

EMERGING MARKET SPREADS AT THE TURN OF THE CENTURY: A ROLLER COASTER

SPREADS DE MERCADOS EMERGENTES EN EL CAMBIO DE SIGLO: UNA MONTAÑA RUSA

SERGIO GODOY*

Larraín Vial S.A., Catholic University of Chile, Adolfo Ibáñez University

Abstract

This paper examines the empirical behavior of monthly secondary spreads from eighteen emerging market economies located in Asia, East Europe and Latin America from October 1997 to September 2002, a particularly turbulent period. A succession of events affected these economies such as the Asian crisis, the Russian default, the Brazilian devaluation, the Ecuadorian default, the Turkish crisis and the Argentine default. Our empirical estimations allow us to construct taxonomy of these crises. First, the Russian default and the Turkish crisis correspond to episodes of global reduction of portfolio flows to emerging sovereign debt markets. Second, the Brazilian devaluation was fundamentally an abatement of portfolio flows to Latin America and East Europe (except for Russia). Third, the Asian crisis and the Ecuadorian default were consistent with a rebalancing of portfolios in emerging markets. Fourth, although the Argentine crisis shares some similarities with the former crises, it is unique in the sense that it was fully anticipated long before it happened. Finally, in light of these results, policy-makers in emerging markets should be keenly aware of the possibility that their country might be hit by a crisis so structural reforms should also include policies that help to protect the country from these unruly episodes.

Keywords: *Emerging Markets, Financial Crises, Sovereign Spreads, Fundamentals.*

JEL Classification: *F34, G01, G15, G12.*

* The views expressed in this paper are mine and do not reflect those of the Central Bank of Chile. This paper is part of my doctoral dissertation. I would like to thank Joseph Stiglitz, Monica Fuentes, Charles Himmelberg and Rajeev Dehejia, Jorge Selaive, Alejandra Marinovic and anonymous reader for very insightful comments and suggestions. However, any error remaining is my responsibility.

Resumen

Este estudio analiza el comportamiento empírico de los spreads soberanos mensuales de dieciocho economías emergentes ubicadas en Asia, Europa Oriental y América Latina para el período que va desde octubre de 1997 hasta septiembre de 2002, el cual fue un período especialmente turbulento. En particular, estas economías sufrieron una serie de crisis financieras, tales como la Crisis Asiática, la Moratoria Rusa, la Devaluación Brasileña, la Moratoria Ecuatoriana, la Crisis Turca y la Moratoria Argentina. Nuestras estimaciones empíricas nos permiten construir una taxonomía de estas crisis, la cual se explica a continuación. Primero, la Moratoria Rusa y la Crisis Turca corresponden a episodios de reducción global de los flujos de capitales hacia los mercados de deuda soberana emergente. En segundo lugar, la Devaluación Brasileña fue fundamentalmente una reducción de los flujos de capitales hacia América Latina y Europa Oriental (a excepción de Rusia). Tercero, la Crisis Asiática y la Moratoria Ecuatoriana son consistentes con un rebalanceo de los portafolios de mercados emergentes. En cuarto lugar, a pesar de que la Moratoria Argentina comparte algunas similitudes con las crisis anteriores, es única en el sentido de que fue plenamente anticipada por los agentes económicos mucho antes que ocurriera. Por último, a la luz de estos resultados, los encargados de hacer políticas económicas en países emergentes deben estar muy atentos a la posibilidad de que su país pueda ser golpeado por una crisis externa. Por lo tanto, las reformas estructurales en dichos países también deben considerar políticas que ayuden a proteger al país frente a estos episodios tan violentos.

Palabras Clave: Mercados Emergentes, Crisis Financieras, Spread Soberanos, Fundamentales.

INTRODUCTION

The emerging financial markets went through a period of extreme instability in 1997-2002 with not much parallel in recent history. This turbulent period included a succession of crisis events that tested international investors' appetite for financial assets in those markets. The main crisis events in that period were the following: the Asian crisis, the Russian default, the Brazilian devaluation, the Ecuadorian default on Brady Bonds, the Turkish currency and banking crises and the Argentine default.

The behavior of emerging sovereign spreads is well documented for the period prior to the Asian crisis.¹ However, the literature is relatively thinner going forward.² Given the convulsive period after 1997, we believe it is important to study the behavior of these spreads. In consequence, the main contribution of this paper is explaining the behavior of monthly bond stripped spreads on sovereign bonds for eighteen emerging market countries located in Asia, East Europe and Latin America from October 1997 to November 2002.

We check whether macroeconomic and financial variables are capable of explaining the variability of sovereign market spreads. These variables are chosen according to the literature on determinants of sovereign spreads and the theoretical and empirical literature on contagion. The set of explanatory variables is composed by changes in short term interest rates, a measure of short term country liquidity, changes in the sovereign rating and a measure of trade linkages with developed countries.³

In addition, we exploit intensively the recollection of events explained in Fuentes and Godoy (2004) in order to create variables that capture the mentioned crises. Hence, we used as explanatory variables specific dummies associated with emerging markets crises that happened in our sample period. This attempt to capture the effect of these events is crucial for understanding the trajectory of sovereign spreads since they are the most salient characteristics of emerging financial markets over these years. The literature has not made the most of these events and, thus, taking advantage econometrically of these episodes is an additional contribution of this paper.

The next set of estimations consists of doing principal components analysis. In particular, we construct principal components of spreads for Latin America, Asia and East Europe. We interpret the first component of each region as a regional spread over the default-free international interest rate. This interpretation is based on the highly (negative) correlation vis-à-vis the J.P. Morgan bond price indexes. Thus, changes in these components reflect changes in the international perception on regional risk. Similarly to the spread themselves, we use the same financial and macroeconomic variables and our crisis-dummies for explaining these components.

Finally, we perform Bootstrap simulations in order to check the finite sample properties of our estimators. Interestingly, the literature on determinants of emerging market spreads has been silent on this issue. In particular, in the literature reviewed here, the samples are relatively small and no attempt is made in order to check whether the results are driven by finite sample biases. Thus, this is another important contribution of this paper.

¹ See Edwards (1984, 1986) for the late 1970s, and Boehmer and Megginson (1990) for the late 1980s. For the 1990s and primary spreads see Min (1998), Kamin, and Kleist (1999), Eichengreen, and Mody (2000) and for secondary spreads see Barnes and Cline (1997), Westphalen (2001) and Uribe and Yue (2004). These papers will be reviewed in the following section.

² The only exception is Uribe and Yue (2004). We will examine this paper in the next section.

³ The first three variables are standard determinants of spreads in the literature; however we are the first to include a measure of trade linkages as part of the explanatory set. The literature has ignored this variable despite the important work done by the theoretical and empirical contagion literature on this area. In this paper we review some of the contagion literature on trade linkages. See section 1.2.

This paper is organized as follows. The next section covers the literature review. Section 3 describes the data used in this paper. Section 4 provides the methodology and results obtained in this paper. Section 5 presents our conclusions.

1. LITERATURE REVIEW

This paper relates to two branches of the emerging market asset pricing literature. First, one part of the literature focuses on explaining the cross-country and time series variability of emerging market spreads using economic and financial variables. Second, there is another part of the literature focusing on the theoretical and empirical aspects of contagion. Both literatures have been motivated by the same crisis events that inspire this paper. In this literature review we do not plan to go through all this contagion literature.⁴ Instead, we focus on the part of the literature that can be helpful for obtaining possible explanatory variables of the behavior of sovereign spreads.

1.1 Literature on Determinants of Emerging Market Spreads

The literature on determinants of emerging market bond spreads has mirrored the evolution that emerging market financing has had in the last four decades. The earlier papers focused more on explaining the spreads over Libor of bank loans. Bank lending was the most prevalent international financing method for emerging countries before the crisis of the early 1980s.

Edwards (1984) attempted to explain the variability of spreads over Libor using variables that reflect (1) solvency (external debt-GNP ratio), (2) liquidity (reserves-GNP, debt service-exports and current account-GDP ratios), (3) country prospective growth (investment-GNP ratio and GDP per capita growth), (4) stability (rate of inflation, rate of devaluation and reserves variability) and (5) loan specific variables (duration and size of average loans). He reports a significant role of the first three sets of variables. In addition, he calculated the probabilities of default for each country in his sample finding that these probabilities did not increase much before the 1982 debt crisis. Edwards (1986) extended his 1984 paper by testing whether the pricing of bonds and commercial bank loans is different. He also finds a positive relationship between higher debt ratios and risk premium in bonds. However, the effect of liquidity variables is insignificant in the case of bond spreads. The explanatory power –judged by R-squared values– of the bond spread regressions are much lower than in the case of loan spreads.⁵

Similar to Edwards (1984, 1986) but for the late 1980s, Boehmer and Megginson (1990) perform an empirical analysis of the pricing of secondary market of bank loans of emerging economies. They found that solvency variables (e.g. debt to GDP ratio,

⁴ Pericoli and Sbracia (2003) and Wolf (2001) provide a more comprehensive review of the contagion literature.

⁵ Another related paper is Sachs (1985). He found that trade and exchange rate policy were quite relevant for the determination of the risk-premium in emerging market securities.

debt to exports ratio and so on) had much more explanatory power than liquidity variables, such as cover and debt service to export ratios. Moreover, they found that the international interest rate had no significant effect and the debt conversion program had a negative effect on loan prices.

The most recent papers in the literature on explaining the emerging market spreads have focused on bond markets. On one hand, this reflects the fact that since the 1982 crisis, banks in developed economies appear to be reluctant to lend to emerging economies. On the other hand, since the resolution of that crisis in the early 1990s -through the Brady Plan and the issue of the popular Brady Bonds- bonds have become the most common source of funding for emerging market sovereigns. For our purposes, we divide this literature into two distinctive branches: primary issues spreads and secondary market spreads. We first review the (three) papers that have used primary spread and then we go through the papers more related to ours (since they use secondary market data).

Min (1998) used liquidity-solvency, macroeconomic, external shock and debt-related variables in order to explain primary issues yield spreads. He also included dummies for Latin American countries when bonds were issued in 1995 (Mexican crisis) and private sector issues. His sample went through from 1991 to 1995 for dollar denominated bonds. He found that liquidity-solvency, macroeconomic and debt-related sets of variables influenced the volatility of bond spreads. He also found that private sector issues is the only significant dummy. Interestingly, the external shock variables (oil prices and US 3-month T-bill rate) have no explanatory power.

Kamin and Kleist (1999) is a similar attempt to explain the variability of primary issues sovereign spreads. They introduced credit ratings as an explanatory variable. Their sample goes from the beginning of 1991 to the end of 1997. They found that credit ratings, maturity and currency denomination are variables capable of explaining the evolution of emerging market spreads. They also found that there are regional differences and interest rates in developed economies have a minor effect on sovereign spreads. Moreover, a dummy for the Mexican crisis had a significant explanatory power.

Eichengreen and Mody (2000) is a similar paper to Kamin and Kleist (1999). On one hand, for a similar period they tried to explain the variability of spreads of sovereign, other public and private primary issuers. On the other hand, besides attempting to explain this variability, they also modeled empirically the probability of a bond issue. They found that the 10-year Treasury bond rate has a marginal negative effect on spreads. In addition, the other explanatory variables (solvency variables, credit ratings, several dummies) have the expected sign but some of them are not significant.

An earlier attempt to explain secondary spreads corresponded to Barnes and Cline (1997). They perform an OLS regression on pooled cross-section of quarterly secondary market bond spreads. Their data was yield spreads from twelve emerging markets and six "small" European industrial countries for the period 1992-1996. They found that financial ratios and macroeconomic variables are significant. We believe that their sample has two important caveats. First, mixing emerging and industrial

countries spreads unnecessarily complicates the interpretation of their results because of important institutional differences between these two types of countries. Moreover, this paper and Eichengreen and Mody (2000) combined private and government issues. The considerations for default of corporates and sovereigns are very different⁶ and, thus, the pricing in practice of these two kinds of bonds might also be different. For instance, credit rating agencies consider sovereign spreads as ceilings for other domestic issuers and, thus, sovereign spreads are almost always the lowest spread in any country.

To the best of our knowledge, there are three recent papers which attempt to explain emerging market secondary spreads. Westphalen (2001) performs a Generalized Least Square on a sample of yield spreads of twenty-six emerging countries from March 1995 to April 2001. His explanatory variables are debt service to export ratio, change in 10-year risk-free interest rates denominated in different hard currencies for which the sample of bonds were denominated, change in the slope of the yield curve measured by the difference between the 10-year and 2-year rates, change in the local stock market volatility and return on MSCI world stock market index. He found that these variables were significant and their coefficients had the expected sign. However, he deemed the explanatory power of the regressions is too low and, thus, re-estimated the principal components on the residuals of the regressions. He found that the first component explained most of the variability of these residuals. In our case, we follow a different but related strategy. We calculate the first principal component for each region and check whether our regional explanatory variables can explain these components.

Arora and Cerisola (2001) performed individual country regressions using secondary spreads as dependent variables. Their explanatory variables included U.S. federal funds rate, a proxy of market volatility of U.S. monetary policy derived from an ARCH model and some individual country specific variables capturing solvency and liquidity. They found that the fed funds rate and market volatility variables are significant and have a positive effect on emerging market spreads. They also found that the solvency and liquidity variables are significant.

Uribe and Yue (2004) also used secondary market spreads. Their main goal was to check whether sovereign spreads drive business cycles in emerging markets or vice versa. They also addressed the issue of the effect of US interest rates on emerging market sovereign spreads and business cycles. For that purpose, they performed a VAR system that included quarterly data of sovereign yields, 3-month Treasury bill real rate, deviations from a log-linear trend of real GDP and real gross domestic investment, and trade balance to output ratio. They carried out this system for seven emerging market countries using quarterly data from 1994 to 2001. They found that country yields drive business cycles in emerging economies and vice versa but these effects are not very large. Moreover, US interest rates have a larger effect on sovereign yields and on movements of output in emerging markets.

⁶ See Bulow and Rogoff (1989a, 1989b) and Eaton and Gersovitz (1981).

1.2 Literature on Contagion

For our purposes, we can split the literature on financial contagion into four broad categories. From the first three we obtain some of the economic variables that could have some power in explaining the variability of sovereign spreads. Therefore, we focus more intensively on these three categories.

The first category refers to the existence of trade linkages. According to this theory, if a recession occurs in one country its trading partners will see their trade balances affected via a decrease in exports. The stronger the trading relationship between two countries, that is, the higher the ratio of exports and imports to and from one another as a percentage of GDP, the higher the likelihood of a strong transmission channel of crisis between them. Additionally, the transmission mechanism can be indirect, for instance, through speculative attacks on the exchange rate regime.

Eichengreen, Rose and Wyplosz (1996) provided evidence for the trade linkages argument. They analyzed the contagion nature of currency crisis. They found that contagion appeared to spread more easily to countries that are closely tied by trade linkages than to countries with similar macroeconomic circumstances. In the same vein of thought, Glick and Rose (1999) provided empirical evidence that currency crises tend to be regional in the sense that they affect countries in the same geographic zone. Furthermore, given that main trading partners are clustered in the same area, patterns of international trade are important to understand the spread of currencies beyond macroeconomic phenomena.⁷

More recently, Forbes (2001) disentangled the trade effect in three distinctive channels: competitive effect (when a country suffering a crisis devalues its currency and, thus, increases the competitiveness of its exports); income effect (a crisis reduces the country's income and, thus, it reduces its demand for imports) and cheap-import effect (in a crisis the depreciation of the currency reduces the price of imports and causes a positive supply effect). She found evidence that the competitive and income effects are significant, that is, countries which compete through exports with a crisis country and which export to the crisis country had significant lower stock market returns.

Contagion through financial market linkages constitutes the second category of the literature. This literature suggests that in the event of a crisis in one nation, asset prices and capital flows appear to be correlated, in the sense that countries within the same category as the country in trouble have similar features, and thus explain regional co-movements. The empirics here usually are conducted through event

⁷ Friedman, Johnson and Landsberg (2001) developed a related theoretical model of intercountry linkages. Theirs is a simple model of country linkages through supply chain in which even weak linkages can lead to a high correlation of large economic events. Moreover, reducing the strength of linkages between countries will not reduce the probability of large events being correlated across countries.

studies with the objective of analyzing how positive or negative news in one country influence other markets.

In this fashion, Frankel and Schmukler (1996) provided evidence that shocks, such as the Mexican crisis, produced spillover effects in other markets. These effects were weaker in Asia than in Latin America. In addition, Calvo and Reinhart (1995) analyzed the developments in emerging equity markets in Asia and Latin America in the presence of events in the larger economies in Latin America. More recently, Kaminsky and Schmukler (1999) found evidence that news related to international organizations and credit rating agencies triggered large stock price movements in Asian markets. Moreover, Baig and Goldfajn (1999) provide evidence that negative news (including credit rating downgrades) negatively affected asset prices in Asian countries. Their assets included exchange rates, stocks and sovereign bonds.

The third category refers to capital allocation changes resulting from an external event. The effect of a change in interest rates either in the US or Euroland might cause investors to re-evaluate their risk exposure, and as a consequence we observe phenomena such as a flight to safety. Changes in interest rates in large economies lead to important movements in capital flows overall, and in particular, to emerging markets as investors' change their perception of risk. Masson (1999) constructs a balance of payments model that allows for multiple equilibria and self-fulfilling expectations in order to illustrate this theory.

The fourth category is related to capital market structure phenomena. This category considers linkages among domestic financial markets and global banks. It also examines the importance of liquidity effects and sudden stops in debt rollovers, which affect borrowers in different countries during the transmission of the crisis. Banerjee (1992) carried out research in this area through a sequential decision model in which each decision-maker looked at the decisions made by previous decision-makers when making his own decision. In this model decision rules were the result of optimizing individuals characterized by herd behavior, where individuals replicated what others were doing rather than using their own information. Bikhchandani, Hirshleifer, and Welch (1992) developed a model and conditions under which it was optimal for an individual to follow the behavior of the previous individual, without utilizing his own information, once he had seen the actions of the others.

2. DATA DESCRIPTION

2.1 Dependent Variables

In this section we describe the variables used in our empirical analysis. We use as dependent variables the monthly changes in sovereign spreads from Latin America, Asia and East Europe. Table 1 provides details on the underlying bonds used in this paper.

We will employ the spreads themselves and the regional first principal components built from those spreads.

TABLE 1
DESCRIPTION OF THE BOND DATA

Country	Coupon Rate	Maturity Date	Credit Rating
Argentina	11.375%	30/1/17	SD
Brazil	10.125%	15/5/27	B+
Bulgaria	6.750%	28/7/11	BB-
China	7.300%	15/12/08	BBB
Colombia	7.625%	15/5/07	BB
Ecuador	(1)	15/8/25	CCC+
Indonesia	7.750%	1/8/06	CCC+
Malaysia	8.750%	1/6/09	BBB+
Mexico	11.375%	15/9/16	BBB-
Peru	(2)	7/3/17	BB-
Philippines	9.875%	15/1/19	BB+
Poland	(3)	27/10/14	BBB+
South Africa	9.125%	19/5/09	BBB-
Thailand	7.750%	15/4/07	BBB-
Turkey	11.875%	15/1/25	B-
Venezuela	9.250%	15/9/27	B-
Russia	12.750%	24/6/28	BB-
South Korea	8.875%	15/4/08	A-

(1) Steps up gradually from 4% to 10% in year seven.

(2) Steps up gradually from 4% initially to 5% in year 2003.

(3) Steps up gradually from 3.25% initially to 7% in year 2003.

Source: Goldman Sachs. Standard & Poor's.

In particular, we collect monthly spreads for Argentina, Brazil, Bulgaria, China, Colombia, Ecuador, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, South Africa, Thailand, Turkey, Venezuela, Russia and South Korea from October 1997 to September 2002. Table 2 provides a statistical summary of these monthly spreads changes.

TABLE 2
SUMMARY STATISTICS SOVEREIGN STRIPPED SPREADS (MONTHLY CHANGES)

Panel 1: Statistics																		
	Argentina	Brazil	Colombia	Ecuador	México	Peru	Venezuela	China	Indonesia	Korea	Malaysia	Philippines	Thailand	Bulgaria	Poland	Russia	South Africa	Turkey
Mean	88.84	31.01	15.23	22.38	2.39	10.09	11.52	0.14	3.71	0.09	1.14	5.39	0.86	-0.13	3.61	4.82	2.24	12.02
Median	11.00	4.00	7.50	14.00	-7.50	-14.50	7.50	-2.50	3.50	-10.50	2.50	-2.00	-1.00	-10.00	2.00	-14.00	-8.00	-3.50
Stand. Dev.	580.51	183.64	105.57	441.86	75.37	97.21	169.13	32.15	215.58	122.96	89.02	105.98	72.65	158.85	45.34	620.34	76.79	107.92
Kurtosis	11.14	4.40	4.84	3.27	15.79	0.26	19.21	15.24	4.59	30.48	8.55	13.00	10.07	19.23	13.16	27.26	17.69	7.66
Skewness	-0.35	1.77	1.31	-0.38	2.89	0.65	2.28	2.28	0.28	3.77	1.02	2.58	1.75	2.55	2.55	4.09	2.94	2.00

Panel 2: Correlation Matrix																		
	Argentina	Brazil	Colombia	Ecuador	México	Peru	Venezuela	China	Indonesia	Korea	Malaysia	Philippines	Thailand	Bulgaria	Poland	Russia	South Africa	Turkey
Argentina	1																	
Brazil	0.0778	1																
Colombia	-0.2810	0.6681	1															
Ecuador	-0.0251	0.4317	0.4204	1														
México	0.1137	0.7651	0.5648	0.5461	1													
Peru	-0.0460	0.6034	0.6312	0.3933	0.4700	1												
Venezuela	0.1445	0.6004	0.3963	0.4136	0.8460	0.3609	1											
China	-0.0060	0.3805	0.4639	0.4048	0.7916	0.4298	0.8281	1										
Indonesia	0.0186	0.3331	0.3800	0.2400	0.3018	0.3943	0.1361	0.3647	1									
Korea	-0.0296	-0.0128	0.0122	-0.0230	-0.0085	-0.1928	-0.0710	0.0159	-0.2348	1								
Malaysia	0.0317	0.4600	0.5915	0.2410	0.4962	0.4812	0.2660	0.4599	0.6833	0.0923	1							
Philippines	0.0910	0.6551	0.5440	0.4805	0.8738	0.5031	0.7326	0.7159	0.4386	0.0312	0.5987	1						
Thailand	0.0330	0.4666	0.4567	0.3340	0.6075	0.3878	0.5329	0.7433	0.7180	-0.1765	0.6796	0.6500	1					
Bulgaria	0.1274	0.6189	0.4243	0.4429	0.8800	0.3908	0.8411	0.8230	0.2769	-0.0224	0.3962	0.8539	0.6442	1				
Poland	0.0435	0.7254	0.5876	0.5329	0.8783	0.3977	0.7237	0.6901	0.4046	-0.0210	0.5309	0.8877	0.6583	0.8107	1			
Russia	0.0814	0.5145	0.5327	0.4164	0.6826	0.4214	0.5771	0.6049	0.5365	-0.0716	0.7857	0.6965	0.6516	0.6069	0.6740	1		
South Africa	0.1189	0.5780	0.4682	0.3557	0.7809	0.5481	0.7634	0.8416	0.4463	-0.1424	0.5394	0.7464	0.6975	0.7919	0.6999	0.6473	1	
Turkey	0.1726	0.7147	0.4735	0.4124	0.7731	0.4628	0.6026	0.6029	0.4155	-0.0301	0.5344	0.7658	0.5953	0.7314	0.7872	0.6197	0.6754	1

Source: Author's calculations based on data from Goldman Sachs.

Latin American spreads have higher means than the East European and Asian spreads and returns (See Table 2: Panel 1). Volatility is also especially higher for Latin American and Russian spreads. The skewness statistic shows that the sample spreads tend to be positively skew except for the case of Argentina and Ecuador. This is interesting because these are the only two countries of the sample that went on default on their external debt during the period considered in this paper.⁸ Finally, based of the kurtosis measure we found the familiar fact that the distributions of emerging market spreads have fatter tails which implies that extreme events occur with a higher probability than in a normal distribution.

Panel 2 on Table 2 shows the correlation among these spreads. Broadly speaking, correlations seem to follow a regional pattern since they are higher among countries of each region considered. However, there are some exceptions. For instance, in Latin America, Mexican and Venezuelan spreads appear to have higher correlation with countries' spreads from other regions than with Latin American spreads. Although Mexico is closely integrated with the US, we believe this is the case as both countries –Mexico and Venezuela– are large oil producers. In Asia, the Chinese and Filipino spreads are more correlated with non-Asian countries. Table 1 and 2 from Fuentes and Godoy (2004) showed that Philippines differs from Asian countries and simulates non-Asian economies, while China stands out in Asia as its economy has been booming in the past years.⁹

Figures 1a, 1b and 1c show the path of the monthly changes in sovereign yield spreads over the sample period. A simple visual inspection provides some insights on the important turmoil that occurred in this period. There is certainly an important unrest among Asian spreads at the beginning of our sample (Figure 1b). The larger spread volatility can be associated to the events surrounding the financial crisis in Asia in the second half of 1997. However, the spreads in other regions seem to be pretty stable (Figure 1a and Figure 1c).

August 1998 is a key month for all the emerging market sovereign bond market. All spreads rose significantly this month. The Russian default is the highlight event. The beginning of 1999 seemed a particularly jittered period in Latin America (Figure 1a) by the presence of the currency devaluation in Brazil. Spreads from other countries seemed to remain fairly stable. Finally, the end of 2001 shows again some increase in volatility with the default in Argentina.

In addition, we construct principal components for each region. We use the first principal component for each region in our empirical estimation as dependent variable. We give economic interpretation to these components by associating them to economic variables that resemble the regional spread.

In Table 3 we show the correlation between these components and widespread measures of bond price index calculated by J.P. Morgan.¹⁰ These correlations should be negative since our components match the yield spread and these indexes are calculated

⁸ Russia defaulted on domestic debt during our period of analysis.

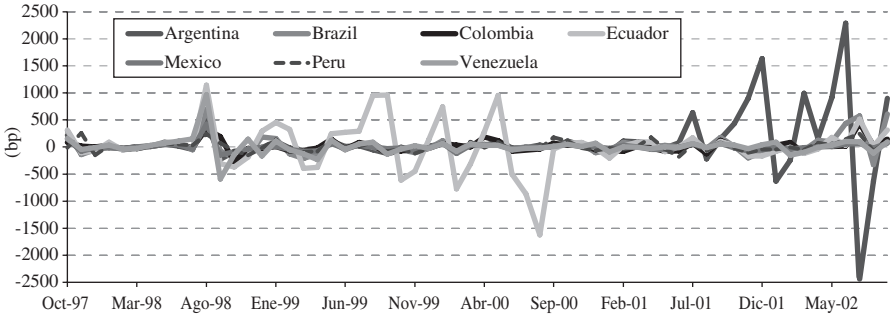
⁹ The monthly changes in spreads preserve the statistical properties of their daily counterparts. See Fuentes and Godoy (2004).

¹⁰ For an explanation on how these indexes are calculated see J. P. Morgan (1999).

FIGURE 1

FIGURE 1A

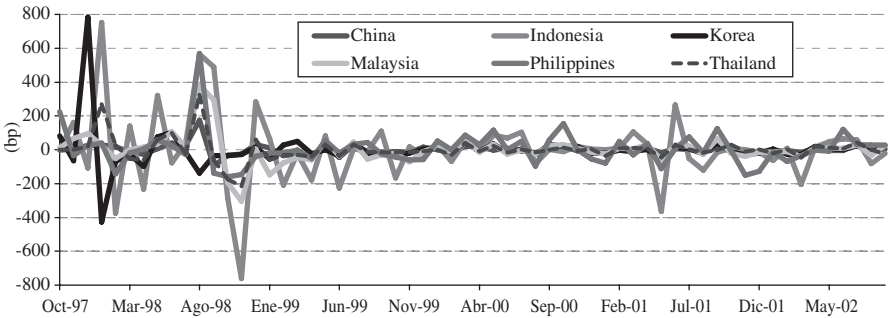
EMERGING MARKET MONTHLY CHANGES IN SOVEREIGN YIELD SPREADS - LATIN AMERICA



Source: Goldman Sachs.

FIGURE 1B

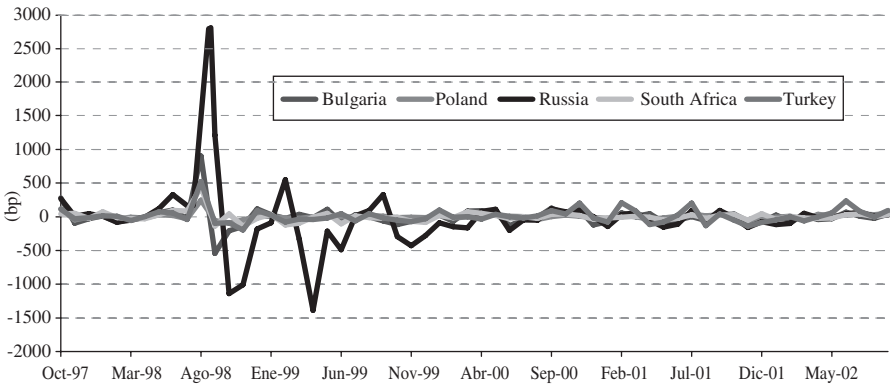
EMERGING MARKET MONTHLY CHANGES IN SOVEREIGN YIELD SPREADS - ASIA



Source: Goldman Sachs.

FIGURE 1C

EMERGING MARKET MONTHLY CHANGES IN SOVEREIGN YIELD SPREADS - EAST EUROPE



Source: Goldman Sachs.

based on bond prices. Table 3 illustrates that these correlations are indeed negative and, more importantly, they are pretty high. For instance, the first principal component of Latin America has a -0.8511 correlation coefficient vis-à-vis the Latin bond index. The first principal components of Asia and East Europe are also highly correlated with the Non-Latin bond index. In consequence, we can interpret confidently these components as measures of changes in the regional spreads.

TABLE 3

PANEL 1: DEFINITIONS

Variable	Definition
PC1la	First Principal Component of Monthly Changes in Latin American Spreads (Argentina, Brazil, Colombia, Ecuador, Mexico, Peru & Venezuela)
PC1as	First Principal Component of Monthly Changes in Asian Spreads (China, Indonesia, Korea, Malaysia, Philippines & Thailand)
PC1ee	First Principal Component of Monthly Changes in East European Spreads (Bulgaria, Poland, Russia, South Africa & Turkey)

PANEL 2: CORRELATION WITH JP MORGAN'S EMBI INDEXES

	PC1la	PC1as	PC1ee	EMBI Plus	Brady Broad	Latin	Non-Latin
PC1la	1						
PC1as	0.6084	1					
PC1ee	0.7548	0.8015	1				
EMBI Plus	-0.8680	-0.6683	-0.8464	1			
Brady Broad	-0.8895	-0.6640	-0.8228	0.9795	1		
Latin	-0.8511	-0.5793	-0.7289	0.9692	0.9470	1	
Non-Latin	-0.7723	-0.7404	-0.9471	0.8895	0.8625	0.7576	1

A summary of the statistics for the first principal components is provided in Table 4. Panel 1 shows that the first principal component for each region is highly and positively correlated with almost every country spread in each region. In addition, for all regions the first principal component explains most of the total variance of the original variables (country spreads).

Albeit the standard deviation of the first principal component for Latin America is lower than for East Europe, Table 4, Panel 2 illustrates that this component for Latin America has a higher mean than the other regions' first principal component. When looking at skewness and kurtosis, the principal components keep the properties of the spreads themselves. Finally, the Asian component shows a mild correlation with the component for Latin America, while the component for East Europe shows a stronger positive correlation with spreads in Latin America and Asia (Table 4: Panel 3).

TABLE 4

PRINCIPAL COMPONENTS (MONTHLY CHANGES)

PANEL 1: PRINCIPAL COMPONENT ANALYSIS

Latin American Principal Components

	Correlations PC1la		Percentage of Variance Explained
Arg	0.0136	1PC	0.5342
Bra	0.8184	2PC	0.1778
Col	0.7089	3PC	0.1010
Ecu	0.8169	4PC	0.0900
Mex	0.8597	5PC	0.0492
Per	0.6563	6PC	0.0329
Ven	0.7379	7PC	0.0149

Asian Principal Components

	Correlations PC1as		Percentage of Variance Explained
Chi	0.6557	1PC	0.5733
Ind	0.8924	2PC	0.1882
Kor	-0.1497	3PC	0.1250
Mal	0.8360	4PC	0.0568
Phi	0.7504	5PC	0.0364
Tha	0.8888	6PC	0.0204

East European Principal Components

	Correlations PC1ee		Percentage of Variance Explained
Bul	0.8015	1PC	0.7649
Pol	0.8190	2PC	0.0875
Rus	0.9528	3PC	0.0717
Sda	0.7939	4PC	0.0470
Tur	0.7806	5PC	0.0290

PANEL 2: STATISTICS

	PC1la	PC1as	PC1ee
Mean	1.85	0.14	0.32
Median	0.68	0.33	-0.66
Stand. Dev.	15.73	9.03	18.39
Kurtosis	5.77	9.99	33.78
Skewness	1.55	1.30	4.89

PANEL 3: CORRELATION MATRIX

	PC1la	PC1as	PC1ee
PC1la	1		
PC1as	0.6084	1	
PC1ee	0.7548	0.8015	1

Figure 2 shows the evolution of these components over our sample period. These components provide a clear picture of the crises described earlier.

2.2 Explanatory Variables

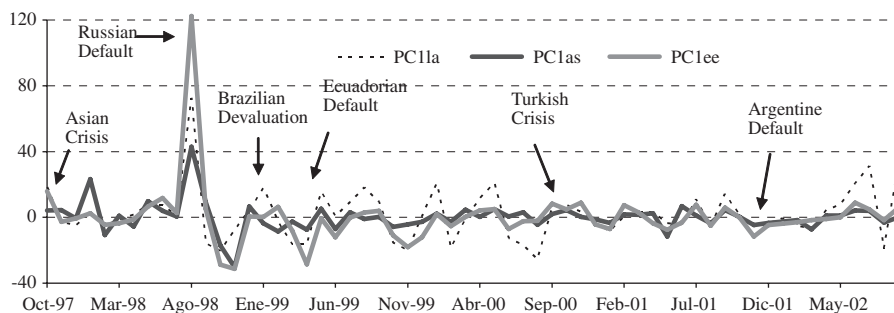
We include in our estimations some economic-financial variables, which are shown in Table 5.

TABLE 5
ECONOMIC-FINANCIAL EXPLANATORY VARIABLES

Variable	Definition	Source
S-T	Monthly changes in 6-month US dollar Libor rate.	British Bankers' Association
rat	Change in Standard & Poor's sovereign rating (+1 for one notch downgrade and -1 for one notch upgrade for S&P rating)	Bloomberg
Liq	Ratio of International Reserves to 6-month Average Imports	International Monetary Fund
Arre	Annual interest arrears as percentage of GDP	Institute of International Finance
Xrde	Monthly Exports as % of Total of each country or region to Developed countries.	International Monetary Fund

FIGURE 2

FIRST PRINCIPAL COMPONENTS



Source: Author's calculation based on data from Goldman Sachs

These variables are related to the literature previously reviewed. In section 2 we showed that the most recent literature on the determinants of emerging market spreads¹¹ mainly uses some measure of international interest rate in its empirical estimations. In addition, this variable is associated to our third category (reviewed in Section 1.2), where capital allocation changes occurring in emerging markets are due to an external event taking place in developed markets.

In this fashion, we include in our estimations a proxy for the world interest rate. This corresponds to the 6-month U.S. dollar Libor interest rate. We used a U.S. dollar-denominated rate because all the underlying bonds used in this paper are dollar-denominated. Our hypothesis is that this variable is a good benchmark of global liquidity conditions. A higher interest rate means tighter global liquidity conditions and, thus, higher emerging market spreads. In turn, we expect a positive sign for this variable.

In section 2 we saw that the literature has also contemplated the influence of credit rating news on sovereign spreads.¹² These papers showed that changes in these ratings can have an important effect on changes in emerging market asset prices and, in particular, on sovereign bonds. Thus, we also include changes in sovereign credit ratings as part of the set of explanatory variables.

For the individual countries and panel data regressions, these changes correspond to +1 (-1) for one notch downgrade (upgrade) for S&P country's rating. For instance, if at any given month a country rating goes down two notches, the value for the variable will be +2. In the case of regional regressions, these changes correspond to +1 (-1) for one notch downgrade (upgrade) for the credit rating of any country in the region. Therefore, the expected effect of this variable on sovereign spreads is positive.

Several papers¹³ have shown that sovereign credit ratings capture long-term country's economic fundamental variables. These fundamentals include, among others, GDP growth rates, fiscal policy, inflation rate, external debt-GDP ratio and export growth. Therefore, in our estimation we do not include solvency and macroeconomic performance variables and we only include a proxy of short-term external liquidity -the well-known cover ratio.¹⁴ A higher ratio means that the country can face more safely short-term capital flow disruptions. Thus, its expected effect on sovereign spreads is negative.

The fourth variable is interest arrears as a percentage of GDP. We include this variable as a proxy of the country's willingness to pay. Bulow and Rogoff (1989a, 1989b) and Eaton and Gersovitz (1981) explain that one of the main differences between corporate and sovereign default is that in the latter case there is no formal mechanism for recovering assets or collateral. Thus, in the case of sovereign default, sovereign's willingness to pay is a key factor for estimating the probability of recovery

¹¹ See Kamin and Kleist (1999), Eichengreen and Mody (2000), Westphalen (2001), Arora and Cerisola (2001), and Uribe and Yue (2004).

¹² See Kaminsky and Schmukler (1999), Baig and Goldfajn (1999) and Kamin and Kleist (1999).

¹³ See e.g. Cantor and Packer (1996), Haque *et al.* (1996) and Monfort and Mulder (2000).

¹⁴ For empirical estimations using cover ratio see, for instance, Boehmer and Megginson (1990), and Arora and Cerisola (2001).

and the amount recovered. That willingness might be reflected in the fact that the sovereign does not incur in interest arrears. Hence, the expected sign of this variable is positive.¹⁵

The last economic-financial variable is monthly exports by country or region to developed countries as percentage of its total exports. Countries that have larger trade links with developed markets are less affected by the “contagious” effects of emerging market crisis-events. As we explained earlier in our first category of the contagion literature, this “contagious” effect can have in theory two channels: economic contractions and important loss of value of the local currency (*vis-à-vis* hard currencies) that occur simultaneously with emerging market crises. Thus, the expected sign of this variable is negative.

In addition, we exploit intensively the fact that emerging markets endured important financial disruptions in our sample period and, in theory, these severe events can be captured with timely placed dummies.¹⁶ Therefore, we create dummy variables that capture the Asian crisis, the Russian default, the Brazilian devaluation, the Ecuadorian default, the Turkish crisis and the Argentine default. Moreover, even though these crisis events share some common expected features,¹⁷ they can have potential distinctive effects on the other emerging countries or regions. The following table (Table 6: Panel 1, 2 and 3) provides details of the construction of dummies employed in this paper.

The first dummy in Table 6: Panel 1 is related to the dither associated to the Asian Crisis. Specifically, we chose November 1997 because this is when the Korean government stopped defending its currency. Korea is by far the largest and richest Asian country involved in the crisis. Thus, we believe the events in this country played a significant role on the path of other emerging market spreads, in particular, on yield spreads in the rest of Asia.

The second dummy in Table 6: Panel 1 corresponds to the Russian default and collapse of Long Term Capital Management hedge fund. In our opinion this is the most catastrophic single event that happened to emerging market sovereign bonds. As we mentioned before, a casual visual inspection to Figure 1 allows us to conjecture on the importance of this event for emerging market yields.

The third dummy is explained by the Brazilian devaluation that occurred in mid-January 1999, when the Brazilian Central Bank stopped defending the currency, after facing several months of pressure on the back of market doubts on whether Brazil was going to meet debt payments.

The fourth dummy is related to the episode of the default in Ecuador, which occurred in the context of a banking crisis and political turmoil. This event is particularly important because it was the first time a sovereign was defaulting on Brady bonds. These bonds were created to solve the Latin American debt crisis of the early 1980s and currently they have a very active secondary market.

¹⁵ See Boehmer and Megginson (1990).

¹⁶ These dummies are based on the recollection of events explained in Fuentes and Godoy (2004).

¹⁷ The most salient feature is that the country or region involved experienced an important widening of spreads. See the next section.

TABLE 6
DUMMY VARIABLES

PANEL 1: CRISIS DUMMIES

Variable	Definition
Dcasi	Dummy November 1997
Dcrus	Dummy August 1998
Dcba	Dummy January 1999
Dcecu	Dummy June 1999
Dctur	Dummy October 2000
Dcarg	Dummy December 2001

PANEL 2: COUNTRY/REGION DUMMIES

Variable	Definition
Dumarg	Dummy Argentina
Dumbra	Dummy Brazil
Dumcol	Dummy Colombia
Dumecu	Dummy Ecuador
Dummex	Dummy Mexico
Dumper	Dummy Peru
Dumven	Dummy Venezuela
Dumchi	Dummy China
Dumind	Dummy Indonesia
Dumkor	Dummy Korea
Dummal	Dummy Malaysia
Dumphil	Dummy Philippines
Dumtha	Dummy Thailand
Dumbul	Dummy Bulgaria
Dumpol	Dummy Poland
Dumrus	Dummy Russia
Dumsda	Dummy South Africa
Dumtur	Dummy Turkey
Dumla	Dummy Latin America
Dumas	Dummy Asia
Dumee	Dummy East Europe

PANEL 3: REGION-CRISIS DUMMIES

Variable	Definition
Dumlaasi	Dumla.*Dcasi
Dumlarus	Dumla.*Dcrus
Dumlabra	Dumla.*Dcba
Dumlaecu	Dumla.*Dcecu
Dumlatur	Dumla.*Dctur
Dumlaarg	Dumla.*Dcarg
Dumasasi	Dumas.*Dcasi
Dumasrus	Dumas.*Dcrus
Dumasbra	Dumas.*Dcba
Dumasecu	Dumas.*Dcecu
Dumastur	Dumas.*Dctur
Dumasarg	Dumas.*Dcarg
Dumeeasi	Dumee.*Dcasi
Dumeeerus	Dumee.*Dcrus
Dumeebra	Dumee.*Dcba
Dumeeecu	Dumee.*Dcecu
Dumeeetur	Dumee.*Dctur
Dumeearg	Dumee.*Dcarg

PANEL 4: COUNTRY-CRISIS DUMMIES

Variable	Definition	Variable	Definition	Variable	Definition
Dargasi	Dumarg.*Dcasi	Dargbra	Dumarg.*Dcbra	Dargtur	Dumarg.*Dctur
Dbraasi	Dumbra.*Dcasi	Dbrabra	Dumbra.*Dcbra	Dbratur	Dumbra.*Dctur
Dcolasi	Dumcol.*Dcasi	Dcolbra	Dumcol.*Dcbra	Dcoltur	Dumcol.*Dctur
Decuasi	Dumecu.*Dcasi	Decubra	Dumecu.*Dcbra	Decutur	Dumecu.*Dctur
Dmexasi	Dummex.*Dcasi	Dmexbra	Dummex.*Dcbra	Dmextur	Dummex.*Dctur
Dperasi	Dumper.*Dcasi	Dperbra	Dumper.*Dcbra	Dpertur	Dumper.*Dctur
Dvenasi	Dumven.*Dcasi	Dvenbra	Dumven.*Dcbra	Dventur	Dumven.*Dctur
Dchiasi	Dumchi.*Dcasi	Dchibra	Dumchi.*Dcbra	Dchitur	Dumchi.*Dctur
Dindasi	Dumind.*Dcasi	Dindbra	Dumind.*Dcbra	Dindtur	Dumind.*Dctur
Dkorasi	Dumkor.*Dcasi	Dkorbra	Dumkor.*Dcbra	Dkortur	Dumkor.*Dctur
Dmalasi	Dummal.*Dcasi	Dmalbra	Dummal.*Dcbra	Dmaltur	Dummal.*Dctur
Dphiasi	Dumph.*Dcasi	Dphibra	Dumph.*Dcbra	Dphitur	Dumph.*Dctur
Dthaasi	Dumtha.*Dcasi	Dthabra	Dumtha.*Dcbra	Dthatur	Dumtha.*Dctur
Dbulasi	Dumbul.*Dcasi	Dbulbra	Dumbul.*Dcbra	Dbultur	Dumbul.*Dctur
Dpolasi	Dumpol.*Dcasi	Dpolbra	Dumpol.*Dcbra	Dpoltur	Dumpol.*Dctur
Drusasi	Dumrus.*Dcasi	Drusbra	Dumrus.*Dcbra	Drustur	Dumrus.*Dctur
Dsdaasi	Dumsda.*Dcasi	Dsdabra	Dumsda.*Dcbra	Dsdatur	Dumsda.*Dctur
Dturasi	Dumtur.*Dcasi	Dturbra	Dumtur.*Dcbra	Dturtur	Dumtur.*Dctur
Dargrus	Dumarg.*Dcrus	Dargecu	Dumarg.*Dcecu	Dargarg	Dumarg.*Dcarg
Dbrarus	Dumbra.*Dcrus	Dbraecu	Dumbra.*Dcecu	Dbraarg	Dumbra.*Dcarg
Dcolrus	Dumcol.*Dcrus	Dcolecu	Dumcol.*Dcecu	Dcolarg	Dumcol.*Dcarg
Decurus	Dumecu.*Dcrus	Decuecu	Dumecu.*Dcecu	Decuarg	Dumecu.*Dcarg
Dmexrus	Dummex.*Dcrus	Dmexecu	Dummex.*Dcecu	Dmexarg	Dummex.*Dcarg
Dperrus	Dumper.*Dcrus	Dperecu	Dumper.*Dcecu	Dperarg	Dumper.*Dcarg
Dvenrus	Dumven.*Dcrus	Dvenecu	Dumven.*Dcecu	Dvenarg	Dumven.*Dcarg
Dchirus	Dumchi.*Dcrus	Dchiecu	Dumchi.*Dcecu	Dchiarg	Dumchi.*Dcarg
Dindrus	Dumind.*Dcrus	Dindecu	Dumind.*Dcecu	Dindarg	Dumind.*Dcarg
Dkorrus	Dumkor.*Dcrus	Dkorecu	Dumkor.*Dcecu	Dkorarg	Dumkor.*Dcarg
Dmalrus	Dummal.*Dcrus	Dmalecu	Dummal.*Dcecu	Dmalarg	Dummal.*Dcarg
Dphirus	Dumph.*Dcrus	Dphiecu	Dumph.*Dcecu	Dphiarg	Dumph.*Dcarg
Dtharus	Dumtha.*Dcrus	Dthaeu	Dumtha.*Dcecu	Dthaarg	Dumtha.*Dcarg
Dbulrus	Dumbul.*Dcrus	Dbulecu	Dumbul.*Dcecu	Dbularg	Dumbul.*Dcarg
Dpolrus	Dumpol.*Dcrus	Dpolecu	Dumpol.*Dcecu	Dpolarg	Dumpol.*Dcarg
Drusrus	Dumrus.*Dcrus	Drusecu	Dumrus.*Dcecu	Drusarg	Dumrus.*Dcarg
Dsdarus	Dumsda.*Dcrus	Dsdaecu	Dumsda.*Dcecu	Dsdaarg	Dumsda.*Dcarg
Dturrus	Dumtur.*Dcrus	Dturecu	Dumtur.*Dcecu	Dturarg	Dumtur.*Dcarg

The fifth dummy is associated to the banking and currency crisis that Turkey suffered in 2000. The weaknesses of the Turkish bank system had been documented for a while and its burden on the budget precipitated a confidence crisis on the Lira. A quick IMF package in early 2001 helped stabilize the financial system. The sixth dummy captures the biggest default in the history of emerging markets. After two years of struggling, the Argentine government announced that the sovereign was ceasing payments on \$155 billion of outstanding debt in December 2001. An inevitable consequence was the fallout of the currency board. This episode marked the end of the convertibility era in Argentina.

3. ECONOMETRIC ANALYSIS

3.1 Types of regressions

We perform two types of regressions. The first type corresponds to country or region time series for individual regressions. These provide important preliminary insights about the behavior of spreads. In symbols,

$$y_t = j * \beta_0 + X_t * \beta + u_t \quad t = 1 : 60 \quad (1)$$

where,

y_t is the $T \times 1$ column vector of spreads for i th country or region ($T = 60$ in our case).

j is a $T \times 1$ column vector of 1s.

β_0 is the constant parameter.

X_t is the $T \times m$ matrix of associated explanatory variables.

β is the $m \times 1$ row vector of corresponding parameters.

u_t is the $T \times 1$ column vector of associated disturbances.

However, these individual times series regressions do not provide a complete picture of these events because they neglect the cross-section dimension of the data and, thus, they do not consider the whole sample variability. Therefore, we estimate dummy variable panel data regressions for all countries and regions.

Collecting and concatenating all country or regional equations such as (1) (18 in the case of countries and 3 in the case of regions), we obtain

$$y = D * \alpha + X * \beta^D + u \quad (2)$$

where,

y is the $nT \times 1$ column vector of spreads ($n = 18$ for countries or $n = 3$ for regions).

D is a $nT \times n$ matrix of column vectors d_i s.

d_i are n ($nT \times 1$) dummy variable column vectors such as elements.

$[1+(i-1)T : T+(i-1)T ; i = 1 : n]$ are equal to 1 and all other elements are equal to 0.

α is the $n \times 1$ column vector of associated parameters to D.

X is the $nT \times k$ matrix of associated explanatory variables.

β^D is the $k \times 1$ row vector of corresponding parameters to X.

u is the $nT \times 1$ column vector of associated disturbances.

u can be heterocedastic but we assumed they are not serially correlated. This assumption of no autocorrelation of the errors is important because, as Davidson and MacKinnon (1993) explained, it is not possible to perform bootstrapping resampling in the presence of serial correlation of the errors. To be sure, we run tests of serial correlation for each regression performed in this paper.¹⁸ Based on the results from these tests we do not find evidence of serial correlation of the errors. The dummy variable estimators are the estimators of α and β in equation (2).

3.2 Estimation Methods

For each type of regression we perform two sets of estimations. In the first set, we correct the standard errors of coefficient estimates for heteroscedasticity using the method introduced by White (1980). The key advantages of this procedure are that it is independent of the specific structure of the (possible) heteroscedasticity of the data, and that it has become standard in the applied econometric literature.

In our estimation we would like to minimize any possibility that our results are driven by small sample problems. Therefore, we investigate the finite sample properties of our estimators, standard errors and t-statistics using bootstrapping experiments. Broadly speaking, bootstrapping is a method for estimating any large sample statistic of interest by repetitive resampling with replacement from the same sample that the statistic comes from.¹⁹ This allows us to obtain the empirical probability distribution of any statistic.

The main advantage of this methodology is that the random variables (in our case, the spreads vector and the matrix of explanatory variables) are drawn from the empirical distribution of these variables and not from an assumed (normal) distribution. In other words, when bootstrapping is used the data itself helps to approximate its distribution.

¹⁸ This test consists of running a regression similar to the original regression but including as additional dependent variables the first order lag of the errors of the original regression. The second part of the test is to check for the significance of the t-statistic of this added regressor. The first observation is lost in this regression compared to the original. For our exercise, this variable was not significant in every regression. For details, see Wooldridge (2002), page 176.

¹⁹ Efron (1979) started off this procedure in his seminal paper. Other key contributions are Efron (1982), Efron and Gong (1983), Efron and Tibshirani (1986), Bickel and Freedman (1981), Freedman (1981) and Hall (1988). For some interesting bootstrapping applications to specific econometric issues see e.g. Freedman (1984), Freedman and Peters (1984), and Raj and Veall (1998). See Chapter 4 of Chernick (1999) for a comprehensive review of the mushroomed literature on bootstrap method applied to regression analysis.

There are two procedures for bootstrapping resampling. The first method consists of the following steps:

1. Run a regression model such as $y = X * \beta + u$ and obtain $\hat{\beta}$.
2. Resample with replacement the errors \hat{u} . We obtain $\hat{u}^{(b)}$.
3. Obtain least square estimates from bootstrap sample,

$$y^{(b)} = X\hat{\beta} + \hat{u}^{(b)}$$

$$\hat{\beta}^{(b)} = (X' * X)^{-1} X' * y^{(b)}$$

4. Repeat steps 2 and step 3 for $b = 1 \dots B$ and obtain $\hat{\beta}^{(b)}$ s to estimate standard errors and t-statistics.

The second method corresponds to the following steps,

1. Resample directly with replacement from the sample (y, X) . Obtain $(y^{(b)}, X^{(b)})$.
2. Obtain least square estimates from bootstrap sample,

$$\hat{\beta}^{(b)} = (X^{(b)'} * X^{(b)})^{-1} X^{(b)'} * y^{(b)}$$

3. Repeat steps 1 and step 2 for $b = 1 \dots B$ and obtain $(\hat{\beta}^{(b)})$ s to estimate standard errors and t-statistics.

In our paper we choose to use the second method due to several reasons. First, this resampling approach maintains the y and X association. From an economic point of view, this association is crucial in order to preserve the potential causality between y and X . Second, this procedure is less dependent of the statistical assumptions of the model selected in the sense that the first method assumes that the errors are well-behaved, that is, are independent and identically distributed.²⁰ Finally, as Stine (1985) stressed, the second method is more appropriate for survey data (our case) and the first procedure is better suited for experimental designs.

In our case we perform 10,000 bootstrap experiments for each regression estimated. We collect the estimators $(\hat{\beta}^{(b)s})$, their standard errors and bootstrap t-statistics. As the following tables show (Tables 7-10), the bootstrap standard errors are systematically higher than White-heteroscedastic consistent standard errors.²¹ In consequence, we choose to use bootstrap t-statistics in order to assess the significance of the estimators. This bootstrap t-statistics are much more stringent tests of significance because they consider these higher standard errors. Moreover, we carry out the 10,000 bootstrap experiments for estimating accurately these t-statistics.²²

3.3 Spreads Regressions

In Table 7 we run time series individual regressions for countries that, according to the analysis in Fuentes and Godoy (2004), were the main focus of financial crisis during the period of our sample. As we explained earlier, these regressions do not take into account the cross-section variability of our sample. Therefore, the conclusions we

²⁰ Davidson and MacKinnon (1993) emphasize this point.

²¹ The bootstrap and White-heteroscedastic consistent betas are extremely similar.

²² For bootstrap t-statistics see Efron and Tibshirani (1993).

TABLE 7
FOCAL COUNTRIES INDIVIDUAL REGRESSIONS
(INCLUDING CRISIS-DUMMY VARIABLES)
 (Dependent variable is the Monthly Change in the Spreads for Each Country)

	Constant	Dcasi	Dcrus	Dcbra	Dcecu	Detur	Dcarg	S-T	Rat	Liq	Arrears	Xrde
Argentina	456.6 (501.4) (428.1)	-206.7 (120.7) (100.7)	345.9* (130.2) (111.5)	226.7* (84.0) (69.5)	30.2 (108.0) (94.4)	110.6* (29.2) (21.5)	1661.7* (33.6) (25.8)	3.7** (2.5) (1.9)	263.0* (121.2) (78.6)	50.7 (34.8) (29.3)	10.9 (88.4) (81.2)	-23.4 (17.1) (14.8)
R-squared	0.3277											
Rbar-squared	0.1736											
Brazil	-378.7 (880.1) (829.4)	-127.6 (74.4) (70.1)	639.0* (44.4) (36.4)	-149.5 (221.9) (145.6)	-82.6 (61.4) (56.1)	76.3* (29.6) (27.6)	-103.9* (25.8) (24.9)	-0.5 (1.0) (0.8)	355.8 (192.3) (141.4)	11.1 (9.1) (7.7)		4.3 (12.0) (11.3)
R-squared	0.3934											
Rbar-squared	0.2696											
Ecuador	-3562.7 (1568.0) (1408.5)	-132.7 (160.2) (145.8)	949.2* (94.1) (88.2)	664.8* (161.4) (138.9)	346.0* (155.8) (140.4)	-250.8 (155.6) (144.5)	-16.2 (96.6) (89.9)	3.5 (2.7) (2.4)	125.8* (66.4) (57.4)	102.9 (64.9) (60.4)	-200.6 (105.6) (93.8)	48.8 (22.3) (20.1)
R-squared	0.3220											
Rbar-squared	0.1666											
Korea	1215.8 (1157.2) (985.4)	-280.3 (221.6) (200.3)	-190.1 (52.2) (46.8)	-22.6 (70.9) (44.9)	-134.3 (88.0) (74.2)	73.5** (55.6) (45.3)	-9.5 (20.5) (16.3)	0.2 (0.5) (0.5)	11.4 (83.9) (49.5)	-12.7 (17.5) (15.2)	975.5 (1238.8) (1061.9)	-18.6 (17.8) (15.0)
R-squared	0.5371											
Rbar-squared	0.4310											
Russia	1274.5 (2016.9) (1816.7)	-7.8 (147.2) (137.6)	3208.2*** (1201.6) (260.7)	-524.5 (918.9) (185.9)	-363.2 (146.1) (136.9)	60.2* (99.0) (89.7)	71.5 (319.2) (132.1)	1.1 (3.3) (3.1)	205.1 (305.9) (51.6)	4.6 (42.5) (40.9)	-60.7 (82.0) (78.4)	-17.9 (30.1) (27.5)
R-squared	0.5832											
Rbar-squared	0.4876											
Turkey	122.5 (402.3) (359.1)	-57.0 (35.2) (30.4)	523.4* (28.0) (24.5)	33.0* (18.3) (17.3)	58.2* (17.2) (15.5)	25.9** (28.7) (27.5)	-101.3* (21.2) (18.8)	1.0 (0.5) (0.5)	38.1 (92.1) (75.9)	-27.5 (20.4) (19.2)	180.7 (120.2) (114.8)	0.4 (5.5) (5.0)
R-squared	0.4565											
Rbar-squared	0.3319											

Note 1: The first row corresponds to the bootstrap regression estimate coefficients.

The second row corresponds to bootstrap standard errors.

The third row corresponds to White heteroscedastic consistent standard errors.

Note 2: The R-squareds and Rbar-squareds come from the bootstrap simulation.

* Significant at 1% level.

** Significant at 5% level.

*** Significant at 10% level.

can obtain in this case are tentatively. However, these individual country regressions already reflected some patterns that we will discuss in more detail for the panel data spreads and regional principal component regressions.

In Table 7 we can see that the coefficients for the Asian crisis are all negative but insignificant. These results are indeed preliminary and in the next table (Table 7) we will see that we find some significant effects of this crisis. The dummies for the Russian crisis are sizeable, significant, and positive for all the countries under study, except for Korea.²³ Table 7 also shows that the Brazilian devaluation seem to be confined to regional crisis but with some spillover to East Europe (see Turkey regression in Table 7).

The Ecuadorian crisis appears as an isolated country crisis. For the Turkish crisis we find a similar but milder effect than in the case of the Russian default. That is, all spread's coefficients are positive but they are smaller in size compared to the Russian default coefficients. Finally, the Argentine crisis emerges as a country specific event but having some rebalancing portfolio effect in other emerging countries (Brazilian and Turkish spreads fall significantly).

In conclusion, the only economic-financial variable that has some explanatory power is the change in sovereign credit ratings for Argentina and Ecuador. Nonetheless, all these tentative conclusions will be reviewed later when we look at the entire sample as well as the regional variability of spreads (see Table 8).

In Table 8 we perform a panel data regression of all emerging market spreads.

Table 8 shows that sovereign spreads increase in countries where the crisis events occurred. This happens in the case of Argentina, Brazil, Ecuador, Russia and Turkey. This pattern is important because it confirms the fact that countries in crisis experience a substantial widening of their sovereign yield spreads.

The Asian crisis was different in nature because it outspreaded to different countries and, thus, it would be difficult for specific country spreads to capture the effects of the event. Table 8 displays this crisis' coefficients. Spreads in East Europe and Latin America tend to sharply fall with some exceptions such as Colombia, Peru,²⁴ Russia, and South Africa. Spreads in Asia have a disposition to rise except for those of sovereigns like China²⁵ and Korea.²⁶ These results to some extent support the possibility that the Asian crisis triggered an important rebalancing effect on emerging market portfolios.²⁷

Table 8 also shows that the dummy for the Russian crisis is positive and significant for all emerging countries, except for Korea. We relate this result to some catastrophic events that occurred in emerging market bond market. In this case, the sign and size of the coefficient of this dummy is associated to an important abatement in the demand

²³ Fuentes and Godoy (2004) shows that this country has a distinctive behavior based on its good fundamentals and the rapid economic recovery it went through after the Asian Crisis.

²⁴ Using principal component analysis, Fuentes and Godoy (2004) show that spreads were especially sensitive to this crisis and relate this sensitivity to financial weaknesses and special ties to Asia.

²⁵ This country was not affected by the Asian crisis and, thus, it is not surprising that its spreads trace the pattern of other emerging market spreads.

²⁶ Fuentes and Godoy (2004) also explained that this country is somewhat "different" in the region based on its financial strength and rapid recovery from the crisis.

²⁷ The next tables (see Table 9 and Table 10) show that the dummy for the Asian crisis captures the effect of this crisis using a regional measure of sovereign yield spread.

for these bonds, that is, a reduction in capital flows to emerging markets. In the next section we provide more evidence on this point.

The Brazilian devaluation is a period of when portfolio flows drained away from Latin America²⁸ and East Europe, except for Russia. The dummy for the devaluation in Brazil captures a positive and significant effect on all Latin American and East European spreads, except for Russia. The non-significant coefficient for spreads in Russia is not surprising since at the time Russia was still emerging out of its own crisis. The effect of this event in Asia shows no clear pattern, as the rambling sign of the coefficient indicates.

The dummy for the default in Ecuador marks a mild rebalancing effect on emerging market portfolios. All emerging market spreads came out with negative coefficients except for the spreads in Ecuador, Poland, and Turkey²⁹ (see Table 8). As mentioned before, the dummy for the crisis in Turkey has a positive and significant effect on emerging market spreads in a similar but smoother way than the dummy for the crisis in Russia.³⁰ In essence, we find again that crisis events bring along a dip in portfolio flows toward emerging market sovereign assets.

The crisis in Argentina can be filed as an episode triggering very mild emerging market portfolio rebalancing (see Table 8). We believe this is based on the fact that spreads have a relative shallow decline in all emerging markets except for Venezuela. This is an outstanding result if one sees the crisis in Argentina as the biggest default in size ever in the history of emerging markets. Nonetheless, this result is not really that surprising. We will explain more in the next section.

Lastly, the economic-financial variable included in this regression has no explanatory power (Table 8). This includes our country specific variables, that is, changes in credit ratings,³¹ liquidity-related variable (cover ratio), willingness to pay variable (arrears) and trade variable. Moreover, we detect that changes in the international interest rates are also insignificant despite having the expected sign.

Generally speaking these results are somewhat inconsistent with the results found by the literature reviewed in this paper, as the literature gives some role for local economic and financial variables to explain sovereign spreads, even though their explanatory power is not indeed very strong. More importantly, the literature missed to check finite-sample properties of their estimators.³² Therefore, the results produced

²⁸ Using a structural vector autoregression model, Dungey *et al.* (2003) finds that Brazilian devaluation was a turmoil experienced by Latin American economies.

²⁹ The regional panel data regression confirms this result (see Table 10).

³⁰ The regional regressions confirm these findings (see Tables 9 and 10).

³¹ However, we do find evidence at a regional level that changes in credit ratings affect spreads. See next section.

³² For instance, the three modern papers that attempt to explain secondary market spreads are the following: Westphalen (2001), Arora and Cerisola (2001), and Uribe and Yue (2004). In the case of the first paper, he compiles 215 bonds but only 26 countries and an average of 38 monthly observations per bond. Arora and Cerisola (2001) perform time series country regressions for 10 countries. The number of observations by country is the following: Argentina (69 months), Brazil (69 months), Mexico (69 months), Panama (41 months), Colombia (33 months), Poland (62 months), Bulgaria (56 months), Philippines (69 months), Thailand (26 months), Korea (18 months) and Indonesia (33 months). Finally, Uribe and Yue (2004) have 28 quarters and 7 countries. Thus, their samples are similar or smaller in size than ours (60 months and 18 countries) but none of them investigate the finite sample properties of their estimators.

TABLE 8
ALL COUNTRIES PANEL DATA REGRESSION (INCLUDING CRISIS-DUMMY VARIABLES)
(Dependent variable is the Monthly Change in the Spreads for Each Country)

	Dumarg	Dumbra	Dumcol	Dumsecu	Dummex	Dumper	Dumven	Dumchi	Dumind	Dumkor	Dummal	Dumphi	Dumtha	Dumbul	Dumpol	Dumrus	Dumsda	Duntur
Fixed Effects	8.6 (117.1)	63.5 (158.4)	51.4 (163.4)	78.1 (171.6)	145.9 (203.2)	3.7 (180.8)	56.5 (188.3)	9.8 (155.0)	-36.2 (226.7)	44.5 (140.3)	48.4 (122.8)	82.9 (155.1)	38.0 (163.1)	71.0 (165.5)	87.9 (182.6)	21.4 (179.4)	123.7 (177.7)	96.3 (181.5)
	(114.2)	(155.1)	(159.9)	(168.4)	(199.8)	(176.9)	(184.9)	(151.7)	(222.6)	(137.9)	(120.6)	(152.3)	(160.0)	(162.3)	(179.1)	(175.9)	(174.5)	(178.0)
Dugasi	Dbraasi	Dcolasi	Ddecusi	Ddexusi	Dperasi	Dvenusi	Dchiasi	Dindasi	Dkorasi	Dmalasi	Dphiusi	Dthiasi	Dbulasi	Dpolasi	Dnusi	Ddsasi	Dturasi	
-136.1*	-179.3*	9.3*	-125.0	-81.2*	254.4*	-75.6*	-23.3*	256.4	-160.5	78.0*	-7.4	23.2*	-119.0	-52.2*	80.1*	55.4*	-34.8*	
(48.9)	(25.7)	(18.4)	(63.7)	(8.3)	(14.2)	(24.8)	(17.2)	(148.5)	(77.2)	(15.7)	(18.0)	(45.1)	(133.4)	(13.9)	(68.4)	(9.6)	(20.9)	
(48.2)	(25.0)	(17.8)	(63.1)	(8.2)	(13.8)	(24.3)	(16.9)	(146.8)	(74.5)	(15.4)	(17.7)	(44.3)	(131.3)	(13.5)	(67.5)	(9.1)	(20.3)	
Dargus	Dbranus	Dcolrus	Ddecrus	Ddexrus	Dperus	Dvenrus	Dchirus	Dindrus	Dkorrus	Dmalrus	Dphirus	Dthirus	Dbulrus	Dpolrus	Dnusrus	Ddsrus	Dturus	
448.8*	622.4*	342.7*	1152.0*	421.1*	249.9*	971.5*	157.8*	614.7*	-137.6*	396.7*	592.9*	335.2*	901.1*	231.0*	3739.1*	455.8*	512.2*	
(47.6)	(37.3)	(19.0)	(60.1)	(7.3)	(16.3)	(25.3)	(12.6)	(58.3)	(20.8)	(11.5)	(16.3)	(18.6)	(20.3)	(7.4)	(134.2)	(9.3)	(17.1)	
(46.7)	(35.8)	(18.3)	(59.0)	(7.2)	(16.0)	(25.2)	(12.1)	(57.6)	(20.7)	(11.2)	(16.0)	(18.1)	(19.5)	(7.2)	(126.4)	(9.2)	(16.7)	
Dargbra	Dbrabra	Dcolbra	Ddecbra	Ddexbra	Dperbra	Dvenbra	Dchibra	Dindbra	Dkorbra	Dmalbra	Dphibra	Dthibra	Dbulbra	Dpolbra	Dnusbra	Ddsabra	Dturbra	
79.0*	97.0*	21.7*	447.7*	14.4*	153.4*	105.4*	0.1	96.8*	10.9*	-145.2*	-12.0*	-65.3*	45.2*	3.9*	-214.4	46.8*	25.4*	
(43.1)	(38.2)	(21.2)	(114.0)	(7.4)	(21.0)	(18.9)	(10.9)	(34.2)	(25.5)	(12.7)	(10.3)	(14.8)	(19.4)	(7.9)	(139.4)	(8.0)	(13.6)	
(42.9)	(36.4)	(21.0)	(112.5)	(7.2)	(20.8)	(18.8)	(10.5)	(33.0)	(23.2)	(12.4)	(10.1)	(14.4)	(19.0)	(7.7)	(135.3)	(7.9)	(13.1)	

TABLE 8 (Continued)

	Dargecu	Dhnaecu	Dcoilecu	Dceutecu	Dmexecu	Dporecu	Dvaneecu	Dchiecu	Dindecu	Dkorecu	Dmalecu	Dphiecu	Dthaeecu	Dbuilecu	Dpolecu	Druisecu	Dsdlaecu	Dturecu
Ecuadorian Default	-40.1 (46.9)	-88.7* (26.3)	-72.5* (16.3)	223.0** (116.6)	-39.5* (10.1)	-31.1* (22.1)	-77.9* (22.8)	-73.3* (11.6)	-244.9* (36.1)	-57.6* (20.5)	-51.2* (15.4)	-31.4* (12.0)	-53.8* (14.3)	-92.3* (18.1)	45.1* (29.3)	-450.0 (102.6)	-111.9* (10.2)	20.3* (16.5)
	(46.1)	(26.1)	(16.2)	(115.2)	(9.8)	(21.7)	(22.5)	(11.2)	(35.2)	(20.5)	(15.3)	(11.7)	(13.9)	(17.5)	(27.3)	(101.0)	(9.8)	(16.1)
Dargtur	Dbratur	Dcoltur	Dcutur	Dmextur	Dpertur	Dventur	Dchitur	Dindtur	Dkortur	Dmaltur	Dphitur	Dthatur	Dbultur	Dpoltur	Drustur	Dsdatur	Drturur	
72.6* (43.5)	64.6* (28.0)	23.7* (13.8)	98.0* (68.1)	58.3* (8.2)	124.0* (15.0)	45.8* (19.1)	43.2* (15.3)	387.4 (167.5)	22.3* (16.9)	40.0* (10.6)	158.1* (9.8)	25.2* (11.2)	53.8* (17.7)	25.7 (5.2)	107.7* (44.5)	40.4* (7.9)	48.7* (14.2)	
(42.7)	(27.2)	(13.5)	(66.7)	(8.0)	(14.6)	(18.5)	(14.9)	(154.1)	(17.0)	(10.4)	(9.7)	(10.8)	(17.3)	(5.0)	(43.8)	(7.6)	(13.9)	
Dargung	Dbraung	Dcolang	Dcuang	Dmexang	Dperang	Dvenang	Dchiang	Dindang	Dkorang	Dmalang	Dphiang	Dthang	Dbulang	Dpolang	Drusang	Ddsang	Dturang	
1607.3* (42.8)	-112.4* (22.8)	-55.8* (21.8)	-139.6* (66.5)	-42.7* (7.6)	-40.1* (12.0)	87.1* (23.8)	-4.4* (7.8)	-21.7 (56.3)	-43.2* (18.1)	-13.0* (10.3)	-136.5* (13.5)	14.0* (9.8)	-58.1* (15.7)	-19.5* (6.0)	16.9 (49.5)	55.2* (7.7)	-89.0* (14.1)	
(42.7)	(22.3)	(21.5)	(64.2)	(7.4)	(11.7)	(23.3)	(7.6)	(55.2)	(18.2)	(10.2)	(13.4)	(9.6)	(15.4)	(5.8)	(47.3)	(7.7)	(13.7)	
S-T	Rat	Liq	Arre	Xrde														
0.4	61.2	9.9	7.4	-1.8														
Economic- Financial	(0.2)	(27.5)	(6.3)	(46.8)	(2.1)													
(0.2)	(25.1)	(6.2)	(46.1)	(2.0)														
R-squared	0.3853																	
Rbar-squared	0.3011																	

Note 1: The first row corresponds to the bootstrap regression estimate coefficients. The second row corresponds to bootstrap standard errors.

Note 2: The R-squareds and Rbar-squareds come from the bootstrap simulation.

* Significant at 1% level.
** Significant at 5% level.

in this framework need to be taken with a grain of salt as small sample issues have an important impact on them.³³ As in any other small sample case, the standard errors of the estimators can be notably underestimated, questioning then the robustness of the results. We get around this problem by using bootstrap resampling methodology.

The lack of significance of the coefficient of the international interest rate is an interesting result. As discussed earlier, this variable is important, as it is a proxy for global liquidity. Although its sign and significance have been a topic of extensive discussion in the literature, the literature is not conclusive on the sign and significance of this variable.

The first paper to introduce this variable to the literature was written by Min (1998). He found that the 3-month U.S. Treasury bill rate has a positive but insignificant coefficient. Kamin and Kleist (1999) using the same interest rate found a positive effect but its significance level broke down when they divided the sample into two sub-periods (before and after the Mexican crisis). Eichengreen and Mody (2000) employed 10-year U.S. Treasury bond rates and obtained a different result, as the coefficient of this variable was negative but insignificant for the whole sample. However, coefficients for Latin America are positive and significant. All these papers attempt to explain primary spreads and, as we explained earlier, these spreads show a different behavior vis-à-vis secondary spreads employed in this paper.

To the best of our knowledge, there are three papers that attempt to explain secondary spreads using some measure of international interest rates. Westphalen (2001) also uses 10-year U.S. Treasury bond rate and finds a significant negative effect on spreads. However, the R-square of these regressions makes him cautious on his results. Arora and Cerisola (2001) employ the U.S. federal funds rate and get a positive and significant coefficient. Finally, Uribe and Yue (2004) find a positive but marginally significant effect for the 3-month U.S. Treasury bill rate.

To sum up, there is no clear agreement in the literature on the significance (and even on the sign) of the coefficient of international interest rate when the variable is involved in spread regressions. From that point of view, our positive but not significant coefficient is not that surprising. Moreover, this result is based mainly on the bootstrap estimation since the White-heteroscedastic consistent estimation provides a coefficient that is significant at only 10%. Thus, it would be an interesting exercise to check whether the literature results survive applying bootstrap resampling or another large sample simulation technique for their specific sample.

³³ On one hand, in Table 8 several variables became insignificant when the bootstrap methodology is used relative to the output of the White-heteroscedastic consistent t-statistics. They are the following: decuasi, dindasi, dkorasi, drusecu, dindtur, decuarg, S-T and rat. On the other hand, in Table 8 more than a few variables become significant using bootstrap vis-à-vis White-heteroscedastic consistent t-statistics. They are the following: dcolasi, dchiasi, dthaasi, drusasi, dcolbra, dkorbra, dphibra, dpolbra, dperecu, dpolecu, dturecu, decutur, dkortur, dchiarg, dmalarg and dthaarg. For definitions of these variables see Table 5 and Table 6. These dissimilar results emphasize the importance of checking the finite properties of the estimators using bootstrap or another large sample simulation technique. In addition, in our case the bootstrap resampling validates the importance of the crisis events captured by our dummies and refutes the significance of the economic-financial variable.

3.4 Principal Component Regressions

In this section we perform regressions using each regional first principal component as dependent variable (Table 9 and 10). In section 2.1 we gave economic interpretation to this variable—a measure of regional spread. We did so by checking the correlation with regional EMBI bond price indices.

In a similar fashion as the panel data regression of spreads, Tables 9 and 10 show that when there is a crisis in a continent the regional spreads go up. This occurs in the case of the Asian Crisis, the crisis in Russia, the devaluation in Brazil, the currency and banking crises in Turkey, and the default in Ecuador and Argentina are distinctive for reasons that we will explain below.

As we saw earlier, the Asian crisis suggests a rebalancing effect in the emerging market portfolio. This phenomenon is also explained by Pettis (2001). He states,

“The Asian crisis, ironically, led indirectly to a major buildup of liquidity, primarily in the United States, which may have contributed to the strong stock and high-yield markets and undoubtedly helped subsequently power the Latin American debt markets...”

Furthermore, a remarkable table (reproduced in Table 11) in Pettis’ book shows the evolution of capital flows in Asian economies at the time of the crisis. This table shows the sharp reversal of capital flows that Asia swallowed. These flows were available for investing in other regions and, thus, regional spreads went down (significantly) in Latin America and (not significantly) in East Europe, as Table 9 and 10 shows.

Van Royen (2002) describes a similar behavior around the Asian crisis as well. She basically calculates indices that aim to capture the degree of contagion and capital flows between August 1996 and September 2000 simultaneously. This means that this author includes four episodes from our sample period, which are the following: the Asian crisis, the default in Russia, the devaluation in Brazil, and the default in Ecuador. Her results are very similar to ours. In the case of the Asian crisis, she stresses that the crisis induced flows to get directed to safer regions.

The crisis in Russia mustered up an important widening in all emerging market regional first principal components of the spreads. This result is similar to the one found for the spreads themselves. We consider that this strong outcome can only be explained by an important withdrawal of portfolios flows to emerging markets, as mentioned by J.P. Morgan Chase Bank (2003):

“Chart 3 highlights that trading volumes for benchmark Brazil, Mexico and Russia instruments are less than one-third of the levels recorded before the 1998 Russian crisis”.³⁴

³⁴ See page 3 of J.P. Morgan Securities (2003).

TABLE 9
REGIONAL PRINCIPAL COMPONENTS INDIVIDUAL REGRESSIONS (INCLUDING CRISIS-DUMMY VARIABLES)
(Dependent variable is the Monthly Change in the First Principal Component of the Spreads for Each Region)

	Constant	Deasi	Derus	Debra	Dcecu	Detur	Dearg	S-T	Rat	Arrears	Liq	Xde
Latin America	8427.3 (6443.7) (5320.3)	-72.8* (43.4) (38.3)	1475.0* (56.4) (48.7)	317.1* (75.8) (52.2)	-88.0 (70.6) (59.1)	106.5 (143.4) (97.6)	120.2 (81.1) (69.0)	2.9 (2.1) (1.7)	101.3 (65.1) (39.9)	69.0 (48.8) (272.9)	244.9 (318.6) (43.0)	-90.3 (65.9) (54.2)
R-squared	0.4885											
Rbar-squared	0.3713											
Asia	25777.6 (20623.5) (15313.4)	134.5* (83.1) (58.1)	866.0* (123.6) (102.7)	21.3 (47.6) (43.7)	-122.4** (39.3) (37.5)	222.3* (91.6) (72.4)	-45.9* (22.5) (20.9)	0.6 (0.9) (0.8)	28.7 (14.6) (11.9)	-31.2 (32.8) (449.1)	622.7 (498.4) (31.4)	-259.4 (208.5) (154.6)
R-squared	0.5344											
Rbar-squared	0.4277											
East Europe	-326.8 (4021.6) (3483.0)	-68.4 (90.5) (78.8)	2469.1* (174.1) (86.2)	19.8 (132.2) (76.2)	-150.9 (75.3) (62.3)	125.2* (74.6) (64.1)	-24.6 (46.4) (25.9)	1.1 (1.2) (1.0)	34.8 (40.9) (16.6)	-1.0 (44.8) (106.1)	-211.0 (113.8) (38.5)	4.5 (41.7) (36.4)
R-squared	0.6094											
Rbar-squared	0.5199											

Note 1: The first row corresponds to the bootstrap regression estimate coefficients.

The second row corresponds to bootstrap standard errors.

The third row corresponds to White heteroscedastic consistent standard errors.

Note 2: The R-squareds and Rbar-squareds come from the bootstrap simulation.

* Significant at 1% level.

** Significant at 5% level.

TABLE 10

ALL REGIONS PANEL DATA REGRESSION (INCLUDING CRISIS-DUMMY VARIABLES)
 (Dependent variable is the Monthly Change in the First
 Principal Component of the Spreads for Each Region)

	Dumla	Dumas	Dumee			
	5175.7	5208.2	5030.8			
Fixed Effects	(3303.6)	(3336.8)	(3185.8)			
	(3206.4)	(3237.0)	(3089.7)			
	Dumlaasi	Dumlarus	Dumlabra	Dumlaecu	Dumlatur	Dumlaarg
	-59.1*	1513.5*	339.6*	-24.2	129.3*	-156.6*
Latin America	(36.6)	(38.6)	(39.3)	(42.7)	(47.5)	(46.0)
	(35.8)	(37.0)	(37.8)	(41.7)	(46.0)	(44.7)
	Dumasasi	Dumasrus	Dumasbra	Dumasecu	Dumastur	Dumasarg
	49.0*	890.2*	-14.8	-179.8*	326.2*	-44.4*
Asia	(55.5)	(26.7)	(28.7)	(33.0)	(77.2)	(25.9)
	(52.4)	(25.5)	(27.7)	(31.8)	(71.8)	(25.1)
	Dumeeasi	Dumeerus	Dumeebra	Dumeeecu	Dumeetur	Dumeearg
	-34.5	2519.7*	-53.0	-255.7*	24.0	-49.7*
East Europe	(43.5)	(66.0)	(70.8)	(60.1)	(59.6)	(27.1)
	(41.0)	(63.6)	(68.2)	(58.1)	(57.0)	(25.5)
	S-T	Rat	Liq	Arrears	Xrde	
	1.2	34.5*	10.1	-7.6	-53.5	
Economic-Financial	(0.6)	(11.6)	(17.1)	(101.8)	(33.8)	
	(0.6)	(10.9)	(16.1)	(98.4)	(32.8)	
R-squared	0.5699					
Rbar-squared	0.5001					

Note 1: The first row corresponds to the bootstrap regression estimate coefficients.

The second row corresponds to bootstrap standard errors.

The third row corresponds to White heteroscedastic consistent standard errors.

Note 2: The R-squareds and Rbar-squareds come from the bootstrap simulation.

* Significant at 1% level.

TABLE 11

NET CAPITAL FLOWS
(US\$ Billions)

	1995	1996	1997	1998
Current Account	-41	-55	-26	69
Private Flows	80	102	0	-28
Equity Investment	15	19	4	14
Private Creditors	65	84	-4	-41

Note: This net figures correspond to Indonesia, Malaysia, Philippines, Korea and Thailand.

Source: Pettis (2001).

This chart stresses the point that the crisis in Russia was a major event that triggered a significant departure of portfolio flows from emerging markets.³⁵ Van Royen (2002) also found evidence that this crisis was a major episode of aggregated capital outflows for emerging economies. As we have seen in this paper, this strong effect is dominant in all our regressions and, thus, we believe this crisis caused a great upward shift in emerging market spreads.³⁶

The devaluation in Brazil is another interesting event. In the previous section we argued that this crisis caused mostly an exit in portfolio flows from Latin American and East European countries but Russia.³⁷ In addition, we did not discern any effect of this crisis on Asian spreads. Table 9 and 10 confirm the important effect on Latin America and the lack of a significant effect on Asia. The case of East European spreads is more intriguing. As shown in these tables, we find no significant effect of the crisis on our measure of regional spreads in East Europe. This could be explained by the fact these regional spreads traced better the path of spreads in Russia³⁸ which were not affected by this episode, as Tables 7 and 8 confirm.

The default in Ecuador displays the effects of a mild rebalancing in emerging market portfolios. Ecuador is a very small country. Its weight in the EMBI Plus market capitalization index is only 1.8% and its external debt represented only 0.96% of 1999 total external debt of the countries included in this sample. As we saw in the former

³⁵ Moreover, this catastrophic event had spillovers on developed financial markets. This episode is related to the collapse of the Long Term Capital Management hedge fund and the intervention of the Fed to avoid a financial crisis of larger magnitude (Edwards (1999)).

³⁶ Dungey *et al.* (2003) also finds evidence that the crisis in Russia was what they called a “global credit risk shock”.

³⁷ Van Royen (2002) finds evidence that the episode caused a milder departure of portfolios flows from emerging markets.

³⁸ The correlation between spreads in Russia and the first principal component in East Europe is 95.3 - the largest in our sample. In the case of the EMBI Plus, Russia represents 36.7% of this index and carries the largest weight. See page 7 of J.P. Morgan Securities (1999).

section, spreads in Ecuador substantially widened and other emerging market spreads narrowed, except for the spreads in Poland and Turkey. Using regional measures of spreads as seen in Table 10, reveal that spreads in Asia and East Europe significantly narrowed and spreads in Latin America narrowed as well but not significantly. Given that spreads appear to have slightly narrowed in size, we argue this episode corresponds to a mild rebalancing of emerging market portfolios.³⁹

The episode of banking and currency crises in Turkey was a similar experience to the crisis in Russia, but with smaller-scale effects on spreads. Table 9 and 10 show that almost all regional spreads went up significantly but the coefficients are much smaller than in the case of the crisis in Russia. Thus, this behavior is consistent with a milder aversion in investors' appetite for emerging market bonds.

The default in Argentina is a unique event when compared to episodes discussed here. As mentioned in the previous section, the default called for some rebalancing of emerging market portfolios, which in turn caused yield spreads to slightly narrow, except for Venezuela. Table 9 and 10 confirm our finding. We reiterate this event is the biggest default in the emerging market default history. Given the magnitude of this event we expected the crisis to bring with it a larger rebalancing of emerging market portfolios. This apparent surprising result can be explained by the fact that economists and market analysts had anticipated the cease of payments several months before the actual credit event. In fact, a prominent economist like Allan Meltzer (Meltzer (2002)) wrote in his testimony to the U. S. House of Representatives,

“Astute observers recognized publicly more than a year ago (and privately as early as 1999) that Argentina’s foreign currency denominated debt was unsustainable”.⁴⁰

Therefore, when the default finally occurred in December 2001, there was no surprise and spreads slightly narrowed, as the event had been fully anticipated. In consequence, we deem this crisis as a foreseen crisis that caused an important disruption exclusively in this country. However, on a cautionary note, the timing and associated costs to this crisis was not really forecasted by the same economists and market analysts.

Finally, we find that changes in credit ratings have the expected effect on regional spreads. That is, if an economy gets downgraded in any particular region, regional spreads widen by 34.5 basis points. This result is consistent with some of the literature reviewed in Section 1. In particular, Kaminsky and Schmukler (1999) found that credit rating agencies news triggered stock price movements in Asian countries and Baig and Goldfajn (1999) attested that downgrades in credit ratings negatively affect asset

³⁹ Van Royen (2002) indices showed that around the time of the actual default there was not a specific spillover to other emerging markets (see figures 2 and 3 in her paper).

⁴⁰ A good example of an “astute observer” is Calomiris (2001). Moreover, Calomiris (2003) explained that research conducted in investment banks in Wall Street stayed mute about the obvious lack of Argentina’s solvency because of their interest in profiting from underwriting fees offered by Cavallo’s debt swap operations in June 2001.

prices such as exchange rates, stocks and sovereign bonds. In addition, Kamin and Kleist (1999) and Eichengreen and Mody (2000) found evidence that better credit ratings lead to lower sovereign spreads.

4. CONCLUSIONS

This paper examined a very turbulent period in the financial history of emerging markets. Financial and currency crises were very common in these economies over this period. The most disruptive events in chronological order were the Asian crisis, the default in Russia, the devaluation in Brazil, the default in Ecuador, the banking and currency crises in Turkey, and the default in Argentina. This paper was an attempt to explain the variability of emerging market sovereign spreads by combining the usual economic-financial variables obtained from the emerging market literature with dummy variables that aim to capture those crisis episodes. Therefore, our estimations were not only based on economic-financial variables that from a theoretical point of view should explain the variability of spreads, but they were also based on a comprehensive reading of these disruptive events that disturbed the emerging markets in this period.

For this purpose, we performed country and regional time series and panel data regressions for the period between October 1997 and September 2002. We considered countries from Asia, Latin America and East Europe. Regional measures of spreads we computed out of the first principal component of each region. Since the sample period was not very long we examined the finite sample properties of our regressors performing bootstrap resampling. These bootstrap experiments helped overcome the possibility that our results were driven by small sample properties of the estimators.

Our results are summarized as follows. First, we detected almost no effect of economic-financial variables. This result differs from other result found in the literature on the determinants changes in emerging market spreads. A possible explanation for this dissimilar result is a distinct sample period. An alternative explanation is that this is the first paper in the literature to examine the finite sample properties of estimators of changes in spreads. Bootstrapping resampling has important implications for the validity of our results by, broadly speaking, strengthening the significance of the crisis dummies and diminishing the significance of the financial-economic variables. Therefore, it is certainly an interesting exercise to verify whether other authors' results might change by checking the finite sample properties of those regressors.

Second, based on the dummies aiming to capture the effect of crisis events, we found evidence that crisis in emerging markets have a country or regional character. This result was quite consistent among the estimations. In particular, the dummies showed that spreads increased robustly in every country that faced a crisis. This was true for the crisis in Russia, the devaluation in Brazil, the default in Ecuador, the crisis in Turkey, and the default in Argentina. Furthermore, we also found that a similar result for the only crisis in our sample that had a regional character – the Asian crisis. The regional measure of spreads showed that Asian spreads significantly widened over the Asian crisis.

Third, when we examined the effect of these country or regional crisis-events on other countries or regions we highlighted some important differences among these episodes. For instance, the Asian crisis could be classified as an episode of important rebalancing of emerging market portfolios because spreads in other regions narrowed in tandem over this period. In addition, the crisis in Russia produced a sizeable exit of portfolio flows from emerging market bond markets, and in turn, all emerging market spreads widened substantially and significantly.

The devaluation in Brazil resulted in an exodus of portfolio flows from Latin American and East European assets, with the exception of Russian assets. All spreads in Latin America and East Europe (with the exception of Russia) rose significantly and there was no clear effect on the Asian economies. Additionally, the default in Ecuador is certainly a country-specific crisis with some rebalancing of emerging market portfolios. Spreads widened strongly in Ecuador and mildly narrowed in almost all other developing economies.

The crisis in Turkey is another event where there was a departure of portfolio flows from emerging bond markets. Spreads soared significantly in every emerging market but in a mildly way compared to the crisis in Russia. Finally, the cease of payments in Argentina had similar characteristics to a rebalancing portfolio episode but in this case there was some evidence that market participants anticipated this crisis. Spreads widened by several orders of magnitude in Argentina and narrowed in almost all other emerging markets.

Our empirical work provides an important insight for policy-makers in emerging market countries. Policy-makers should be aware that developing economies have been subject too often to crisis events and they do not have much control over the occurrence of these episodes. This paper has provided evidence on this issue. In sum, structural reforms leading to improve the long-run economic performance of these economies should also include policies that help to protect the country from these unruly common episodes.

Policy-makers in emerging markets should seriously consider the possibility that their country might be hit by a crisis and, thus, a capital structure is a must to deal with these catastrophic events.⁴¹ For instance, if the private sector is incurring in excessive currency risk because the international interest rates are very low the sovereign should consider design its capital structure in order to partially or fully offset this risk.

As future work we envisage two important developments. First, there are some excellent accounts from a historical perspective on how prone are emerging economies to financial and currency crises.⁴² This literature emphasizes the importance of liquidity conditions in developed markets in order to explain changes in emerging market asset prices. However, this interesting historical work has not been matched by empirical measures of country liquidity that go beyond changes in international interest rates,

⁴¹ Pettis (2001) provides some insight on this area from a liability management point of view. See also Beim and Calomiris (2001).

⁴² Kindleberger (1996) is probably the best historical account on this area. See also Pettis (2001).

such as, US Treasury bill and bond rates, other developed market default-free interest rate and LIBOR.⁴³

Finally, there is ample room for improving local measures of financial strength in the empirical work. The current measures are clearly unsatisfactory in terms of having any explanatory power on sovereign spreads. The contagion literature, partially reviewed in this paper, provides some good insights but more work needs to be done on this area.

REFERENCES

- ARORA, V. and M. CERISOLA (2001). "How Does U.S. Monetary Policy Influence Sovereign Spreads in Emerging Markets?", *International Monetary Fund Staff Papers* 48 (3), pp. 474-498.
- BAIG, T. and I. GOLDFAJN (1999). "Financial Markets Contagion in the Asian Crisis", *International Monetary Fund Staff Papers* 46 (2), pp. 167-195.
- BANERJEE, A. (1992). "A Simple Model of Herd Behavior", *Quarterly Journal of Economics* 107 (3), pp. 797-817.
- BARNES, K. and W. CLINE (1997). "Spreads and risks in emerging markets lending", Institute of International Finance *Working Paper* N° 97-1, Washington D.C.
- BEIM, D. and C. CALOMIRIS (2001). *Emerging Financial Markets*, Boston: McGraw-Hill/Irwin.
- BICKEL, P. and D. FREEDMAN (1981). "Some Asymptotic Theory for the Bootstrap", *Annals of Statistics* 9 (6), pp. 1196-1217.
- BIKHCHANDANI, S.; D. HIRSHLEIFER and I. WELCH (1992). "A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades", *Journal of Political Economy* 100 (5), pp. 992-1026.
- BOEHMER, E. and W. MEGGINSON (1990). "Determinants of Secondary Market Prices for Developing Country Syndicated Loans", *Journal of Finance* 45 (5), pp. 1517-1539.
- BULOW, J. and K. ROGOFF (1989a). "Sovereign Debt: Is to Forgive to Forget?", *American Economic Review* 79 (1), pp. 43-50.
- _____ (1989b). "A Constant Recontracting Model of Sovereign Debt", *Journal of Political Economy* 97 (1), pp. 155-78.
- CALOMIRIS, C. (2001). "Argentina Can't Pay What It Owes?", *Wall Street Journal*, 13 April.
- _____ (2003). "Lessons from Argentina and Brazil", *Cato Journal* 23 (1), pp. 33-45.
- CALVO, S. and C. REINHART (1995). "Capital Flows to Latin America" in Guillermo Calvo, Morris Goldstein and Eduard Hochreiter (eds.), *Private Capital Flows to Emerging Markets After the Mexican Crisis*, Washington: IIE, pp. 151-171.
- CANTOR, R. and F. PACKER (1996). "Determinants and Impact of Sovereign Credit Ratings", *Economic Policy Review* 2 (2), Federal Reserve Bank of New York, pp. 37-53.
- CHERNICK, M. (1999). *Bootstrap methods: A Practitioner's Guide*, New York; Chichester [England]: Wiley.
- DAVIDSON, R. and J. MACKINNON (1993). *Estimation and inference in econometrics*, New York: Oxford University Press.
- DUNGEY, M.; R. FRY; B. GONZALEZ-HERMOSILLO and V. MARTIN (2003). "Characterizing Global Investors' Risk Appetite for Emerging Market Debt During Financial Crises", *International Monetary Fund, Working Paper* WP/03/251.

⁴³ Kennedy and Slok (2004) tried a measure of money supply in industrial countries to explain the first principal component of the U.S. and Western European corporate bond risk premium, the developed countries' equity premium and emerging market spreads. They found that it had a significant effect on their regressions. However, their result is not comparable to ours because they used different dependent variables. Additionally, we tried a variable similar to their variable but it was not significant in our regressions.

- EATON, J. and M. GERSOVITZ (1981). "Debt with Potential Repudiation: Theoretical and Empirical Analysis", *Review of Economic Studies* 48 (2), pp. 289-309.
- EDWARDS, F. (1999). "Hedge Funds and the Collapse of Long-Term Capital Management", *Journal of Economic Perspectives* 13 (2), pp. 189-210.
- EDWARDS, S. (1984). "LDC Foreign Borrowing and Default Risk: An Empirical Investigation, 1976-80", *American Economic Review* 74 (4), pp. 726-34.
- _____ (1986). "The Pricing of Bonds and Bank Loans in International Markets: An Empirical Analysis of Developing Countries' Foreign Borrowing", *European Economic Review* 30 (3), pp. 565-589.
- EFRON, B. (1979). "Bootstrap Methods: Another Look at the Jackknife", *Annals of Statistics* 7 (1), pp. 1-26.
- _____ (1982). *The Jackknife, the Bootstrap and Other Resampling Plans*, CBMS-NSF Regional Conference Series in Applied Mathematics, Monograph 38, SIAM, Philadelphia.
- EFRON, B. and G. GONG (1983). "A Leisurely Look at the Bootstrap, the Jackknife, and Cross-Validation", *American Statistician* 37 (1), pp. 36-48.
- EFRON, B. and R. TIBSHIRANI (1986). "Bootstrap Methods for Standard Errors, Confidence Intervals, and Other Measures of Statistical Accuracy", *Statistical Science* 1(1), pp. 54-75.
- _____ (1993). *Introduction to the bootstrap*, New York: Chapman & Hall.
- EICHENGREEN, B. and A. MODY (2000). "What Explains Spread on Emerging Market Debt?" in Sebastian Edwards (ed.), *Capital Flows and The Emerging Economies: Theory, Evidence, and Controversies*, Chicago: University of Chicago Press, pp. 107-136.
- EICHENGREEN B.; A. ROSE and C. WYPLOSZ (1996). "Contagious Currency Crisis", *Scandinavian Economic Review* 98 (4), pp. 463-484.
- FORBES, K. (2001). "Are Trade Linkages Important Determinants of Country Vulnerability to Crises?", *NBER Working Paper* 8194.
- FRANKEL, J. and S. SCHMUKLER (1996). "Country Fund Discounts and the Mexican Crisis of December 1994", *Open Economies Review* 7, pp. 511-34.
- FREEDMAN, D. (1981). "Bootstrapping Regression Models", *Annals of Statistics*, 9 (6), pp. 1218-1228.
- _____ (1984). "On Bootstrapping Two-Stage Least Squares Estimates in Stationary Linear Models", *Annals of Statistics* 12 (3), pp. 827- 42.
- FREEDMAN, D. and S. PETERS (1984). "Bootstrapping a Regression Equation: Some Empirical Results", *Journal of the American Statistical Association* 79 (385), pp. 97-106.
- FRIEDMAN, E.; S. JOHNSON and A. LANDSBERG (2001). "Large-Scale Synchrony, Global Interdependence and Contagion", Rutgers University, Department of Economics, *Departmental Working Papers* 200103.
- FUENTES, M. and S. GODOY (2004). "Co-movements in Emerging Market Spreads: A Principal Component Analysis", Central Bank of Chile, *Working Paper* N° 332.
- GLICK, R. and A. ROSE (1999). "Contagion and Trade: Why are Currency Crises Regional?", *Journal of International Money and Finance* 18 (4), pp. 603-617.
- HALL, P. (1988). "Theoretical Comparison of Bootstrap Confidence Intervals", *Annals of Statistics* 16 (3), pp. 927-953.
- HAQUE, N.; M. KUMAR; N. MARK and D. MATHIESON (1996). "The Economic Content of Indicators of Developing Country Creditworthiness", International Monetary Fund, *IMF Working Papers* 96/9.
- J.P. MORGAN (1999). *Introducing the J.P. Morgan Emerging Markets Bond Index Global (EMBI Global)*, Emerging Market Research, New York.
- J.P. MORGAN CHASE BANK (2003). *Emerging Market Outlook*, Emerging Market Research.
- KAMIN, S. and K. VON KLEIST (1999). "The Evolution and Determination of Emerging Market Credit Spreads in the 1990s", Board of Governors of the Federal Reserve System, International Finance Discussion Papers 653.
- KAMINSKY, G. and S. SCHMUKLER (1999). "What Triggers Market Jitters?", *Journal of International Money and Finance* 18 (4), pp. 537-560.
- KENNEDY, M. and T. SLOK (2004). "Factors Driving Risk Premia", Organization for Economic Cooperation and Development, Economics Department, *Working Paper* N° 385.

- KINDLEBERGER, C. (1996). *Manias, Panics, and Crashes: A History of Financial Crises* (Third Edition), New York, NY: John Wiley & Sons, Inc.
- MASSON, P. (1999). "Contagion: Macroeconomic Models with Multiple Equilibria", *Journal of International Money and Finance* 18(4), pp. 587-602.
- MELTZER, A. (2002). "Argentina and the IMF", Testimony before the Committee on Financial Structure, Subcommittee on International Monetary Policy and Trade U.S. House of Representatives.
- MIN, H. (1998). "Determinants of Emerging Market Bond Spread: Do Economic Fundamentals Matter?", World Bank, *Working Paper* N° 1899.
- MONFORT, B. and C. MULDER (2000). "Using Credit Ratings for Capital Requirements on Lending to Emerging Market Economies - Possible Impact of a New Basel Accord", *IMF Working Paper* N° 00/69.
- PERICOLI, M. and M. SBRACIA (2003). "A Primer on Financial Contagion", *Journal of Economic Surveys* 17 (4), pp. 571-608.
- PETTIS, M. (2001). *The Volatility Machine: Emerging Economics and the Threat of Financial Collapse*, New York: Oxford University Press.
- RAJ, B. and M. VEALL (1998). "The Energy-Capital Complementarity Debate: An Example of a Bootstrapped Sensitivity Analysis", *Environmetrics* 9, pp. 81-92.
- SACHS, J. (1985). "External Debt and Macroeconomic Adjustment in the 1970s", *Brookings Papers on Economic Activities* 1, pp. 201-268.
- STINE, R. (1985). "Bootstrap Prediction Intervals for Regression", *Journal of the American Statistical Association* 80, pp. 1026-1031.
- URIBE, M. and V. YUE (2004). "Country spreads and emerging countries: who drives whom?", *Proceedings Federal Reserve Bank of San Francisco*.
- VAN ROYEN, A. (2002). "Financial Contagion and International Portfolio Flows", *Financial Analysts Journal* 58 (1), pp. 35-49.
- WESTPHALEN, M. (2001). "The Determinants of Sovereign Bond Credit Spreads Changes", École de HEC, Université de Lausanne and Fame.
- WHITE, H. (1980). "A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity", *Econometrica* 48, pp. 817-838.
- WOLF, H. (2001). "Why do markets move together? A Survey of the Contagion Literature", *Emerging Markets Quarterly* 5 (1), pp. 56-62.
- WOOLDRIDGE, J. (2002). *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA: MIT Press.