sovereign credit risk at the cluster level, we form indexes for each of the six clusters shown in Table 4 by simply averaging the changes in spreads for the sovereigns in each cluster. Similarly, we form indexes for each of the four geographic regions in the sample by averaging the changes in CDS spreads for the sovereigns in each region. We then regress these cluster and regional indexes on the global financial market, risk premia, and capital-flow variables.

As another approach, we also form indexes based on sovereigns with CDS contracts that may tend to trade in tandem. In particular, we form indexes based on whether the sovereigns are included in the actively-traded CDX emerging market index (CDX-EM) of sovereign CDS contracts and repeat the regression analysis. This index currently consists of 14 emerging market countries, 12 of which are included in our sample: Brazil, Columbia, Malaysia, Mexico, Panama, Peru, the Philippines, South Africa, Russia, Turkey, the Ukraine, and Venezuela. Since many market participants trade this index, as opposed to trading individual sovereigns in the index, it is possible that this aspect could induce similarities in the spreads of constituent sovereigns in the index. Finally, we also estimate the regression using a global index

[11]These results are consistent with the evidence that closed-end country fund premiums are closely tied to movements in the U.S. equity markets. For example, see Bodurtha, Kim, and Lee (1995) and Levy-Yeyati and Ubide (2000).

formed using all 26 of the sovereigns in the sample. The regression results are reported in Table 6.

At each level, the U.S. stock and high-yield markets remain the dominant factors. The U.S. stock market is significant for Clusters 1, 2, and 4, but is significant for all four regions. The U.S. high-yield spread is significant for Clusters 1, 3, 4, and 5, and is significant or marginally significant for all four regions. Both variables are significant at the global level. The results are similar when we form indexes based on whether the sovereigns are included in the CDX-EM index or not. In each case, the U.S. stock market and the high-yield spread are significant. However, the results are somewhat stronger for the sovereigns in the CDX-EM index. In particular, the t-statistics for these variables are larger in absolute value. Furthermore, the adjusted R^2 for the sovereigns in the CDX-EM index is 0.51, but only 0.22 for the sovereigns not in the index.

The results for the other variables indicate that there are geographical differences in way that sovereign credit spreads relate to the global risk premia and capital-flow measures. Specifically, the equity premium proxy is significant or marginally significant for Cluster 5 and Latin America, while the volatility premium and term premium proxies are significant only for Cluster 3. The stock-flow variable is significant or marginally significant for Cluster 3, Europe, and the CDX-EM index.

4.4 Correlation Matrix Analysis

As an alternative way of exploring the sources of commonality among sovereign credit spreads, we use an approach in which we model the cross-sectional structure of the unconditional correlation matrix of spread changes and estimate the model via maximum likelihood.

In this approach, we assume that the distribution of standardized monthly changes in the N-vector of sovereign credit spreads $\bar{Y}_t$ is a standard multivariate normal with zero mean vector and covariance matrix Σ with main diagonal elements equal to one. Given this structure, the log likelihood function $L(\bar{Y};\theta)$ for T independent monthly observations is

$$L(\bar{Y};\theta) = -\frac{NT}{2}\ln(2\pi) \; - \; \frac{T}{2}\ln|\,\Sigma\,| \; - \frac{1}{2}\sum_{t=1}^{T} \bar{Y}_t' \; \Sigma^{-1} \; \bar{Y}_t, \qquad (1)$$

where θ is a vector of parameters. Standard results imply that the maximum likelihood estimator for Σ is the sample covariance matrix. In general, Σ is heavily parameterized; the total number of free parameters in Σ is $(N^2 - N)/2$.

In this framework, it is possible to consider alternative specifications for Σ. For example, one could test the hypothesis that there is no correlation among credit spreads by setting the $(N^2 - N)/2$ free parameters of Σ equal to zero (the identity matrix) and evaluating the resulting decline in the log likelihood via a standard likelihood ratio test. Similarly, one could test the hypothesis that the correlations among credit spreads are constant by estimating a single off-diagonal element for Σ, thus placing $(N^2 - N)/2 - 1$ parameter restrictions on Σ.

Our goal, however, is not to test specific restrictions on Σ. Rather, our objective is to understand better the cross-sectional structure of the correlation matrix of sovereign credit spread changes. Accordingly, we examine whether sovereign credit spread correlations are related to local stock market correlations, exchange rate correlations, etc.

To illustrate the approach, first denote the correlation of the credit spreads of sovereigns i and j, $i \neq j$, by σ_{ij}. To parameterize σ_{ij}, we adopt the specification

$$\sigma_{ij} = \alpha_0 + \alpha_1 D_R + \alpha_2 D_{CDX} + \sum_{k=1}^{12} \gamma_k \ \sigma_{ijk}, \tag{2}$$

where D_R is a dummy variable that takes value one if sovereigns i and j are in the same geographic region, D_{CDX} is a dummy variable that takes value one if sovereigns i and j are both included in the current CDX-EM index, and $\sigma_{ijk}, k = 1, 2, 3$ are the correlations between the local stock returns, percentage changes in exchange rates, and percentage chances in foreign currency reserves for sovereigns i and j, respectively. The term $\sigma_{ijk}, k = 4$ is the product of the correlation of changes in sovereign's i spread with the U.S. stock market return and the correlation of changes in sovereign's j spread with the U.S. stock market return. Similarly, $\sigma_{ijk}, k = 5, 6, \ldots, 12$ are the products of the correlations of changes in the spreads for sovereigns i and j with the Treasury, investment-grade, high-yield, equity premium, volatility premium, term premium, bond-flow, and stock-flow explanatory variables, respectively. All of the correlations are based on the overlapping sample.

With this specification, the α and γ parameters are easily estimated via maximum likelihood. In doing this, care must be taken so that the estimated Σ is positive definite and the individual fitted correlations all lie within the range $[-1, 1]$. Once the parameters are estimated, we can test whether individual α and γ parameters are significantly different from zero. If so, then this implies that there is cross-sectional structure in Σ related to the corresponding dummy variable or correlation measure.

Table 7 reports the maximum likelihood estimates and asymptotic t-statistics of the coefficients for the intercept, dummy variable, and the correlations included in the linear specification. Intuitively, the estimated parameters can be thought of as the "slope coefficients" obtained from "regressing" σ_{ij} on a vector of explanatory variables (which are either dummy variables, correlations, or products of correlations).

The estimated intercept of the model is 0.053, but is not significant. In contrast, the coefficient for the regional dummy variable is 0.063 with a t-statistic of 3.16. Thus, holding all other correlations fixed, the correlation between two sovereign credit spreads is roughly six percent higher when the two sovereigns are located in the same geographical region. This result indicates that there is a strong regional dimension to sovereign credit risk above and beyond that captured by the correlations of other local or global variables.

The 0.102 coefficient for the CDX-EM dummy variable is also significant with a t-statistic of 2.29. Thus, holding all other effects fixed, the common inclusion of two sovereigns in the CDX-EM index is associated with more than a ten-percent increase in the correlation of their credit spreads. A possible interpretation of this result could be that correlated trading induces correlation in sovereign spreads. Thus, sovereign CDS contracts within the same index basket and, therefore, traded in similar ways by index market participants, display more correlation than could be accounted for by economic fundamentals.

Table 7 shows that a number of the correlations included in the model specification have a significant effect on the value of σ_{ij}. Consistent with the earlier regression results, the most significant of these correlations are those for the U.S. stock market return, changes in the U.S. investment and high-yield spreads, and changes in the volatility premium. Both of the capital-flow correlations are significant. Of the three local variables, however, only the reserve correlation is significant.

In summary, the results from this alternative approach reinforce those presented earlier. The results support the view that multiple types of factors play important roles in determining the correlation structure of sovereign credit spreads: geography, local variables, and global financial market, risk premia, and capital-flow variables.

5. SOVEREIGN CREDIT RETURNS

We have shown that there is significant correlation in sovereign CDS spreads. Furthermore, a major source of this correlation is their common dependence on global financial market, risk premia, and capital-flow variables. The natural next step is to consider what implications these results have for the expected returns of sovereign credit instruments.

From the earlier discussion about the components of credit spreads, there are at least four potential types of risk premia that might be present in sovereign credit returns. First, investors may require a risk premium as compensation for the jump-to-default risk inherent in sovereign debt. This premium would be incorporated into the risk-neutral default-arrival process λ_Q. Second, investors may require a separate risk premium as compensation for the risk created by the variation in the probability of an arrival of a credit event, which we designate distress risk. This risk premium would likewise be incorporated into the risk-neutral default-arrival process λ_Q. Third, there may be a premium for recovery risk which would be included in L_Q. Finally, expected returns may also incorporate a premium for various types of liquidity risk such as event-related flights to quality or liquidity, sovereign credit crunches, or similar withdrawals of risk capital from the global debt markets. These types of risk premia would be incorporated into the value of l.

In turn, each of these four types of risk premia could have both "local" and "global" components. For example, part of the distress-risk premium could stem from the risk of country-specific economic and political events, while another part may arise from the risk of broader economic crises affecting entire regions or the entire global economy. Similarly, part of the liquidity premium may be due to the projected supply of a specific sovereign's debt in the market, while another part may be due to the sovereign's enhanced liquidity in the event of a global liquidity crisis through its inclusion in a broad emerging markets index.

To explore the nature of sovereign credit risk premia, we conduct a Sharpe style analysis by regressing the excess returns from portfolios invested in sovereign credit instruments on the excess returns of a number of U.S. equity and bond market portfolios. Specifically, we compute the monthly returns from a hypothetical dollar-denominated five-year floating-rate note issued by each sovereign. As shown by Duffie and Singleton (2003), this hypothetical floating-rate note is equivalent to investing \$100 in a U.S. money market account and selling credit protection via the sovereign CDS market. Thus, this return directly measures the returns associated with sovereign CDS contracts.[12] An important advantage of studying the returns for these floating-rate notes is that their prices are unaffected by changes in riskless rates; the returns for these floating-rate notes reflect only variation in credit spreads. Thus, this approach allows us to focus on the returns from sovereign credit exclusively and avoid the confounding effects of changes in riskless interest rates. We then regress the excess monthly returns from this sovereign credit position on the three Fama-French factors (the market, SMB, and HML) and the excess returns from portfolios of five-year par Treasury bonds, investment-grade corporate bonds, and high-yield corporate bonds.

Table 8 presents summary statistics for the excess returns and the Appendix provides details of how the excess returns are calculated. The first column of the table reports the mean (non-risk-adjusted) monthly excess returns for the sovereign credit portfolios. All of these mean excess returns are positive. This is perhaps not surprising given that there were no sovereign defaults or restructurings for any of the countries in the sample during the period studied. Many of the mean excess returns are large in economic and statistical terms. For example, the mean excess returns for Venezuela and Brazil are 151.6 and 143.6 basis points per month, respectively. Averaging over all 26 sovereigns, the mean excess return is 38.4 basis points per month. Of the 26 sovereigns, 16 have mean excess returns that are significant at the five-percent level,

[12]Like interest rate swaps, CDS contracts have a value of zero at inception. Thus, the return on a CDS contract is not defined. By combining a CDS contract with a money market position, however, the return on the portfolio is well specified.

and 20 have mean excess returns that are significant at the ten-percent level.

Table 9 reports the results from regressing the excess returns on the market factors. Consistent with the evidence about the behavior of spreads, Table 9 shows that many sovereigns have significant loadings on the U.S. market factors. In particular, 15 of the sovereigns have significant coefficients for the U.S. stock market factor, 8 have significant coefficients for the HML factor, and 16 have significant coefficients for the high-yield factor. Thus, there is significant U.S. market risk incorporated into sovereign credit returns.

Turning now to the risk-adjusted excess returns, the second column of Table 9 reports the regression alpha (intercept), and the third column reports its t-statistic. Although 20 out of 26 sovereigns have positive alphas, only 3 of these are significant or marginally significant. Averaging over all 26 sovereigns, the mean alpha is only 11.2 basis points per month. Thus, after controlling for global risk factors as proxied by U.S. equity and bond market excess returns, there is little or no evidence of a sovereign credit risk premium. In other words, the positive mean excess return from taking sovereign credit positions appears to be simply compensation for bearing the risk of global factors that drive sovereign credit spreads; a diversified portfolio of U.S. stock and bond positions reproduces a substantial portion of the historic excess returns in the sovereign debt market.

Given that there were no sovereign defaults or restructurings in our sample, one might be tempted to extrapolate that a sovereign's alpha might have been much smaller, or even negative, had it experienced such a credit event. However, this conclusion does not necessarily follow since it is also possible that any peso-problem risk premium associated with sovereign default may already be part of the risk premium incorporated into the prices of other global asset classes such as U.S. equities and bonds. Thus, the results in Table 8 may not necessarily have been different had there been a sovereign default during the sample period.

Although only a few of the alphas in Table 9 are significant, it is important to stress that a number of these alphas are still large in economic terms. For example, both Russia and Turkey have alphas of roughly 0.44 percent per month, while Venezuela has an alpha in excess of 0.30 per month. Interestingly, these countries all experienced large local shocks during the sample period, and some may have actually come close to restructuring. Pan and Singleton (2007) document substantial idiosyncratic behavior for Turkey's CDS spreads (such as inversion of the CDS curve). Thus, it is possible that these sizable alphas may in fact represent a "local" jump-to-default risk premium as compensation for the special economic and political factors experienced by these sovereigns, factors that would not have been captured by the U.S.-based risk factors in the regression.

A closely related issue is the extent to which measures of global risk premia can be used to forecast sovereign credit returns. If sovereign credit returns include a time-varying risk premium for bearing the risk of broader global factors, then ex ante risk premia measures from these global markets may be able to explain variation in realized credit returns.

To explore this, we first regress the ex post monthly excess returns for the individual sovereigns on the ex ante levels of the U.S. equity, volatility, and term premia (described in the previous section) and the U.S. high-yield credit spread (which should incorporate credit risk premia).[13] In the interest of brevity, we do not report the results for the individual regressions. The one-month forecasting ability of these regressions, however, is often relatively large. In particular, the adjusted R^2 from the forecasting regression is greater than 20 percent for 7 of the sovereigns, and greater than 15 percent for 10. On average, the adjusted R^2 is 10.8 percent.

Because there appears to be some clustering in terms of which sovereigns display predictability, we reestimate the regression for portfolios formed on the basis of cluster, region, and CDX-EM inclusion (similar to Table 6). These results are presented in Table 10.

These results indicate that the ex ante risk premium measures have significant forecasting ability for the realized excess returns of some of these portfolios. The most significant risk premium is the U.S. high-yield spread which is significant for several of the clusters, and for three of the four geographical areas. This spread is also highly significant for the overall portfolio formed from all 26 sovereigns. The U.S. equity premium measure is also significant for several of the clusters, and also for Latin America. On the other hand, the fact that none of coefficients for the term premium are significant may be due to the sovereign credit returns being based on floating-rate note returns, and not on longer-duration fixed-coupon bond returns.

The adjusted R^2s for a number of the regressions are fairly sizable. For example, the adjusted R^2 for the Latin America regression is 0.274. Similarly, the adjusted R^2 for the CDX-EM portfolio formed from the 12 emerging markets sovereigns in the index that are included in our sample is 0.155. The adjusted R^2 for the portfolio formed from all 26 sovereigns is 0.147.

These results raise the interesting issue of why the credit returns for the Latin American countries display so much predictability. Table 8 indicates that first order serial correlations of monthly excess returns for Brazil, Chile, Mexico, and Venezuela are 0.399, 0.198, 0.237, and 0.241, respectively. If this predictability is due to the effects of time-varying risk premia, then these results argue that the sovereign spreads for these Latin American countries may incorporate more risk premium than is true

[13]We include only the high-yield spread in this regression, rather than both the investment-grade and high-yield spreads, since the two spreads are highly correlated in their levels. Note that this regression involves the level of the credit spread; previous regressions involve changes in credit spreads.

for most of the other countries in the study. Although beyond the scope of this study, it would be interesting to explore how the return predictability varies with the level of credit risk.

6. CONCLUSION

Understanding the nature of sovereign credit risk is of first-order importance in many financial and economic contexts. If sovereign credit risk is driven primarily by idiosyncratic or country-specific factors, then standard portfolio diversification methods are available to manage sovereign credit risk. On the other hand, if sovereign credit risk is driven primarily by systematic global factors, then there are major implications for the optimal allocation of investment capital across individual countries and regions of the world.

The results of this paper suggest that sovereign credit risk is driven much more by global financial market variables and global risk premia than by local economic forces. This dependence on common global factors such as U.S. stock market returns and high-yield spread changes induces significant correlation into the credit spreads of a broad cross-section of sovereign nations. Also, we find that global investment flows play an important role in determining the correlation structure of credit risk in sovereign debt markets. These results help explain why we find no evidence of a separate credit risk premium in sovereign debt markets—the risk premium embedded in sovereign credit returns is the same risk premium embedded in U.S. stock, volatility, and fixed income markets. These results raise the question of whether sovereign credit should be viewed as a separate asset class.

It is tempting to attribute these results to the growing importance of globalization in the international economy. However, there are many other possible explanations for these results. In particular, the relation between global investment flows and the variation in risk premia in markets such as the sovereign debt market needs to be explored in greater depth. Similarly, the commonalities in risk premia across such widely-different asset classes as stocks, corporate bonds, and sovereign bonds also requires further investigation.

Finally, it is important to provide the caveat that our results are to the 2000-2007 period. Thus, the sample period does not include sovereign crises and credit events such as those experienced during the 1990s. Similarly, there are no defaults for the sovereigns included in the study during the sample period. As a result, further research and additional data would be necessary before being able to determine whether these results would hold during a global economic downturn.

APPENDIX

This appendix provides additional details about the definition, sources, and timing of the data used in the study.

1. Sovereign CDS Spreads. The CDS spreads in the study are obtained from the Bloomberg system. These CDS spreads are midmarket indicative prices for five-year CDS contracts. In all cases, the CDS contract references the sovereign (as opposed to a central bank or some other entity). For 23 of the countries, the reference bond is U.S. dollar-denominated. For two of the sovereigns, the reference bond is Euro-denominated. The CDS contract for the People's Republic of China references international debt, but the only international bonds in the five-year sector are U.S. dollar-denominated. Thus, the reference bond for the People's Republic of China is presumably U.S. dollar-denominated. The monthly data are generally for the last trading day of the month. When there is no quotation for the last trading day of the month, however, the last available quotation during the month is used.

2. Local Stock Market Returns. The local stock market returns for the countries in the sample are monthly total returns (including dividends). The data are obtained from Datastream. In all cases, the indexes are either from MSCI or S&P IFC. Local stock market data for Panama is not available. Local stock market data for Qatar is only available beginning with June 2005. Thus, for the several months prior to June 2005 for which we have CDS data for Qatar, we use the mean stock market return for Qatar for the June 2005 to May 2007 period as a proxy for the missing observations.

3. Exchange Rates. Exchange rates, expressed as units of the local currency per U.S. dollar, are obtained from Datastream. For some time periods for a few of the countries, the exchange rate does not vary from month to month. In these cases, the percentage change of zero is included in the sample.

4. Foreign Currency Reserves. The dollar values of sovereign foreign currency holdings are obtained from the Datastream system. The original source of the data is the International Monetary Fund. Since this data is reported with a lag, data for the final two or three months of the sample period are missing for some countries. In these cases, we use the average percentage change over all available months as the estimate of the percentage changes for the months with missing observations.

5. U.S. Stock Market Returns. The U.S. stock market excess return is the monthly value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month Treasury-bill return (from Ibbotson Associates). We also include in the latter part of the study the additional Fama-French factors SMB and HML. Data are provided courtesy of Ken French.

6. Treasury Yields. Changes in the Treasury yields are monthly differences in the five-year constant maturity Treasury (CMT) rates computed by the Federal Reserve Board and reported as part of the H.15 Federal Reserve Statistical Release (Historical

Data).

7. Corporate Yield Spreads. Changes in investment-grade yield spreads are monthly changes in the basis-point yield spread between BBB and AAA industrial bond indexes. Changes in high-yield spreads are monthly changes in the basis-point yield spread between BB and BBB industrial bond indexes. The yield data for the AAA, BBB, and BB bonds are obtained from the Bloomberg system (fair market curves). These indexes represent the average yields of a broad cross-section of non-callable AAA-, BBB-, and BB-rated bonds with maturities approximately equal to five years.

8. Equity Premium. As a proxy for changes in the equity premium, we use monthly changes in the price-earnings ratio for the S&P 100 index. This time series is obtained from the Bloomberg system.

9. Volatility Risk Premium. The volatility risk premium is calculated as the difference between the VIX index (obtained from the Bloomberg system) and a measure of realized volatility for the S&P 100 index. The measure of realized volatility for date t is based on the Garman-Klass (1980) open-high-low-close volatility estimator applied to the corresponding data for the S&P 100 index for the 20-day period from date $t - 19$ to t. S&P 100 index open, high, low, and close prices are obtained from the Yahoo financial webpage.

10. Term Premium. The term premium is based on Cochrane-Piazzesi (2005) in which expected excess returns on Treasury bonds are represented as a linear function of one- through five-year forward rates. Using the estimated parameters for excess returns on five-year Treasury bonds reported in their Table 1, we use Fama-Bliss data (from CRSP) to construct their estimator of expected excess returns for the period from the beginning of the sample through December 2006. For the period from January 2007 to May 2007, we use one- through five-year Treasury Strips data (from the fair value curves in the Bloomberg system) instead of the Fama-Bliss bond prices to construct their estimator (since Fama-Bliss data is only available through 2006).

11. Bond and Equity Flows. The bond-flow and equity-flow variables are measures of the flow of investment capital to foreign markets. Specifically, we use the net flows (inflow minus outflow) to mutual funds investing in international bonds and equity, respectively. The data are obtained from The Investment Company Institute. We measure flows to international bond funds as the total net flows to the fund category "World Bond," as a percentage of total net assets for this category. Similarly, we measure flows to international equity funds as the total net flows to the fund category "World Equity," again as a percent of total net assets.

12. Regional and Global Sovereign CDS Spreads. For each country, we compute the regional CDS spread by taking the average of the CDS spreads for all of the other countries in that country's region. In doing this, we categorize the 26 countries in the sample into four distinct regions: Latin America, Asia, Europe, and the

Middle East/Other (including Pakistan and South Africa). For each country, we also compute the global CDS spread by taking the average of the CDS spreads for all of the countries outside that country's region. The regional and global spreads are then orthogonalized by regressing them on the other explanatory variables and using the residual from this regression as the measure of regional and global spreads.

13. Sovereign Credit Returns. Duffie and Singleton (2003) Chapter 8 implies a (hypothetical) sovereign floating-rate note paying the riskless rate plus the sovereign CDS spread is equivalent to selling protection via a sovereign CDS contract and owning a riskless floating-rate note (which will always trade at par). Thus, the change in the value of this hypothetical sovereign note over a month is identical to the change in the value of a sovereign CDS contract. We compute the change in the value of a five-year sovereign CDS contract during month t by assuming that the market five-year CDS spread at time $t+1$ also applies to a four-year eleven-month contract. Thus, the change in value is just the change in the CDS spread over the month times the present value of a four-year eleven-month annuity (discounted at the five-year riskless par CMT rate plus the sovereign CDS spread). The return on the floating-rate note is then given by taking the sum of the change in the value of the sovereign CDS contract from t to $t+1$ and the accrued coupon for the note over the same period, and dividing by the initial par value of the floating-rate note.

14. Fixed Income Returns. To calculate the returns on portfolios of five-year Treasury, investment-grade corporate, and high-yield corporate bonds, we assume that the yields described above in paragraphs 6 and 7 of the Appendix above represent par yields for five-year bonds, and that the yield of a four-year eleven-month bond is equal to that of a five-year bond. With this assumption, bond returns can be computed directly from the time series of yields.

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Table 1

Descriptive Statistics for Sovereign Credit Default Swap Spreads. This table reports summary statistics for month-end spreads for five-year sovereign CDS contracts for the October 2000 to May 2007 period. CDS spreads are measured in basis points.

	Mean	Standard Deviation	Minimum	Median	Maximum	Serial Correlation	*N*
Brazil	753.02	827.24	62.92	464.56	3790.00	0.951	68
Bulgaria	195.99	188.90	13.45	130.69	697.50	0.979	80
Chile	44.55	38.94	13.37	23.67	160.00	0.990	53
China	28.15	15.88	10.23	25.45	85.75	0.892	53
Columbia	328.67	188.19	79.00	310.24	805.00	0.966	53
Croatia	133.66	120.19	15.90	98.38	382.50	0.988	80
Hungary	29.47	10.05	11.00	29.75	50.34	0.884	63
Israel	32.80	10.85	17.75	34.25	66.41	0.476	34
Japan	7.50	5.11	2.50	5.70	21.50	0.968	53
Korea	47.88	27.42	14.25	39.39	162.50	0.882	64
Malaysia	67.95	56.28	13.63	35.84	180.00	0.986	68
Mexico	138.58	90.70	28.82	109.96	392.00	0.957	68
Pakistan	216.57	45.54	157.50	217.50	335.00	0.863	32
Panama	180.49	80.05	63.53	164.32	354.55	0.954	43
Peru	221.72	117.02	63.14	202.21	570.89	0.928	44
Philippines	367.33	145.16	102.19	414.96	617.50	0.967	62
Poland	34.30	18.93	8.13	35.50	83.33	0.960	80
Qatar	27.43	9.32	11.50	31.00	39.00	0.867	34
Romania	127.13	121.63	18.05	59.77	455.00	0.984	56
Russia	324.11	288.16	38.83	233.79	1017.50	0.985	80
Slovak	37.48	41.76	6.00	15.00	152.50	0.981	68
South Africa	122.29	66.83	25.25	115.42	254.67	0.983	80
Thailand	44.05	22.26	27.50	37.64	130.00	0.926	53
Turkey	527.64	330.42	122.94	446.94	1281.25	0.911	80
Ukraine	203.22	64.68	132.63	180.06	369.50	0.875	34
Venezuela	516.86	475.90	119.22	337.67	2012.50	0.976	53

Table 2

Correlation Matrix of Monthly Changes in Sovereign Credit Default Swap Spreads. This table reports the pairwise correlation coefficients for monthly changes in the CDS spreads for the indicated countries. Each pairwise correlation is computed using all available overlapping observations for the two sovereigns.

	Brazil	Bulgar	Chile	China	Colum	Croatia	Hungary	Israel	Japan	Korea	Malays	Mexico	Pakistan
Brazil	1.00												
Bulgaria	0.62	1.00											
Chile	0.69	0.39	1.00										
China	0.65	0.21	0.64	1.00									
Columbia	0.82	0.39	0.49	0.60	1.00								
Croatia	0.29	0.15	0.48	0.43	0.34	1.00							
Hungary	0.14	0.27	0.23	0.26	0.14	0.37	1.00						
Israel	0.33	0.35	0.06	0.04	0.42	0.31	0.15	1.00					
Japan	0.27	0.27	0.55	0.47	0.22	0.12	0.36	−0.09	1.00				
Korea	0.00	0.08	0.51	0.68	0.31	0.23	0.37	−0.08	0.53	1.00			
Malaysia	0.39	0.34	0.71	0.75	0.48	0.26	0.37	−0.01	0.59	0.57	1.00		
Mexico	0.78	0.64	0.56	0.68	0.76	0.28	0.24	0.41	0.38	0.19	0.28	1.00	
Pakistan	0.31	0.56	0.36	0.46	0.36	0.53	0.38	0.17	0.00	0.31	0.31	0.49	1.00
Panama	0.54	0.55	0.53	0.23	0.61	0.65	0.32	0.29	0.17	0.07	0.44	0.64	0.50
Peru	0.72	0.60	0.43	0.45	0.68	0.49	0.26	0.02	0.15	0.28	0.56	0.66	0.34
Philippines	0.25	0.20	0.27	0.50	0.42	0.35	0.42	0.35	0.31	0.47	0.40	0.35	0.64
Poland	0.49	0.39	0.37	0.35	0.23	0.36	0.49	0.07	0.35	0.30	0.34	0.60	0.53
Qatar	0.12	0.34	0.06	0.23	0.15	0.39	0.37	0.47	0.09	0.20	0.24	0.08	0.18
Romania	0.49	0.77	0.49	0.13	0.17	0.60	0.50	0.28	0.41	0.30	0.60	0.23	0.56
Russia	0.63	0.79	0.50	0.47	0.69	0.29	0.21	0.26	0.19	0.10	0.30	0.74	0.41
Slovak	0.35	0.42	0.33	0.10	−0.09	0.25	0.23	0.13	0.17	0.05	0.08	0.45	0.21
S. Africa	0.40	0.21	0.46	0.33	0.55	0.29	0.53	0.20	0.21	0.26	0.44	0.48	0.36
Thailand	0.69	0.30	0.71	0.89	0.58	0.43	0.35	0.10	0.48	0.70	0.85	0.63	0.34
Turkey	0.59	0.63	0.71	0.57	0.42	0.31	0.35	0.54	0.46	0.52	0.51	0.70	0.55
Ukraine	0.38	0.56	0.14	0.19	0.42	0.52	0.34	0.17	0.02	0.09	0.34	0.64	0.58
Venezuela	0.47	0.53	0.46	0.56	0.43	0.14	0.36	0.24	0.45	0.59	0.66	0.41	0.27

Table 2 Continued

Correlation Matrix of Monthly Changes in Sovereign Credit Default Swap Spreads.

	Panama	Peru	Phillip	Poland	Qatar	Romania	Russia	Slovak	S Africa	Thai	Turkey	Ukraine	Venez
Brazil													
Bulgaria													
Chile													
China													
Columbia													
Croatia													
Hungary													
Israel													
Japan													
Korea													
Malaysia													
Mexico													
Pakistan													
Panama	1.00												
Peru	0.64	1.00											
Philippines	0.51	0.27	1.00										
Poland	0.59	0.46	0.31	1.00									
Qatar	0.22	−0.20	0.41	0.19	1.00								
Romania	0.45	0.68	0.12	0.52	0.23	1.00							
Russia	0.48	0.66	0.28	0.46	0.13	0.41	1.00						
Slovak	0.16	0.00	0.08	0.47	0.38	0.40	0.57	1.00					
S. Africa	0.60	0.60	0.32	0.49	0.29	0.54	0.33	0.35	1.00				
Thailand	0.30	0.49	0.55	0.39	0.12	0.28	0.51	0.16	0.39	1.00			
Turkey	0.73	0.62	0.44	0.61	0.34	0.57	0.67	0.41	0.41	0.65	1.00		
Ukraine	0.59	0.31	0.54	0.48	0.18	0.38	0.56	−0.02	0.43	0.23	0.62	1.00	
Venezuela	0.31	0.55	0.43	0.33	0.18	0.34	0.42	0.33	0.38	0.64	0.50	0.14	1.00

Table 3

Principal Components Analysis Results. This table reports summary statistics for the principal components analysis of the correlation matrix of monthly sovereign CDS spread changes. All Observations denotes results based on the correlation matrix computed using all available overlapping observations for each pairwise correlation. Overlapping Observations denotes results based on the correlation matrix computing using only the months of the sample for which data is available for all 26 sovereigns.

	All Observations		Overlapping Observations	
Principal Component	Percentage Explained	Cumulative Percentage Explained	Percentage Explained	Cumulative Percentage Explained
First	31.69	31.69	47.67	47.67
Second	11.76	43.45	9.63	57.30
Third	9.78	53.23	8.19	65.49
Fourth	6.36	59.59	5.86	71.35
Fifth	6.02	65.61	5.59	76.94

Table 4

Sovereign Credit Clusters. This table reports the clusters formed on the basis of the correlation matrix of monthly changes in sovereign CDS spreads. The pairwise correlations in the correlation matrix are computed using all available overlapping observations for the two sovereigns. Ave. Corr. Internal denotes the average correlation among sovereigns within each cluster. Ave. Corr. External denotes the average correlation between the sovereigns within a cluster and those outside of that cluster. Ave. CDS Spread is the average CDS value taken over all monthly observations for all sovereigns within a cluster. CDS spreads are measured in basis points.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Countries in Cluster	Brazil Bulgaria Mexico Poland Russia Slovak Turkey	Chile China Japan Korea Thailand Venezuela	Croatia Hungary Malaysia Romania S. Africa	Columbia Panama Peru	Pakistan Philippines Ukraine	Israel Qatar
Ave. Corr. Internal	0.516	0.596	0.402	0.588	0.517	0.466
Ave. Corr. External	0.210	0.220	0.278	0.245	0.218	0.102
Ave. CDS Spread	287.30	114.83	96.10	243.63	262.37	30.12

Table 5

Results from the Regression of Changes in Sovereign Credit Default Swap Spreads on the Local Variables, Global Financial Market Variables, Global Risk Premia, Capital Flows, and Regional and Global Sovereign Factors. This table reports the White (1980) *t*-statistics for the indicated regression explanatory variables. Local Ratio denotes the ratio of the R^2 from the regression in which only the local variables are included to the R^2 from the regression in which all of the variables are included. Significance at the five-percent (ten-percent) level is denoted by ** (*).

	Local Variables			Global Financial Market				Global Risk Premia			Capital Flows		Sov Spreads			
Country	Stock	Exchg	Resrv	Mkt	Trsy	IG	HY	Equ	Vol	Term	Bond	Stock	Reg	Glob	Adj R^2	Local Ratio
Brazil	−1.09	4.46**	1.75*	−0.38	−1.22	−0.22	2.19**	1.77*	−1.14	1.14	−1.45	1.51	−1.03	1.48	0.67	0.82
Bulgaria	0.07	−0.43	0.55	−4.78**	0.12	1.18	0.74	−0.99	−0.37	0.28	0.64	1.87*	3.76**	1.84*	0.58	0.02
Chile	−2.25**	0.89	−0.41	−0.94	0.95	1.80*	2.55**	−2.10**	2.52**	0.80	0.96	0.32	1.64	4.64**	0.54	0.38
China	1.29	−1.41	0.81	−2.48**	−0.55	0.41	3.26**	1.13	1.78*	2.42**	2.57**	−0.82	2.86**	0.75	0.67	0.02
Columbia	0.53	3.78**	0.19	−2.38**	0.77	−0.34	3.47**	−2.03**	3.49**	1.40	1.06	−0.38	3.50**	−1.08	0.57	0.18
Croatia	−1.60	−1.60	−2.44**	−0.08	−1.65	0.82	4.39**	0.40	0.12	2.97**	0.16	1.43	2.40**	−0.52	0.24	0.34
Hungary	−2.94**	1.29	−0.62	0.22	0.00	0.67	1.24	0.07	−1.06	0.08	−0.71	0.09	1.89*	−1.38	0.26	0.75
Israel	−0.49	−0.79	−1.57	−1.35	−0.99	0.26	1.09	−1.03	−0.33	1.15	−0.88	0.18	1.58	−0.85	0.09	0.42
Japan	−0.68	−0.31	−0.04	−1.26	0.83	−1.15	1.42	−0.39	−0.62	0.00	0.76	−0.35	1.24	0.92	0.13	0.21
Korea	−2.15**	1.25	0.93	−0.32	1.32	−1.03	0.44	−0.87	−1.10	0.16	1.33	−1.21	2.41**	−0.22	0.27	0.36
Malaysia	−2.68**	3.53**	1.17	−1.85*	−0.42	−0.65	1.06	−1.70*	−1.91*	−0.49	−0.84	2.02**	3.47**	2.74**	0.59	0.21
Mexico	−2.69**	−0.51	1.86*	−3.16**	0.78	2.13**	4.33**	4.10**	−4.10**	1.26	0.05	1.50	3.44**	1.38	0.78	0.48
Pakistan	−2.36**	0.90	1.43	−1.08	−0.18	0.02	−1.07	0.90	−0.96	−0.19	−0.47	0.75	0.37	0.89	0.14	0.63
Panama			1.78*	−0.24	0.61	2.45**	2.79**	2.14**	−1.19	1.06	−2.59**	−0.30	1.91*	2.14**	0.63	0.05
Peru	−1.20	−0.07	1.32	−0.19	−1.58	0.73	2.69**	0.49	−0.42	2.93**	−1.48	1.44	3.11**	−0.19	0.50	0.18
Philippines	−2.79**	0.01	2.19**	−1.65	−0.28	−0.20	1.57	−0.28	0.27	1.70*	−0.13	−2.07**	4.92**	1.08	0.44	0.56
Poland	−2.59**	−0.38	1.75*	−0.62	0.45	1.25	3.94**	0.24	−1.56	−0.41	−0.35	0.04	0.97	1.46	0.38	0.41
Qatar	−2.56**	0.04	−1.24	−1.30	−1.21	1.44	1.42	−1.14	−2.48**	1.94*	−0.87	−1.20	2.27**	−1.24	0.19	0.41
Romania	−0.08	−0.39	1.63	−1.32	−0.31	0.86	2.02**	0.70	−2.55**	0.72	−1.81*	2.52**	1.77*	1.48	0.36	0.01
Russia	−6.28**	−0.15	−2.05**	−2.07**	−0.68	0.86	2.47**	−0.60	0.03	−0.35	−2.16**	3.77**	3.45**	2.70**	0.68	0.52
Slovak	−0.74	−0.85	0.29	−0.31	2.03**	0.22	2.47**	1.34	−0.29	−0.73	1.19	−0.04	1.51	0.99	0.27	0.08
S. Africa	−3.34**		−0.28	−0.80	1.07	1.18	3.32**	0.88	−2.00**	0.48	−1.86*	1.36	0.71	1.47	0.33	0.51
Thailand	1.00	−0.90	1.23	−2.61**	0.57	0.37	2.73**	0.89	1.32	1.77*	2.82**	0.16	2.88**	2.52**	0.68	0.11
Turkey	−3.70**	1.94*	0.64	−0.83	−0.46	0.38	2.19**	0.26	−0.08	1.67*	1.55	−0.03	0.32	4.96**	0.70	0.75
Ukraine	−4.97**	4.90**	−0.55	0.24	−0.83	0.85	0.06	0.89	−1.59	0.64	−0.44	1.80*	1.46	−0.04	0.65	0.83
Venezuela	4.47**	−3.84**	−0.31	−2.91**	−0.47	−1.78*	2.99**	−2.28**	0.40	0.85	1.83*	−1.07	2.60**	2.04**	0.66	0.36

Table 6

Results from the Regression of Credit Default Swap Indexes on the Global Financial Market Variables, Global Risk Premia, and Capital Flows. This table reports the White (1980) t-statistics for the indicated variables from the regression of the CDS indexes on these explanatory variables. Significance at the five-percent (ten-percent) level is denoted by ** (*).

	Global Financial Market				Global Risk Premia			Capital Flows		
Region	Mkt	Trsy	IG	HY	Equ	Vol	Term	Bond	Stock	Adj R^2
Cluster 1	−4.27**	−0.66	0.24	2.23**	0.73	−0.28	1.33	−0.62	1.46	0.45
Cluster 2	−2.43**	0.36	0.21	1.33	−2.56**	−0.43	1.03	1.29	0.29	0.19
Cluster 3	−1.50	−1.43	0.98	4.48**	−0.08	−2.11**	2.36**	−1.05	1.77*	0.25
Cluster 4	−2.08**	0.20	0.83	2.85**	−0.44	1.52	1.20	−0.32	0.47	0.40
Cluster 5	−1.73*	−0.34	−0.09	2.60**	−1.98*	−0.79	1.49	−0.68	−1.36	0.24
Cluster 6	−1.79*	−1.29	0.80	1.49	−0.94	−0.44	2.01**	−0.95	−0.71	0.05
Latin America	−2.37**	−1.56	0.43	2.08**	2.06**	−1.27	1.60	−1.28	1.63	0.50
Asia	−2.00**	0.51	0.50	2.41**	−1.50	−0.98	0.88	0.32	−1.39	0.25
Europe	−3.40**	−0.38	0.92	2.45**	−0.34	−0.18	0.60	−0.61	2.10**	0.24
Mideast/Other	−4.89**	0.41	0.35	1.74*	−0.37	−0.18	1.05	1.52	−0.07	0.39
CDX-EM	−5.27**	-0.64	0.00	2.75**	0.45	−0.44	1.62	−0.83	1.67*	0.51
Non-CDX-EM	−3.11**	-0.35	0.84	2.35**	−0.32	−0.32	0.90	0.44	1.31	0.22
All	−5.16**	−0.62	0.20	2.83**	0.39	−0.49	1.49	−0.59	1.66	0.49

Table 7

Maximum Likelihood Estimation Results for the Unconditional Covariance Matrix Model. This table reports the maximum likelihood parameter estimates and associated asymptotic t-statistics for the indicated cross-sectional structural variables for the unconditional covariance matrix model for the sovereign CDS spreads.

Variable	Coefficient	t-Statistic
Intercept	0.053	1.22
Regional Dummy	0.063	3.16
CDX-EM Dummy	0.102	2.29
Local Stock Correlation	−0.003	−0.19
Currency Rate Correlation	0.003	0.15
Reserve Correlation	0.050	2.24
Correlation with US Stock Market	0.942	4.54
Correlation with US Treasury Yields	0.101	0.18
Correlation with US IG Yields	2.803	6.05
Correlation with US HY Yields	1.105	3.69
Correlation with Equity Premium	0.230	0.77
Correlation with Volatility Premium	1.167	4.02
Correlation with Term Premium	0.426	0.87
Correlation with Bond Flows	0.455	2.45
Correlation with Equity Flows	1.419	2.40

Table 8

Descriptive Statistics for Sovereign Credit Excess Returns. This table reports summary statistics for the monthly excess returns of sovereign floating-rate notes. These returns are computed using the changes in the five-year sovereign CDS contracts for the October 2000 to May 2007 period. Significance at the five-percent (ten-percent) level is denoted by ** (*).

	Mean	t Statistic for the Mean	Standard Deviation	Minimum	Maximum	Serial Correlation	N
Brazil	0.01436	1.86*	0.06336	−0.26827	0.17314	0.399	67
Bulgaria	0.00457	2.72**	0.01491	−0.04166	0.04075	−0.201	79
Chile	0.00162	3.98**	0.00293	−0.00266	0.01545	0.198	52
China	0.00084	1.85*	0.00330	−0.00224	0.02282	0.053	52
Columbia	0.00841	3.12**	0.01944	−0.03754	0.08196	−0.060	52
Croatia	0.00296	3.40**	0.00774	−0.01072	0.05121	0.121	79
Hungary	0.00033	1.20	0.00213	−0.00685	0.00592	−0.178	62
Israel	0.00076	0.92	0.00474	−0.01308	0.01834	−0.375	33
Japan	0.00021	2.54**	0.00060	−0.00140	0.00234	0.108	52
Korea	0.00076	1.02	0.00592	−0.02280	0.02906	−0.141	63
Malaysia	0.00166	3.19**	0.00425	−0.01074	0.01845	−0.015	67
Mexico	0.00301	2.22**	0.01109	−0.03717	0.03378	0.237	67
Pakistan	0.00038	2.17**	0.00966	−0.01681	0.02772	0.054	31
Panama	0.00038	2.51**	0.00986	−0.03150	0.02198	−0.054	42
Peru	0.00044	1.64	0.01773	−0.03548	0.05505	−0.085	43
Philippines	0.00046	2.47**	0.01460	−0.03128	0.05185	0.086	61
Poland	0.00052	1.96*	0.00237	−0.00589	0.00944	0.128	79
Qatar	0.00055	1.52	0.00206	−0.00441	0.00753	−0.174	33
Romania	0.00443	3.32**	0.00992	−0.02197	0.03440	0.256	55
Russia	0.00708	3.42**	0.01842	−0.03677	0.06592	0.102	79
Slovak	0.00129	2.83**	0.00372	−0.00761	0.01434	0.508	67
South Africa	0.00195	3.25**	0.00532	−0.00971	0.02333	0.049	79
Thailand	0.00110	2.04**	0.00390	−0.00344	0.02447	0.116	52
Turkey	0.00071	1.32	0.04800	−0.13564	0.13735	−0.040	79
Ukraine	0.00044	1.92*	0.01309	−0.01585	0.04808	0.030	33
Venezuela	0.01516	2.99**	0.03653	−0.04734	0.15787	0.241	52

Table 9

Results from the Regression of Sovereign Excess Returns on Global Risk Factors. This table reports the intercept (alpha) and White (1980) t statistics from the regression of implied monthly excess returns for sovereign floating-rate notes on the excess return on the three Fama-French factors, and the excess returns on five-year US Treasury bonds, investment-grade bonds, and high-yield bonds. Significance at the five-percent (ten-percent) level is denoted by ** (*).

Country	α	t-Statistics α	Market	SMB	HML	Trsy	IG	HY	Adj. R^2
Brazil	0.00286	0.34	2.75**	−1.40	0.40	0.34	−0.82	2.21**	0.32
Bulgaria	0.00281	1.80*	1.87*	2.08**	−0.43	−0.84	0.71	0.71	0.23
Chile	0.00057	1.39	1.33	0.31	0.86	−0.48	0.14	1.70*	0.25
China	−0.00014	−0.33	1.35	−0.88	0.62	1.32	−1.70	1.66	0.26
Columbia	0.00258	0.91	2.26**	−0.09	0.78	2.08**	−2.52**	3.36**	0.41
Croatia	0.00154	1.92*	0.27	0.99	1.31	−2.36**	0.53	3.06**	0.15
Hungary	−0.00007	−0.25	2.22**	−0.52	2.25**	0.08	−0.27	1.37	0.07
Israel	0.00002	0.02	1.40	1.12	0.05	−0.15	0.12	0.97	0.11
Japan	0.00011	1.36	0.29	1.16	1.33	1.68*	−2.30**	1.69*	0.14
Korea	−0.00016	−0.21	1.76*	1.04	2.14**	2.00**	−1.68*	0.82	0.13
Malaysia	0.00104	1.26	0.72	0.65	0.55	1.66	−1.60	1.78*	0.06
Mexico	0.00019	0.16	4.38**	−0.89	0.85	0.36	−0.76	3.00**	0.44
Pakistan	0.00085	0.39	2.25**	−1.67*	0.41	−0.28	0.58	−0.11	0.03
Panama	−0.00006	−0.04	2.06**	−0.63	1.87*	−1.16	0.63	2.87**	0.42
Peru	−0.00128	−0.41	1.47	0.56	3.19**	1.60	−1.69*	2.18**	0.27
Philippines	0.00199	1.08	2.25**	−1.49	1.65	0.64	−1.25	2.52**	0.19
Poland	0.00014	0.50	2.37**	0.41	0.46	−0.67	−0.11	2.81**	0.23
Qatar	0.00029	0.52	0.56	0.45	0.43	−0.94	1.11	0.00	−0.12
Romania	0.00166	1.07	−0.27	2.32**	1.84*	−0.08	−0.35	2.65**	0.16
Russia	0.00439	2.10**	2.16**	1.55	−0.05	0.00	−0.39	2.40**	0.26
Slovak	0.00073	1.24	0.18	0.67	−0.44	−0.38	−0.10	2.35**	0.11
S. Africa	0.00059	1.14	3.07**	1.69*	1.68*	−0.37	0.23	3.15**	0.24
Thailand	−0.00031	−0.65	1.77*	−0.69	1.67*	0.98	−1.27	1.57	0.28
Turkey	0.00443	0.90	4.39**	0.23	−1.61	0.34	−0.67	2.13**	0.43
Ukraine	0.00134	0.58	1.56	−2.00**	−0.21	−0.90	0.83	0.90	0.08
Venezuela	0.00304	0.72	2.03**	1.46	2.25**	2.02**	−1.39	1.40	0.36

Table 10

Results from the Forecasting Regression. This table reports White (1980) t-statistics from the regression of ex post monthly implied excess returns for sovereign floating-rate notes on ex ante measures of the U.S. equity, volatility, and term premia as well as the ex ante spread on U.S. high-yield bonds. Significance at the five-percent (ten-percent) level is denoted by ** (*).

Region	Intercept	Equity Prem	Vol Prem	Term Prem	HY Spread	Adj R^2
Cluster 1	0.14	−1.99**	1.64	0.56	2.79**	0.192
Cluster 2	−0.62	0.82	−1.01	−1.30	1.04	0.035
Cluster 3	−0.31	0.07	0.07	0.35	1.10	0.056
Cluster 4	1.27	−2.31**	0.09	−0.76	2.74**	0.272
Cluster 5	0.93	−0.70	−0.15	−1.05	0.47	−0.017
Cluster 6	−0.90	0.83	−1.49	−0.87	0.92	−0.060
Latin America	0.28	−2.08**	1.31	0.13	2.55**	0.274
Asia	−0.21	0.27	−0.14	−1.14	0.38	−0.042
Europe	−0.30	−0.75	1.65*	0.94	2.08**	0.122
Mideast/Other	0.19	−1.37	0.85	0.25	1.87*	0.063
CDX-EM	0.05	−1.70*	1.43	0.08	2.73**	0.155
Non-CDX-EM	−0.35	−0.67	1.28	0.91	2.10**	0.113
All	0.00	−1.56	1.48	0.38	2.67**	0.147

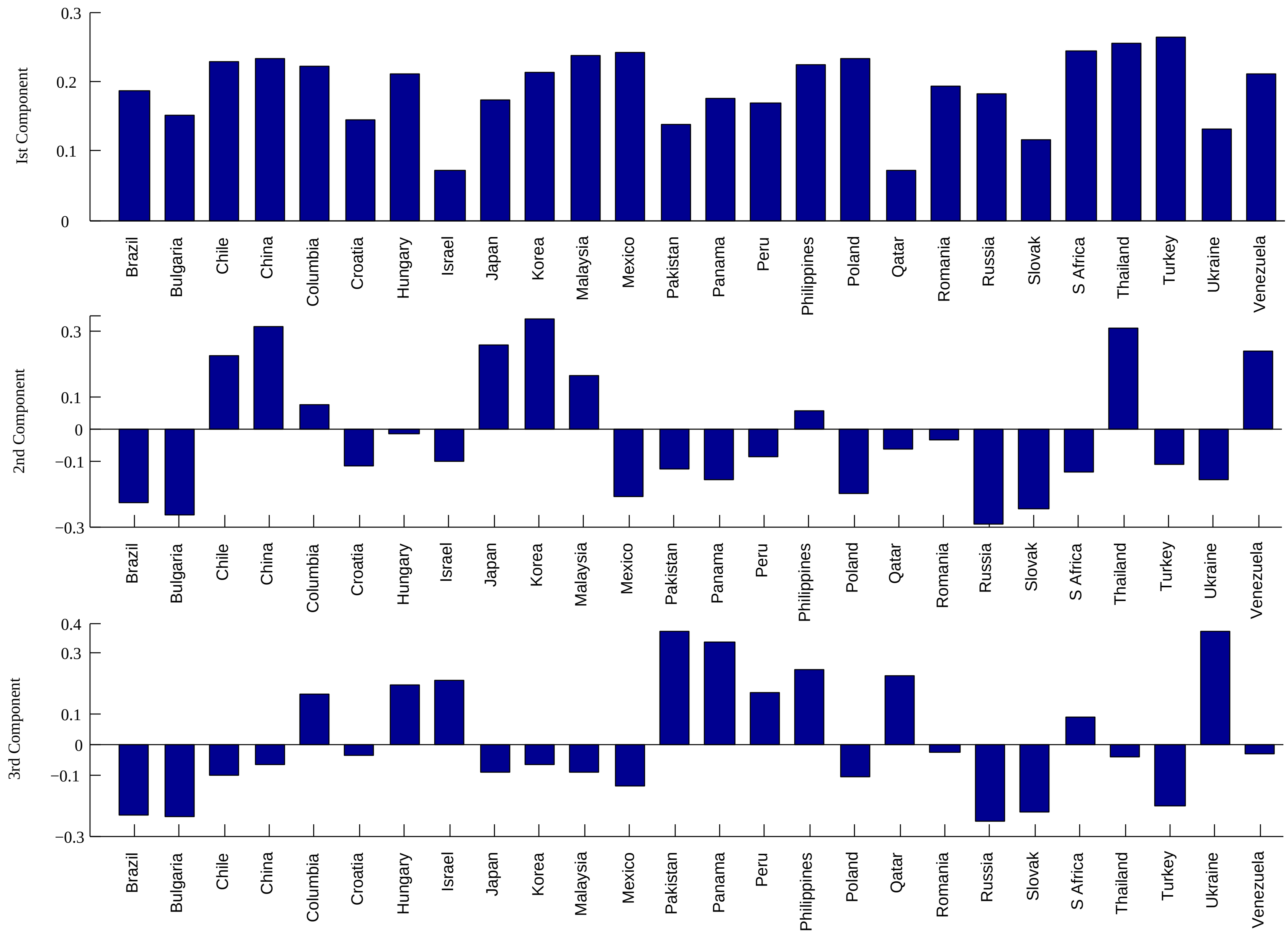

Figure 1: Principal Components for Monthly Changes in Sovereign CDS Spreads