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Cousin Risks: The Extent and the Causes of Positive Correlation between Country and Currency Risks*

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Abstract

When country and currency risk premiums are positively correlated, a negative international liquidity shock harms twice the small open economy, thereby substantially increasing interest rates. This harmful positive correlation between country and currency risk premiums observed in some countries is called cousin risks. We, first, identify the extent of this phenomenon by separating a sample of countries into two groups: the one where the positive correlation is observed and the one where it is not. Based on this taxonomy, we investigate the determinants of the cousin risks. Results indicate that currency mismatch and low financial deepening are strongly associated with the phenomenon.

Key words: Country Risk, Currency Risk, Financial Crisis, Interest Rate, Cousin Risks
JEL classification: E43, G15, F34

1 Introduction

In times of reversal of capital flows and worldwide economic slowdown, as in 2001 and 2002, a few emerging markets are burdened with higher real interest rates precisely when growth is faltering. This combination of bad outcomes constitutes the opposite of the smoothing effect that financial markets are expected to provide. However, the impact of the reversal of capital flows is felt differently across emerging

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markets, as some countries are more vulnerable than others. In order to overcome these fragilities, it is imperative to identify their sources[1].

The covered interest rate parity (CIP) condition can be used to decompose the domestic interest rate into three components: the international interest rate, the forward premium, and a residual that proxies for the sovereign credit risk premium (the so called country risk). The forward premium—measured by the difference of the log of the forward exchange rate and the log of the spot exchange rate—encompasses both the expected depreciation, and the currency risk premium. The joint behavior of country risk and forward premium can be used to analyze the effect of shocks to both the supply of and the demand for international capital flows[2]. Under this framework, vulnerability to external shocks is identifiable through the high level and volatility of both premiums.

An additional vulnerability source occurs up when a country presents positive correlation between country risk and currency risk. That is because, given the CIP, shocks on those two components would occur at the same time and in the same direction, magnifying the necessary interest rate reaction to avoid capital flight. Contrasting with the myriad of papers that aim at understanding how each of these two risks behaves separately, the ones that focus on their co-movement, as the present work does, are scarce.

Powell and Sturzenegger (2000) analyzes if there is a causality relation between currency risk and country risk in a small sample and conclude that the patterns are quite diverse. Garcia and Didier (2003) identified a large and positive correlation between the two risks in Brazilian data. The authors credited this result to the fact that those risks share a common generating factor. Due to the likely existence of a common root for the two risks, the authors named them cousin risks. Deepening that line of research, our paper has two goals. The first one relates to the analysis of the correlation pattern of those two risks among a sample of 25 countries[3], while the second one aims at finding the factors that are behind their common root. In short, we will first investigate how widespread the cousin risk phenomenon is. Having identified its prevalence, we will go on to examine the possible causes of the positive correlation between country and currency risk premiums.

This paper has five sections. Section 2 puts the term cousin risk in context. Section 3 investigates how widespread the cousin risks phenomenon is. Having identified the extent of the cousin risks phenomenon, Section 4 studies the determinants of the cousin risks. Section 5 concludes.

[1] Recent models have tried to identify what makes some economies "financially vulnerable" while others remain "financially robust", e.g. Krugman (1999), Aghion, Bacchetta and Banerjee (1999, 2001 and 2004), Caballero and Krishnamurthy (2000 and 2001a to c), Caballero and Panagea (2003), Calvo and Reinhart (2002), Christiano, Gust and Roldos (2002).

[2] Henceforward, we shall drop the word premium and refer simply to country risk and currency risk.

[3] Such an empirical study only recently became possible, since it presupposes the existence of forward exchange rate markets in different currencies which is the binding restriction to construct our sample, that so far has 25 countries.

2 Cousin Risks

2.1 Covered Interest Rate Parity Condition

Under free international capital flows, the covered interest parity (CIP) condition[4] states that the domestic interest rate may be broken into two components: the international interest rate and the forward premium:

$$1 + i_t = (1 + i_t^*)(\frac{f_t}{s_t}) \Rightarrow i_t \cong i^* + (FwdPremium_t) \tag{1}$$

Where, i_t is the internal interest rate of a domestic bond denominated in the domestic currency, from t to t+1; i_t^* is the risk free international interest rate from t to $t+1$; f_t is the forward exchange rate traded in t to be delivered in $t+1$; s_t is the spot exchange rate in time t.

When there exists default risk, we need to include in the parity condition above a credit risk premium charged by the investors. Denoting θ_t the country risk (sovereign default risk premium), the parity condition becomes:

$$1 + i_t = (1 + i_t^*)(\frac{f_t}{s_t})(1 + \theta_t) \Rightarrow i_t \cong i^* + (FwdPremium_t) + (CountryRisk_t) \tag{2}$$

Studies of the forward premium have traditionally used interest differential between countries to proxy for the forward premium. This approach assumes absence of country risk, which generaly does **not** hold for the emerging markets. Recently, the development of derivative markets for emerging market currencies has rendered possible the direct calculation of forward premiums on a daily basis.

As Fama (1984), Bansal and Dahlquist (2000) and several other authors show, it is a stylized fact that forward exchange rates are biased estimators of the actual spot exchange rate in the future, a puzzle known as the forward premium puzzle. The literature considers many possible explanations for the forward premium puzzle: existence of a risk premium, market inefficiency, lack of rational behavior, learning, peso problem, and others. Assuming that the first risk premium explanation is true, the forward premium is equal to expected depreciation plus a currency risk premium, which, in turn, is a result of exchange rate uncertainty.

The measurement of this unobservable risk premium is not a trivial task, since all that forward market quotes provide is the sum of currency risk with expected depreciation, i.e., the forward premium. To separate the two components of the forward premium, one must rely on extra information, as surveys of market expectations or statistical frameworks[5]. Since both ways could introduce extraneous noise in our procedure, we choose to concentrate on the forward premium as a whole, i.e., on the expectation of depreciation and the risk premium relating to its uncertainty. Thus, henceforth "currency risk" and "forward premium" will be used interchangeably. In our sample we calculate the currency risk (i.e., the

[4] Frankel (1991), Domowitz et al (1998) and Garcia and Didier (2003) are some papers that use this framework.

[5] Wolff (1987, 2001) and Garcia and Olivares (2001).

forward premium) using data[6] on 1 year forward exchange rate and on spot exchange rate as follows:

$$ForwardPremium_{1year,t} = \frac{(\text{forward rate}_{1year,t} - \text{spot rate}_t)}{\text{spot rate}_t} \tag{3}$$

The country risk premium is relevant when agents perceive a possibility of default. We calculate it by two procedures: (1) EMBI+ or EMBI GLOBAL spread and (2) covered interest parity differential (CID). CID is the interest rate deviation vis-à-vis the value predicted by the non-arbitrage condition stated by the CIP on de absence of credit risk. We calculate the CID using the 1 year Swap rate in local currency as i_t and the 1 year US Treasury rate in dollars as i_t^*:

$$CID_t = i_t - i_t^* - (ForwardPremium)_t \tag{4}$$

Alternatively, we could measure a country's credit risk through its issued bonds denominated in a foreign currency. Such a bond would not be subject to currency risk since it is denominated in a foreign currency. It is, nevertheless, subject to the issuer's credit risk. Thus country risk would be equal to the implicit rate of this bond exceeding the international risk free interest rate of same duration, i.e.:

$$CountryRisk_t = i_t^{US} - i_t^* \tag{5}$$

Where, i_t^{US} is the interest rate of one of its issued bonds denominated in a foreign currency (usually the US dollar), from t to t+1; i_t^* is the international risk free interest rate from t to t+1. In our sample, we use directly the JPMorgan's EMBI+ and EMBI GLOBAL stripped spread[7].

The literature on the determinants of country risk is very large. Many papers resort directly to econometric modeling without an explicit model. The goal is to evaluate each variable's net effect over credit risk. Garcia and Didier (2003), Westphalen (2001), Kamin and von Kleist (1999) and Mauro, Sussman, and Yafeh (2000) are papers that follow this methodology. In all of the aforementioned papers, explanatory variables can be classified into three groups: 1) liquidity and solvency variables; 2) macroeconomic performance variables and; 3) global risk aversion variables. In group 1, the main variables affecting country risk are debt over GDP ratio, debt service over exports ratio, debt service over GDP ratio, and the level of international reserves. In group 2, the following variables stand out: GDP growth, inflation rate, and terms of trade. Lastly, the junk bond or high yield spread is largely used as a measure for global risk aversion.

2.2 Why would country and currency risks follow a similar trend?

The literature on the co-movement of the forward premium and the country risk premium is still very incipient. From a logical point of view, a strong correlation between any two series can only arise under

[6] Data sources are provided in Appendix 4.

[7] EMBI+ and EMBI global are indexes, constructed by JPMorgan, composed by the most liquid U.S. dollar-denominated bonds. EMBI's stripped spread is simply the difference between that index and a US Treasury rate of same duration.

one of two conditions: the first is the existence of a common generating factor, and the other possibility is the existence of a causality relation between the two series, i.e., movements in one series influencing the behavior of the other.

In regard to the first possibility, country risk and forward premium are analyzed in the literature and their respective individual determinants are widely researched. These would be the natural candidates of being a common factor, i.e., a factor that would have generated both series. Nevertheless the literature argues that each variable has different determinants. The main determinants of country risk are solvency and liquidity variables (e.g. level of net indebtedness, fiscal deficits, and global risk aversion), while the main components of forward premium dynamics are related to the balance of payments uncertainties. In Section 4 we will formally test if the occurrence of the positive correlation phenomenon is associated with a high (or low) level of these variables.

The causality relation has received some support in the literature. Can forward premium shocks trigger off country risk shocks? Powell and Sturzenneger (2000) try to answer this question. Using an event-study methodology they analyze the causality effect of currency risk on country risk. Their result indicate that there are various patterns. A few countries present positive relation while others present negative or no relation at all. Positive causality was found in Argentina, Austria, Belgium, Brazil, Ecuador, Ireland and Mexico; negative, in Denmark, Portugal and Sweden. Our section 3 presents an analysis of forward premium and country risk joint behavior for a larger sample of countries but our framework does not allow us to infer causality.

There are theoretical arguments in favor of both positive and negative relation between the two risks. If an economy dollarizes, the abandonment of national currency means the abolition of seigniorage and, as a consequence, a possible worsening of the country's fiscal conditions, increasing its credit risk. Another negative effect could come from the smaller nominal flexibility of a dollarized economy, which would imply higher real response to shocks, causing GDP's volatility to increase. In turn, this real volatility could increase country risk.

Conversely, there are arguments that justify a reduction of the country risk due to the abolition of the domestic currency, such as the increase in financial efficiency, the elimination the possibility of suffering speculative attacks, and the end of the government's balance currency mismatch. Increase financial efficiency, eases government funding, which could lead to uncertainty reduction regarding fiscal solvency, ultimately reducing the country risk.

The most interesting argument however is the so called balance sheet effect, which states that the effect of the forward premium on the country risk is due to government balance sheet currency mismatches. This currency mismatch occurs when a significant part of government liabilities are denominated in a foreign currency while assets and future proceeds are denominated in local currency. Under these circumstances, domestic currency depreciation could affect government balance sheet, potentially leading the government to default on its debt. Broadening the exchange rate crisis model, Krugman (1999) presents a model in which balance currency mismatches in firms' balance sheets help to explain an exchange rate crisis. Neumayer and Nicolini (2000) presents, theoretical arguments regarding the relation between balance currency mismatches and country risk.

The 'balance sheet' argument is in line with Eichengreen, Hausmann, and Panizza's (2002) observation of the original sin phenomenon, which states that most of the countries cannot borrow internationally in their own currency. They say that only a few countries, referred to as major financial centers, do not face this problem: the USA, countries in the EURO zone, the United Kingdom, Japan, and Switzerland. According to them:

> ...while the major financial centers issued only 34 percent of the total debt outstanding in 1993-1998, debt denominated in their currencies amounted to 68 percent of total . ... Developing countries accounted for 10 percent of the debt but less than one per cent of currency denomination in 1993-1998 period. This, in a nutshell, is the problem of original sin.

Indeed, Hausmann (2002) claims that the composition of the net stock of debt could explain why, in spite of Latin American fiscal improvement efforts during the 90s, there were no significant improvements in country risk measures.

Despite the fact that many theories justify, by different arguments, correlation between currency risk and country risk, none of the papers reviewed here carried out an empirical investigation on the determinants of the positive correlation between the two risk premiums[8]. Such an analysis will be carried out in Section 4, but the initial objective, to which we turn now, is to identify the extent of the cousin risks phenomenon.

3 How widespread is the cousin risks phenomenon?

3.1 The data

We now investigate the extent of the cousin risks phenomenon, through an analysis of the country and currency risks' joint behavior in a sample of 25 countries: Australia, Argentina, Brazil, Canada, Chile, Colombia, Czech Republic, Great Britain, Indonesia, Japan, Mexico, New Zealand, Norway, Peru, Philippines, Poland, Russia, Singapore, South Africa, South Korea, Sweden, Switzerland, Thailand, Turkey, and Venezuela. Data frequency is daily and the time frame analyzed is January 1995 to January 2004, but it varies substantially across countries according to the data availability. For the thirteen

[8] Eichengreen, Hausmann, and Panizza (2002) estimated which factors could cause an exchange rate mismatch, but they do not estimate if this stylised fact is associated with the correlation between country risk and risk premium.

countries in our sample for which JPMorgan computes the EMBIs, we analyze the relation between embi spread and forward premium and for the rest of them, we analyze the relation between CID and the forward premium[9].

Whenever available, we prefer to work with EMBI spreads, since these are rates less affected by monetary policy interventions than the domestic interest rate (measured by the Swap rate). Also, EMBIs are calculated from the country's most liquid external bonds. Furthermore, if investors change their preferences during the period of analysis, JPMorgan adjusts the sample accordingly, thus EMBIs accurately depict investors' risk perception. Garcia and Valpassos (1998) and Garcia (2002) indicate that for Brazil, although the two measures of country risk are closely related, CID responds a little slower than the EMBI+ spread does.[10].

3.2 Results

The following graphs indicate how different the patterns of joint behavior can be, what confirms that the cousin risks phenomenon is not pervasive.

From the graphs we can infer that there is a strong positive correlation between country risk and currency risk in countries like Brazil and Mexico while in others, such as Colombia and South Korea, the cousin risks phenomenon does not seem to occur. Graphs 1a, 2a, 3a and 4a present country and currency risks time series as well as the rolling window of their correlation coefficient. In Brazil and Mexico, country risk and currency risk curves follow almost identical paths while in Colombia and South Korea they do not. Moreover, the graphic evidence from scatter diagrams 1b, 2b, 3b and 4b confirm our preliminary diagnostic: the positive linear pattern in Brazil and Mexico is remarkable. Even though this result stands out clearly from the graphs we shall carry out a formal statistical analysis.

[9] For 10 of the countries in our sample, we could calculate both measures of country risk: EMBI spread and CID. So for each of these 10 countries, we can have two correlations: the correlation between the FP and embi spread and the correlation between FP and CID. As expected the correlation of these two measures is highly positve: 0.6. These figures are presented in the Appendix 3.

[10] Garcia and Valpassos (1998) analyze the evolution of CID and the C-Bond spread in Brazil (C-Bond spread is similar to the Brazil's EMBI spread) during the controlled exchange rate regime. Undoubtedly, there is a close relationship between these variables and a large mismatch between them should cause other economic variables such as the exchange rate and international reserves to move. During the period analyzed, in the event of bad shocks the C-Bond Spread was the first to jump, and covered-interest-rate-parity differential moved later, as domestic interest rate were raised to avoid further foreign reserves losses. Therefore, the increase in the difference between the C-Bond spread and the covered-interest-rate-parity differential in Brazil had served as a very good coincidental, and sometimes leading, indicator of currency crisis. This paper does not extend the above study to a broader set of countries. The results in Garcia and Valpassos (1998) and Garcia (2002) indicate that CID responds more slowly than the EMBI spread does. So, EMBI spread is more reliable for capturing quick changes in investors' risk perception on a daily basis.

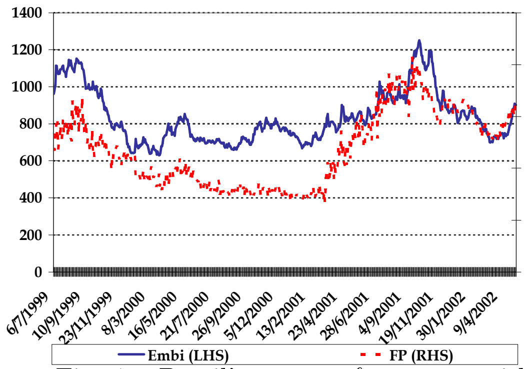

Fig. 1a: Brazil's country & currency risks

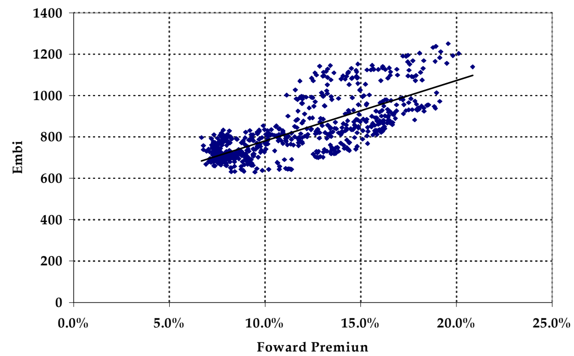

Fig. 1b: Brazil's risks scatter plot

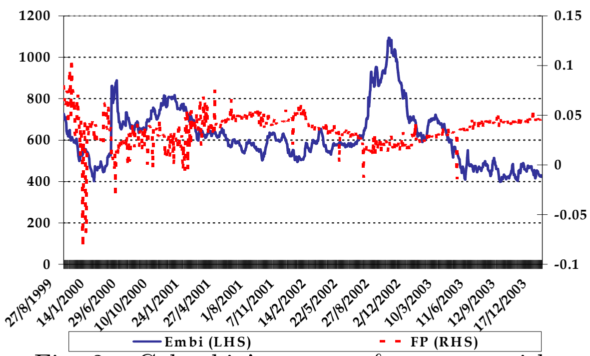

Fig. 2a: Colombia's country & currency risks

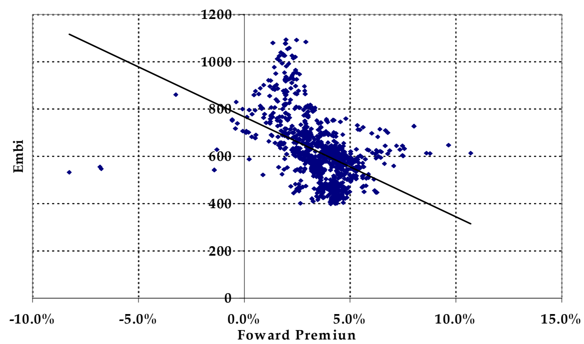

Fig 2b: Colombia's risks scatter plot

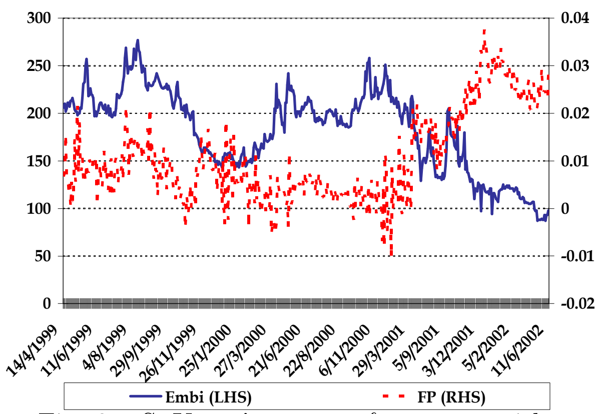

Fig. 3a: S. Korea's country & currency risks

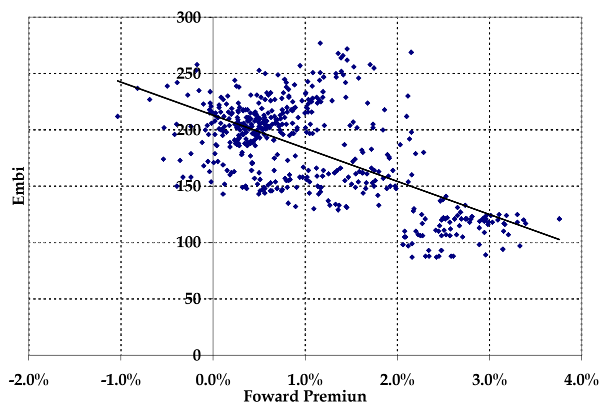

Fig. 3b: S. Korea's risks scatter plot

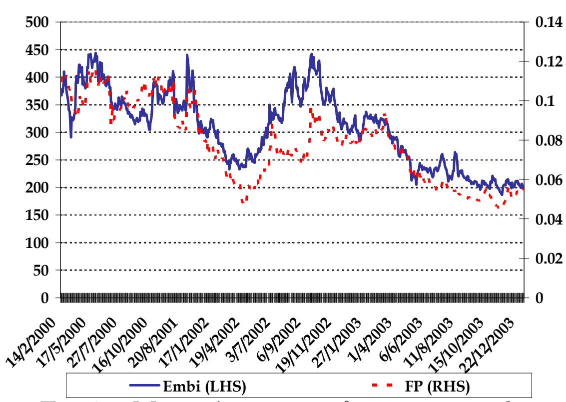

Fig 4a: Mexico's country & currency risks

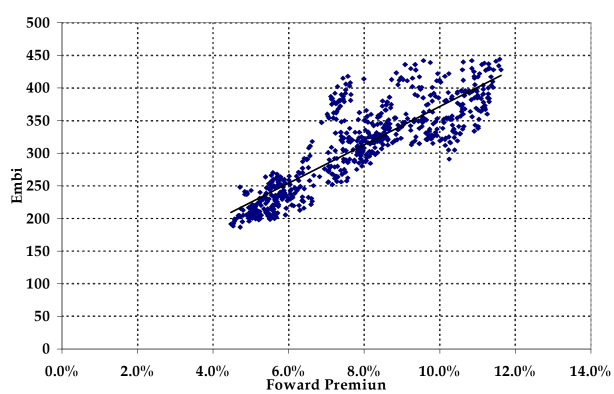

Fig 4b: Mexico's risks scatter plot

Table 1 presents the correlation coefficients, p-values and cointegration analysis results. A positive correlation is an indication of the presence of cousin risks phenomenon. Most of the series are non-stationary or close to non-stationary so the analysis needs extra care since the estimated coefficients can be spurious. We rely on two methods to identify the Cousin Risks phenomenon: non-parametric tests on the correlation coefficients (based on Monte Carlo simulation and bootstrap) and cointegration analysis.

Table 1 - Correlations, Cointegrations and p-values for H0 of Non-Positive Correlation (Monte Carlo and Boostrap)

	Data Sample		Correlation			Cointegration (at 1% significance level)?	Cousin Riks?
	Period Analyzed	Observations		p-value (Monte Carlo)	p-value (Bootsrap)		
1 S. Africa*	Feb/95 - Dec/03	600	**0,0585**	0,4487	0,4380	No	No
2 Australia	Jan/95 - Dec/03	2.191	**-0,8195**	0,9999	0,9999	-	No
3 **Argentina***	Jul/00 - Dec/01	334	**0,9267**	0,0007	0,0010	Yes - Positive	Yes
4 **Brazil***	Jul/99 - May/02	651	**0,7400**	0,0003	0,0000	Yes - Positive	Yes
5 Canada	Jan/95 - Dec/03	2.190	**-0,5684**	0,9999	0,9999	-	No
6 **Chile***	Jul/00 - Dec/03	816	**0,4572**	0,0000	0,0000	-	?
7 Colombia*	Aug/99 - Oct/02	984	**-0,4663**	0,9999	0,9999	-	No
8 Czech Rep	May/97 - Dec/03	1.328	**-0,8444**	0,9980	0,9999	No	No
9 Indonesia	Sep/96 - Mar/01	1.027	**-0,7738**	0,9999	0,9999	-	No
10 Japan	May/95 - Dec/03	2.155	**-0,7611**	0,9999	0,9999	-	No
11 S. Korea*	Mar/99 - Dec/03	491	**-0,6351**	0,9999	0,9999	-	No
12 **Mexico***	Nov/97 - Oct/02	682	**0,8609**	0,0000	0,0000	Yes - Positive	Yes
13 New Zealand	Jan/95 - Dec/03	2.205	**-0,7348**	0,9999	0,9999	-	No
14 Norway	Dec/95 - Dec/03	1.950	**-0,4556**	0,9999	0,9999	-	No
15 **Peru***	Jul/00 - Oct/02	843	**0,7162**	0,0000	0,0000	-	Yes
16 **Phillipines***	Mar/99 - Out/02	1.134	**0,7521**	0,0000	0,0000	-	Yes
17 Poland*	Jun/00 - Dec/03	1.070	**0,2535**	0,1285	0,1860	No	No
18 **Russia***	Dec/99 - Dec/03	398	**0,6398**	0,0000	0,0000	-	Yes
19 Singapore	Jan/95 - Dec/03	2.154	**-0,5717**	0,9999	0,9999	-	No
20 Sweden	Dec/95 - Dec/03	1.960	**-0,6319**	0,9999	0,9999	-	No
21 Switzerland	Jan/95 - Dec/03	2.183	**-0,5865**	0,9999	0,9999	-	No
22 **Turkey***	Ju/99 - Dec/03	878	**0,6324**	0,0000	0,0000	-	Yes
23 Thailand	Sep/95 - Dec/03	1.228	**-0,5810**	0,9999	0,9999	-	No
24 UK	Jan/97 - Dec/03	1.726	**-0,8535**	0,9999	0,9999	Yes - Negative	No
25 **Venezuela***	Jun/99 - Dec/02	629	**0,6884**	0,0005	0,0010	Yes - Positive	Yes

*Notes: (a) The p-values for each country qre calculated as follows: first, we estimate the AR coefficient of each country´s forward premium and country risk. Then, we simulate 3,000 pairs of series (one trying to mimic the properties of this country´s forward premium and the other series its country risk) with the estimated AR properties but we impose zero correlation on their stochastic shocks. (b) * denotes countries in which the country risk were measured by EMBI spread.*

When the series are cointegrated, we can ascertain that the estimated correlation coefficient is super-consistent, i.e., converges to the true value faster than it would if the series were stationary, so, in those cases the point estimate of the correlations on Table 1 are very reliable. We perform cointegration analysis on the series that were pairwise non-stationary[11]. In this case, the cousin risks phenomenon comes up when we do not reject the null hypothesis of cointegration between the two integrated series and the cointegration vector shows a positive relation between them. The detailed results of the Johanssen cointegration tests are presented on the Appendix[12] but are summarized on Table 1.

[11] Phillips-Perron unit root tests results are presented on the Appendix. Only 8 countries presented pairwise non-stationarity on country and currency risk premium: Argentina, Brazil, Czech Republic, Mexico, Poland, UK, South Africa and Venezuela.

[12] The coefficients reported on the appendix refers to the normalized cointegration vector $\begin{bmatrix} 1 & \beta \end{bmatrix} \begin{bmatrix} FP_t \\ CountryRisk \end{bmatrix} =$

We also constructed a distribution of the correlations by Monte Carlo Simulation and Bootstrap for each country under the null hypothesis that the forward premium and the country risk have no correlation and perform a non-parametric hypothesis test on each country's correlation coefficient. Our hypothesis test corrects for possibility of spurious correlation since in this exercise we take into account the high autoregressive properties (sometimes unit root) and the small sample properties of each country's series.

For each country, first, we regress the country risk on its own lag and the forward premium on its own lag as well. Next, we simulate 3,000 vectors $T_K x 2$, where T_K is the number of observations used to calculate the correlation of the FP and the country risk on country K, with the same AR coefficients of the country K's country risk and forward premium estimated in the previous stage. The stochastic term comes from a Monte Carlo simulation under the null hypothesis that the country risk and forward premium have zero correlation. The p-values of the estimated correlation on the distribution generated by this Monte Carlo Simulation for each country is presented in table 1. We implement the same exercise by Bootstrap and the results are also reported on table 1[13].

Based on these results, we propose a separation of the countries of our sample into two groups: (i) one composed of countries in which cousin risks phenomenon is observed and (ii) one composed of countries in which cousin risks phenomenon is NOT observed.

It is interesting to notice that both methodologies generate the same pattern of relationship. Among the countries that we could perform cointegration analysis, Argentina, Brazil, Mexico and Venezuela present positive cointegration relation and also have a positive correlation statistically different from zero. We could also perform cointegration analysis in Czech Republic, Poland, South Africa and UK and in all of them there is no presence of positive cointegration relationship and the correlations are not significantly positive.

Powell and Sturzenneger (2000) also studied Argentina, Brazil, Chile, Colombia, Mexico and Sweden, and their results are compatible with ours, except for the case of Chile. Indeed, Chile is a borderline country because although our hypothesis test can not reject that the correlation coefficient is significantly bigger than zero, we do not find any evidence of cointegration and its point estimate of the correlation is not too high (0.45). For these reasons, we follow Powell and Sturzenneger (2000) and classify Chile as not exhibiting cousin risks.

Table 2 summarizes our final proposed classification:

Table 2: Classification Proposed for the Countries Analysed

Cousin Risks Phenomenon	No Cousin Risks Phenomenon
Argentina, Brazil, Mexico, Peru, Phillipines, Russia, Turkey and Venezuela	Australia, Canada, Chile*, Colombia, South Korea, Indonesia, UK, Japan, Norway, New Zealand, Poland, Singapore, South Africa, Sweden, Switzerland and Thailand

** classification subject to robustness test*

0, so a negative β means a positive relation between the FP and the country risk.

[13] The matlab code for this simulation is available at www.econ.puc-rio.br/mgarcia/.

One of the main goals of our taxonomy is to permit the implementation of statistical tests to identify which variables are associated with the cousin risks phenomenon. Therefore, the classification is vital for the next section's results. For this reason, we implement robustness test of the next section's results by checking if the results would differ if Chile were classified as presenting the cousin risks phenomenon. The tests carried out in the appendix 4 do not point to significant changes in next section's results when the robustness checks are conducted.

4 Determinants of the Cousin Risks Phenomenon

4.1 Methodology and Data Description

Once identified which countries exhibit the cousin risks phenomenon, the next step is to apply a "DNA test" and determine what is linking them. In other words, what are the determinants of the risks co-movement? The most interesting feature of last section's results is that the cousin risks phenomenon does not constitute a rule among emerging countries. We will now investigate the cross-sectional dimension to try to uncover the cousin risks' determinants.

The discussion in Section 2 points to variables that could be responsible for the cousin risks so, in the present section, we will test if they are empirically associated with the presence of the phenomenon. This is done, first, by exploring these variable's statistical distribution among the different groups. Then, in last subsection, we present an econometric binary choice model[14].

4.2 Descriptive Statistics and Preliminary Tests

This subsection presents each country´s macroeconomic and financial data means from 1995 to 2002, almost the same time horizon we used in the last section to identify the phenomenon. The statistics are presented into three groups: (1) Countries that exhibit the cousin risks phenomenon; (2) countries that do not present the cousin risks phenomenon and (3) emerging market countries that do not exhibit the cousin risks phenomenon.

Our aim is to compare the distribution of each variable among the group of countries exhibiting cousin risks phenomenon and the group of countries not exhibiting cousin risks. In order to control for developed countries characteristics not captured in the sample (such as reputation), we also face the distribution of countries presenting the cousin risks phenomenon against the distribution of group of *emerging* countries not exhibiting cousin risks. In the following subsections we present tables with Kolmogorov-Smirnov

[14] The main data sources for this part of the paper are: The World Bank's World Development Indicators WDI, and IMF's International Financial Statistics IFS. Internal and external indebtedness data were obtained from each country's central bank, ministry of finance or statistics agency. Appendix 3 provides data sources and description of the variables.

tests, which determine if the distribution that originated two data sets differ significantly. To illustrate it graphically, we also plot the kernel densities[15] and the QQ plots.

4.2.1 Balance of Payment Variables

This subsection analyzes if a country's external 'health' (which is believed to be the main determinant of exchange rate expectations) is an important factor for the explanation of cousin risks phenomenon.

Table 3

Kolmogorov-Smirnov Test: Balance of Payment Variables	Cousin Risks Countries = Non-Cousin Risk (p-value)	Cousin Risks Countries = Emerging Non-Cousin Risks (p-value)
Exports + Imports (% GDP)	0.2586	0.2929
Current Account Balance (% GDP)	0.9984	0.9438
Mean Import Tariff 1999 - 2000	0.0471	0.2523
International Reserves (% GDP)	0.6522	0.3874

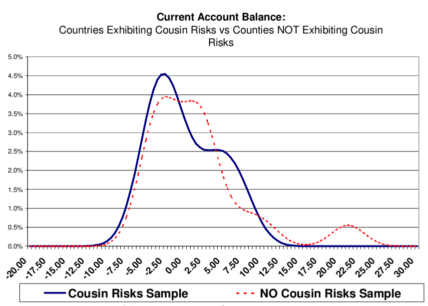

Fig. 5a: Current Account Densities

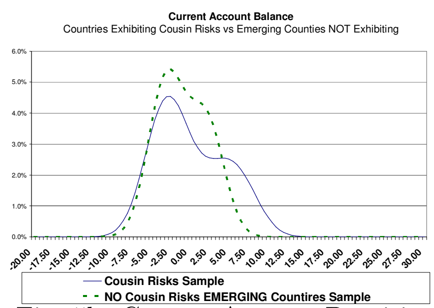

Fig. 5b: Current Account Densities

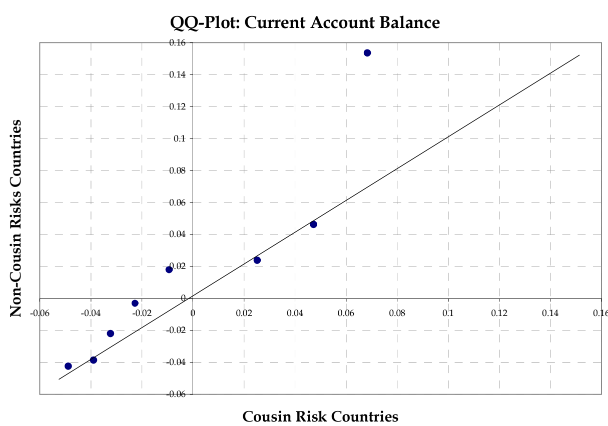

Fig. 6: QQ-Plot

The above data change only slightly from one group to another. This can be seen in figures 5a where we compare the densities of the sample of countries exhibiting the phenomenon against the sample of countries exhibiting the phenomenon and the samples is shown to be almost coincidental. This evidence does not change when we compare the sample of countries exhibiting cousin risks against the sample emerging countries not exhibiting it, as can be seen in figure 5b. The QQ-plots, where the quantile

[15] The bandwidth of this estimation is chosen as suggested by Silverman (1986).

of the cumulative densities of the two samples are compared, reinforce this observation. If they both came from the same distribution, the result would be points on the forty five degree slope line, what is precisely the case here. The same evidence stand out when we plotted the graphs on the other variables, so we omitted them. But the most important step is a formal statistical test and that what we turn to now.

Indeed, Kolmogorov-Smirnov test results, presented in Table 3, indicate that we cannot reject the null hypothesis that current account balance sample (%GDP) and exports plus imports sample (%GDP) among the group of countries exhibiting and not exhibiting cousin risks are statistically identical. The result is the same when we compare the countries exhibiting the phenomenon and *emerging* countries not exhibiting the phenomenon.

The only concern is import tariff. We reject the hypothesis that tariff import samples are identical among countries exhibiting and not exhibiting positive correlation between the country and the currency risk. However, when comparing only emerging markets we cannot reject the hypothesis that their sample are equal. This result is probably due to the fact that the sample of countries not exhibiting cousin risk is largely composed by developed countries that usually have lower import tariffs than emerging ones.

Thus the results of this section indicate that balance of payment indicators from countries that do exhibit the cousin risks do not differ significantly from countries in which the cousin risks phenomenon is not observed.

4.2.2 Solvency Variables

Since the country risk is a central variable to our study, government borrowing requirements and solvency variables are natural candidates to become the determinants of cousin risks. A possibility could be that countries with a fragile fiscal position exhibit a positive relation between country and currency risks.

Table 4

Kolmogorov-Smirnov Test: Solvency Variables	Cousin Risks Countries = Non-Cousin Risk *(p-value)*	Cousin Risks Countries = Emerging Non-Cousin Risks *(p-value)*
Total Public Debt (Internal + External %GDP)	0.1456	0.0214
Overall Budget Balance (% GDP)	0.4446	0.9438
Total External Debt (Government + Private % GDP)	0.5189	0.6852
Internal Government Debt (% GDP)	0.3541	0.6217

The Kolmogorov-Smirnov test results show that there is no distinction between these two groups in terms of the overall budget balance, total external debt (public + private) and government internal debt.

Nonetheless, governments of countries exhibiting cousin risks seem to be more indebted, as the Kolmogorov-Smirnov tests rejects the hypothesis that the sample from countries exhibiting cousin risks is equal to emerging countries not exhibiting cousin risks at 5% significant level. This result is weakened since we do not obtain a similar result when we compare cousin risks countries with the whole sample of countries not exhibiting cousin risks. Even so, we will further investigate it in next section, analyzing total indebtness jointly with other variables.

Therefore, solvency variables do not seem to determine the presence of the cousin risk phenomenon. We will advance on the analysis studying net effects in binary choice models in next section.

4.2.3 Financial Development and Currency Mismatch Variables

We now display the comparison of patterns of currency mismatch and financial development among the countries included in our sample.

Table 5

Kolmogorov-Smirnov Test: Currency Mismatch and Financial Deepening	Cousin Risks Countries = Non-Cousin Risk *(p-value)*	Cousin Risks Countries = Emerging Non-Cousin Risks *(p-value)*
Govt. External Debt - International Reserves (% GDP)	0.0002	0.0029
Gross Domestic Savings (% GDP)	0.1618	0.2929
Domestic credit to private sector (% GDP)	0.0004	0.0134
Market capitalization (% GDP)	0.0120	0.3380

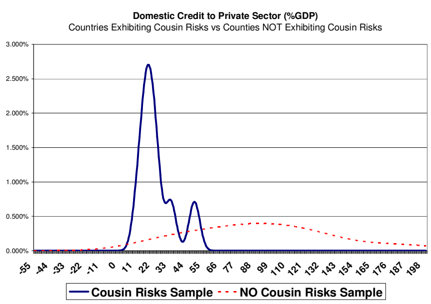

Fig. 7a: Domestic Credit Densities

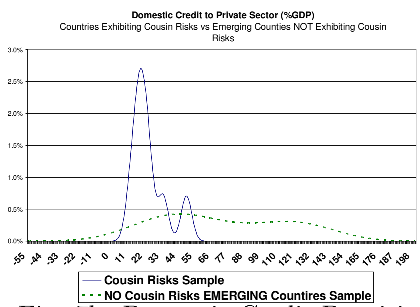

Fig. 7b: Domestic Credit Densities

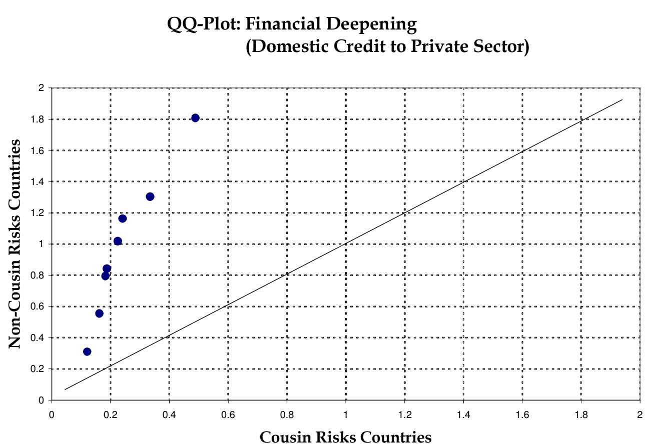

Fig. 8: QQ-Plot

Financial development is less intense in cousin risks countries. The Kolmogorov-Smirnov (KS) test rejects the hypothesis that these distributions are statistically equal: on the comparison of cousin risks countries with non-cousin risks countries it is rejected at the 1% significance level, on the comparison of cousin risks countries with non-cousin risks emerging countries at the 2% significance level. Indeed, these observations are reinforced by the location of the density distributions of cousin risk countries, to the left of the non-cousin risk countries distribution, as can be seen in figures 7a and 7b. The QQ-plot on figure 8 also illustrate that (as the points are far above the 45 degree line) domestic credit to private sector quantiles of the cousin risk sample (x-axis) are all lower than the non-cousin risk countries (y-axis).

The KS tests also highlight a striking difference between net exposure to exchange rate movements among the countries. The hypotheses that currency mismatch sample from cousin risks countries is equal to the ones from countries not presenting cousin risks (be they only the emerging ones or not) are rejected at the 1% significance level.

This indicates that the cousin risks phenomenon is associated with government's currency mismatch (external government debt minus international reserves) and the level of financial development (domestic credit for private sector). We now move to a framework that considers all factors at once: binary choice models.

4.3 Binary Choice Models

In this section we apply a binary choice model[16] using the same variables analyzed in last section. Following the taxonomy discussed in Section 3, the dependent variable assumes the value one for countries that exhibit the cousin risks phenomenon and zero for those that do not[17]. Results refer to Probit model output but the adoption of the Logit model did not qualitatively alter the results.

The explanatory variables are the same ones analyzed in the previous sections. Models contemplating different combinations of explanatory variables were estimated. Table 9 displays the models with only one explanatory variable, while Table 10 shows the results of multivariate analysis.

While working with Probit model, a positive (negative) coefficient significantly different from zero

[16] An alternative to binary choice models would be to use correlation as the dependent variable. Under such methodology, we apply the limited dependent variable models (such that the correlation is limited between -1 and +1) using cross-sectional data or we apply a more robust joint estimation of correlation, using the hierarchical linear model. However, in doing so, our already small sample would be tremendously reduced, thus harming the analysis. For example, in the case when the dependent variable is the correlation between the forward premium and the EMBI+ spread, only thirteen observation points can be included in the regression model. On the other hand, the adoption of the correlation between the forward premium and the CID would not reduce the sample size to the same extent, but the results would nonetheless be full of noises and less representative of investors' risk perception since CID measure is subject to regulatory and interventionist peculiarities of each country.

[17] A robustness test was carried out on our models, and the results are presented in Appendix, where we changed the classification of Chule. Major results don't change.

indicates that an increase the explanatory variable should increase (decreases) the probability of the country to exhibit the phenomenon.

Table 6: Probit Univariate Models

Dependent Variable: Cousin Risks (1 = exhibiting, 0= not exhibiting)

number of observations: 25

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
constant	-1.318753	1.397137	2.101986	-1.311253	-0.776632	0.532655	-0.449209	-2.156276
p-value	*0.0025*	*0.2645*	*0.0024*	*0.0267*	*0.0283*	*0.466*	*0.1004*	*0.0037*
External Debt-Reserves (%GDP)	0.080538	-	-	-	-	-	-	-
p-value	*0.0006*	-	-	-	-	-	-	-
Savings (% GDP)	-	-0.080568	-	-	-	-	-	-
p-value	-	*0.1392*	-	-	-	-	-	-
Domestic Credit to Private Sector (% GDP)	-	-	-0.057412	-	-	-	-	-
p-value	-	-	*0.0026*	-	-	-	-	-
Total Debt (% PIB)	-	-	-	0.020622	-	-	-	-
p-value	-	-	-	*0.0791*	-	-	-	-
Overall Budget Balance (% PIB)	-	-	-	-	-0.164334	-	-	-
p-value	-	-	-	-	*0.1285*	-	-	-
Exports+Imports (% GDP)	-	-	-	-	-	-0.016657	-	-
p-value	-	-	-	-	-	*0.1611*	-	-
Current Account Balance (% GDP)	-	-	-	-	-	-	-0.032057	-
p-value	-	-	-	-	-	-	*0.552*	-
Mean Tariff Import	-	-	-	-	-	-	-	0.185956
p-value	-	-	-	-	-	-	-	*0.0083*
Schwartz criteria	0.86056	1.390352	0.78502	1.357284	1.387635	1.387417	1.494823	1.176535
McFadden's R2	0.518999	0.096429	0.57925	0.141852	0.098597	0.09877	0.013101	0.266973

Table 7: Probit Multivariate Models

Dependent Variable: Cousin Risks (1 = exhibiting, 0= not exhibiting)

number of observations: 25

	Model 9	**Model 10**	**Model 11**	**Model 12**	**Model 13**	**Model 14**
constant	-0.320948	1.909751	1.873102	0.898335	-1.628293	1.755246
p-value	*0.8459*	*0.0427*	*0.0301*	*0.5943*	*0.0046*	*0.0244*
External Debt-Reserves (%GDP)	0.083882	0.115055	0.106144	-	0.080556	-
p-value	*0.0016*	*0.0557*	*0.0022*	-	*0.001*	-
Savings (% GDP)	-0.047175	-	-	-	-	-
p-value	*0.5429*	-	-	-	-	-
Domestic Credit to Private Sector (% GDP)	-	-0.111958	-0.119056	-0.049203	-	-0.054909
p-value	-	*0.0426*	*0.0027*	*0.0222*	-	*0.0053*
Total Debt (% PIB)	-	-0.007048	-	-	-	-
p-value	-	*0.8495*	-	-	-	-
Overall Budget Balance (% PIB)	-		-	-	-0.134947	-0.104533
p-value	-		-	-	*0.3088*	*0.4006*
Exports+Imports (% GDP)	-		-	-	-	-
p-value	-		-	-	-	-
Current Account Balance (% GDP)	-		-	-	-	-
p-value	-		-	-	-	-
Mean Tariff Import	-		-	0.089394	-	-
p-value	-		-	*0.4508*	-	-
Schwartz criteria	0.979494	0.815347	0.660936	0.722177	0.961140	0.896633
McFadden's R2	0.526832	0.775597	0.780918	-	0.541471	0.592924

The results presented in Tables 6 and 7 support the findings in the last subsection. Univariate models, showed in Table 6 indicate that, at the 5% significance level, no solvency variable (Total debt or Fiscal result) significantly contributes to the explanation of the presence of the cousin risks phenomenon. Furthermore, the only external accounts variable that is significantly different from zero is the tariff level: the larger the mean import tariff, the larger the probability a country has of exhibiting cousin risks. Current account, as well as exports plus imports over GDP ratio, do not affect the country's probability of having the cousin risks phenomenon even at the 10% significance level. Gross domestic savings do not affect the probability of the cousin risks phenomenon occurrence even on 10% significance level. Currency mismatch and domestic credit for private sector are both statistically significant at 1% significant level. The higher the currency mismatch—defined as external debt minus international reserves—the higher the probability of the cousin risks phenomenon. Higher levels of financial development—calculated as credit for private sector—reduce the probability of a positive correlation between country and currency risk.

Multivariate models´ results are presented in Table 7. The most interesting feature is that government external debt minus international reserves and domestic credit to private sector are significantly different from zero in every model. Indeed, under both the Akaike and the Schwartz criteria, the best model is model 11 and according to McFadden´s R2 these two variables jointly explain more than 78% of the presence of cousin risks phenomenon. In all of the models, currency mismatch increases the probability and domestic credit to private sector reduces the probability of a country present cousin risks.

Models 13 and 14 show that the overall budget deficit, the gross domestic savings and the total government debt lost significance and do not help to explain the occurrence of cousin risk phenomenon when analyzed jointly with currency mismatch and financial deepening. Furthermore, while univariate models suggested that mean tariff import was important in determining the phenomenon, model 12 indicates that when we jointly analyze it with domestic credit, the tariff is no longer statistically significant.

The models are robust vis-à-vis the Chile's classification (see Appendix 9). Hence, we can conclude that the most important factors in determining the positive correlation between country risk and currency risk seems to be government currency mismatch and domestic credit to private sector.

Our interpretation of these statistical results is the following. Currency mismatch gives support to the causal link: given the currency mismatch, an increase in currency risk weakens balance sheets, thereby increasing country risk. Domestic credit to private sector gives support to the common generating factor link: when capital flows out, the impact on domestic physical investment and production will be stronger if only few domestic substitutes are available to provide financing. The larger the impact, the smaller the growth rate of the country and, hence, its ability to serve debt. Therefore, bad capital flows shocks should be associated with increases in both currency and country risk.

4.4 Adherence Analysis

We can see how well does the model fits the data for each country by checking its adherence. This is undertaken for model 11, the model with the best fit. Figure 11 displays the probability of the occurrence of the cousin risk phenomenon assigned by model 11. Ideally, countries that were classified as exhibiting the phenomenon (the red triangle ones) should be on the top of the graph, with 100% probability. The countries that were classified as not exhibiting the phenomenon should be on the bottom of the graph, with 0% probability. The evidence below suggests that we had a very nice fit and also allow us to identify the few countries in which the model fail to perform well.

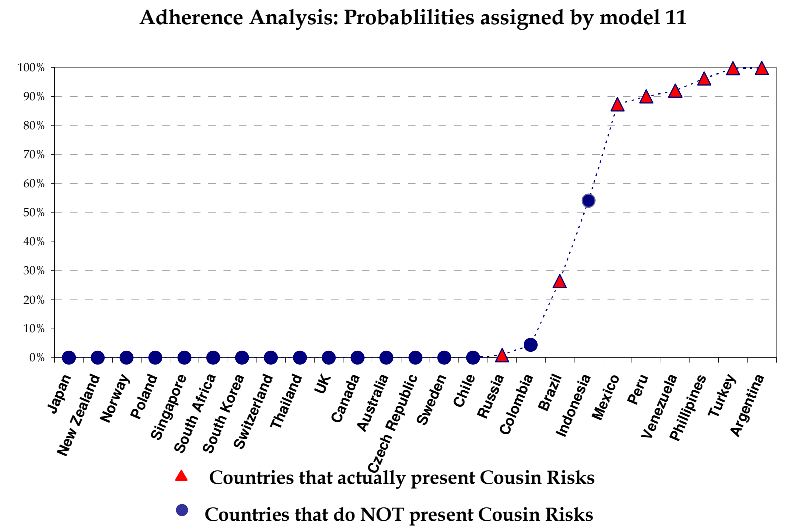

Fig. 9: Adherence Analysis

5 Conclusion

The positive correlation between country and currency risk premiums is referred to as cousin risks. Cousin risks is economically important because both risks are components of the domestic interest rate. Therefore, a country becomes more vulnerable to external shocks when these two risks are positively correlated, since negative shocks, as the reversal of capital flows, increase both risk premiums simultaneously while output is faltering. Cousin risks make interest rates higher and riskier, i.e., more volatile with covariances that amplify the deleterious effects of negative shocks to capital flows as sudden stops[18].

This paper focused on two main goals. The first one was to investigate how widespread the cousin risk phenomenon is, and the second goal was to identify the determinants of the correlation between these two risk premiums.

We identified that, among the countries in our sample (25 countries), Argentina, Brazil, Mexico, Russia, Peru, the Philippines, Turkey and Venezuela exhibit positive correlation between the country risk and the currency risk premiums. It is important to highlight that Chile, Colombia, South Korea, and South Africa do not exhibit positive correlation between these two risks premiums. Therefore, the cousin risks phenomenon is not omnipresent even among emerging markets.

In Section 4 we investigated the determinants of the cousin risks phenomenon. An interesting conclusion was that the sources of the cousin risks phenomenon are not the ones normally presented in the literature as determinants of country risk and currency risk premiums when they are independently analyzed. More specifically, the hypothesis that the balance of payments variables (which are believed

[18] Calvo, Izquierdo and Meija (2004)

to be the main sources of the currency risk premium) are responsible for the positive correlation between country risk and currency risk premiums is rejected. Based on our tests results, neither the level of indebtedness or surplus on fiscal accounts (which are the main determinants of the sovereign risk default) were accepted as being responsible for the cousin risks phenomenon.

Our empirical results indicate that the determinants of this phenomenon are:

1. Currency mismatch, measured as the difference between external government debt and international reserves (over GDP);

2. The level of financial deepening, measured by the credit to the private sector (over GDP);

Based on these results, we conjecture that when the government presents currency mismatch in its balance sheet, an increase in the expectation of exchange rate depreciation or an increase in exchange rate risk (both features are captured by forward premium) increase the perception of future government solvency condition, what, in turns, increases the sovereign credit risk. This would be the main channel through which currency risk would be associated with country risk.

The results are also an indication that cousin risks may be related to the original sin phenomenon (Eichengreen et al. (2002)). A country's inability to borrow in international financial markets in its own currency (original sin) causes a potential exchange rate mismatch. Eichengreen et al. (2002) holds that this can be harmful for those countries, and this paper claims that one of the main problems associated with the original sin is the occurrence of cousin risks. Indeed, cousin risks (which produce high and risky interest rates) and original sin appear to be different aspects of the same, more complex, phenomenon. If this is indeed the case, further examination of cousin risks may shed more light on the determinants of the original sin, as well as on the policy measures necessary to mitigate the deleterious effects of both phenomena.

Finally, high levels of credit to the private sector represent a substantial domestic supply of funds. The higher the level of financial deepening, the smaller the necessity of borrowing in international capital markets. In the event of reversal of capital flows, government and firms are able to resort to domestic finance if financial deepening is substantial. Therefore, in those events, investment would fall less, and so would GDP. On the other extreme, without the domestic credit market investment projects are interrupted and GDP suffers for long periods, thereby harming the countries ability to pay. This is what was called sudden stops.

In summary, we hypothesize that the two factors – exchange rate mismatch and financial deepening – generate the cousin risk phenomenon through two channels : (i) The exchange rate mismatch builds a causality link between currency risk and country risk through the balance sheet effects. In this channel, the reversal of capital flows would increase currency risk, which in turn, given balance sheet effects would increase country risk. (ii) The lack of deep domestic financial markets leverages the negative impacts of reversal of capital flows on investment and output, thereby harming the country's ability to pay. In this second channel, a third factor (reversal of capital flows) would simultaneously affect currency and country risk.

We see our characterization of the cousin risks phenomenon as a contribution to the growing literature on financial crisis affecting emerging markets. Theoretical and simulation models that generate interest rate data should take our results in consideration.

References

[1] Aghion, P., Bacchetta, P., and Banerjee, A. (2000), "A simple model of monetary policy and currency crises", European Economic Review 44, 728-738.

[2] ———————————— (2004), “Financial Development and the Instability of Open Economies”, NBER Working paper no. 10246.

[3] Bansal, R., Dahlquist, M. (2000) “The Forward Premium Puzzle: Different Tales from Developed and Emerging Economies” Journal of International Economics 51

[4] Caballero, R., Krishnamurthy A. (2001a). “International and Domestic Collateral Constraints in a Model of Emerging Market Crises”, Journal of Monetary Economics, December, 48(3), pp. 513-548.

[5] ———————————— (2001b). “Excessive Dollar Debt: Financial Development and Underinsurance”, mimeo, MIT.

[6] ———————————— (2001c). “International Liquidity Illusion: On the Risks of Sterilization”, mimeo, MIT.

[7] ———————————— (2002). “A Dual Liquidity Model for Emerging Markets,” National Bureau of Economic Research, Working Paper #8758.

[8] Caballero, R., Panageas, S. (2003), “Hedging Sudden Stops and Precautionary Recessions: A Quantitative Framework”, NBER Working Paper 9778.

[9] Calvo, G.; Reinhart, C. (2002) “Fear of Floating” Quarterly Journal of Economics

[10] Calvo, Izquierdo and Meija (2004) "On the Empirics of Sudden Stops: The Relevance of Balance-Sheet Effects" NBER Working Papers 10520

[11] Christiano, L., Gust, C. and Roldos, J. (2002) “Monetary Policy in a Financial Crisis”, NBER Working Paper 9005.

[12] Domowitz, I., Glen, J., and Madhavan, A. N. (1998) "Country and Currency Risk Premia in an Emerging Market," Journal of Financial and Quantitative Analysis, 33, 189-216.

[13] Eichengreen, B., Mody, A. (2000). " What explains spread on emerging market debt?". In: Sebastian Edwards, ed., Capital Flows and The Emerging Economies: Theory, Evidence, and Controversies, Chicago: The University of Chicago Press, 2000.

[14] ———————— , Hausmann, R. and Panizza, U. (2002). “Original Sin: The Pain, the Mystery and the Road to Redemption” Paper prepared for the conference “Currency and Maturity Mismatching: Redeeming Debt from Original Sin”, Interamerican Development Bank.

[15] Fama, E. (1984) "Forward and Spot Rates" Journal of Monetary Economics, 14 , p. 319-338.

[16] Frankel, J. A. (1991). “Quantifying International Capital Mobility in the 1980’s”. In: Bernheim, B. D. e Shoven, J. B., eds., National Saving and Economic Performance, National Bureau of Economic Research, The University of Chicago Press, Chicago.

[17] Garcia, M. (2002). “Brazil in the 21st Century: How to Escape the High Real Interest Trap?” The III annual Latin American CREDPR conference on Financial Market development in Latin America , Stanford University.

[18] ———— and Olivares, L. (2001). O Prêmio de Risco da Taxa de Câmbio no Brasil durante o Câmbio Real, Revista Brasileira de Economia.

[19] ———— and Didier, T. (2003). Very High Interest Rates and the Cousin Risks: Brazil During the Real Plan. In: José González and Anne O. Krueger, eds., Macroeconomic Reforms: The 2^{nd} Generation, University of Chicago Press.

[20] Greene, W.H. (2000) “Econometric Analysis” Prentice Hall

[21] Hausmann, R. (2002) “Unrewarded good fiscal behavior: the role of debt structure” Paper prepared for the conference on “Rules-Based Fiscal Policy in Emerging Market economies”

[22] Kamin, S., von Kleist, K. (1999). “The Evolution and Determinants of Emerging Market Credit Spreads in the 1990s”. BIS-Working Paper.

[23] Krugman, P. (1999), “Balance Sheets, the Transfer Problem, and Financial Crises”, International Tax and Public Finance, 6(4), 459-72.

[24] Mauro, P., Sussman, N., Yafeh, Y. (2000) “Emerging Markets Spreads: Then and Now” IMF Working Paper.

[25] Neumeyer, P.A., Nicolini, J.P. (2000) “Using Balance Sheet Data to Identify Sovereign Default and Devaluation Risk”. Working Paper, Universidad Torcuato di Tela.

[26] Powell, A., Sturzenegger, F. (2000) “Dollarization: The Link between Devaluation and Default Risk”. Working Paper, Universidad Torcuato di Tela.

[27] Silverman, B.W. (1986) “Density Estimation for Statistics and Data Analysis” Chapman & Hall.

[28] Westphalen, M. (2001) “The Determinants of Sovereign Bond Credit Spreads Changes”. Working Paper, Université de Lausanne.

[29] Wolff, C. C. P. (1987). "Forward Foreign Exchange Rates, Expected Spot Rates, and Premia: A Signal-Extraction Approach". The Journal of Finance, 42, 395-406.

[30] ———————— (2000). "Measuring the Forward Exchange Risk Premium Multi-Country Evidence from Unobserved Components Models". Journal of International Financial Markets, Institutions and Money, 10, 1-8.

6 Appendix

6.1 Unit root tests:

Phillips-Perron Unit Root Test

	FP	embi+ spread
	P-Value	P-Value
Argentina	0.995600317	1.000000000
Australia	0.980015014	0.000002161
Brazil	0.485506947	0.292443104
Canada	0.802150923	0.000033070
Chile	0.000000000	0.433621695
Colombia	0.000000000	0.231140390
Czech Republic	0.266613873	0.567461202
Indonesia	0.296228539	0.000000000
Japan	0.975541267	0.047035523
Mexico	0.424456258	0.356721968
New Zealand	0.815705860	0.000000000
Norway	0.771100293	0.000000000
Peru	0.000000743	0.678985596
Phillipines	0.000323509	0.220540304
Poland	0.540997625	0.109022705
Russia	0.000000000	0.000000059
Singapore	0.181343242	0.000000000
South Africa	0.480887331	0.745873025
South Korea	0.000020159	0.620878631
Sweden	0.000000000	0.000100000
Switzerland	0.897765617	0.001784714
Thailand	0.160629185	0.000000000
Turkey	0.000000000	0.514916414
UK	0.939619777	0.185104445
Venezuela	0.294404824	0.230181757

6.2 Cointegration tests:

Johanssen Cointegration Test Lags 0 0

	embi's spread vs. FP			
	Cointegration Test		Cointegration Vector	
	P-Value	Number of cointegration relation in HO	embi+	FP
Argentina	0.0000732	None	0.0033682	1.0000000
	0.0013602	At most 1	0.0007540	
Brazil	0.0008632	None	-0.0002153	1.0000000
	0.1114605	At most 1	0.0000351	
Czech Republic	0.3328062	None	0.0212048	1.0000000
	0.1232042	At most 1	0.0056713	
Venezuela	0.0001679	None	-0.0014367	1.0000000
	0.0274875	At most 1	0.0002322	
Mexico	0.0067277	None	-0.0002969	1.0000000
	0.1171373	At most 1	0.0000360	
Poland	0.0147073	None	-0.0006516	1.0000000
	0.0164341	At most 1	0.0002272	
UK	0.0000009	None	4.6790510	1.0000000
	0.9465100	At most 1	0.3716757	
South Africa	0.2717627	None	-0.0656215	1.0000000
	0.2248672	At most 1	0.0247351	

Johanssen Cointegration Test Lags 1 2

	embi's spread vs. FP			
	Cointegration Test		Cointegration Vector	
	P-Value	Number of cointegration relation in HO	embi+	FP
Argentina	0.0021377	None	-0.0011893	1.0000000
	0.0823005	At most 1	0.0002123	
Brazil	0.1901874	None	-0.0003252	1.0000000
	0.2374240	At most 1	0.0000683	
Czech Republic	0.4018867	None	0.0174022	1.0000000
	0.1025867	At most 1	0.0065526	
Venezuela	0.0057897	None	-0.0018123	1.0000000
	0.1108678	At most 1	0.0003025	
Mexico	0.0262723	None	-0.0002960	1.0000000
	0.0846490	At most 1	-0.0000400	
Poland	0.4996500	None	-0.0019121	1.0000000
	0.3704769	At most 1	0.0007107	
UK	0.0355407	None	4.5456027	1.0000000
	0.8787547	At most 1	0.5868052	
South Africa	0.2757992	None	-0.0638790	1.0000000
	0.2301085	At most 1	0.0243118	

6.3 Alternative correlation measures:

		FP-CID Daily Correlation	***FP-EMBI*** Daily Correlation
1	S. Africa	**-0.7300**	**0.0612**
2	Argentina	**-0.4832**	**0.9267**
3	Brazil	**0.0590**	**0.7400**
4	Chile	**-0.8099**	**0.4572**
5	Colombia	**-0.4495**	**-0.4663**
6	S. Korea	**-0.7916**	**-0.6351**
7	Mexico	**0.4156**	**0.8609**
8	Peru	**0.3871**	**0.7162**
9	Phillipines	**0.2636**	**0.7521**
10	Poland	**0.1361**	**0.2535**
	Correlation between the measures of correlation	0.60	

6.4 Data Sources:

The source of almost all financial markets historical quotation, such as spot and future exchange rate, interest rate swaps and treasury rates, is Boomberg. The exceples are: (a) Brazil´s forward premium is calculated from dollar coupon "DDI" future rates and "DI" future rates and the source of these quotations is BMF (Brazilian Mercantile and Futures Exchange). (b) 1 year local interest rate in the following countries: Brazil (DI-pré), Mexico (TIIE 28), Colombia (CD 360) and Peru (deposit rate 1 year).

EMBI+ spread and EMBI GLOBAL spread are provided by JPMorgan.

Deffinition and Data Sources (except debt)

Variable	*Source:*
Exports of goods and services (% of GDP)	WDI - World Bank
Imports of goods and services (% of GDP)	WDI - World Bank
Current account balance (% of GDP)	WDI - World Bank
Simple Mean tarif	WDI - World Bank
Balance of Payments: Overall Balance	IFS - FMI
Gross international reserves (includes gold, current US$)	WDI - World Bank
External debt, total (DOD, current US$)	WDI - World Bank
Gross domestic savings (% of GDP)	WDI - World Bank
Government External Debt (% PIB)	Different each country (see next)
Government Internal Debt (% PIB)	Different each country (see next)
Overall budget balance, including grants (% of GDP)	WDI - Bco Mundial
Domestic credit to private sector (% of GDP)	WDI - Bco Mundial
Market capitalization of listed companies (% of GDP)	WDI - Bco Mundial

Debt Data Sources

	Internal Debt	External Debt
Argentina	Ministerio de Economia y Producción	Ministerio de Economia y Producción
Australia	OECD	RBA - Reserve Bank of Australia
Brazil	BCB - Banco Central do Brasil	BCB - Banco Central do Brasil
Canada	OECD	SDSS IMF
Chile	Ministério da fazenda do chile (Deuda del Gobierno Central)	Ministério da fazenda do chile (Deuda del Gobierno Central)
Colombia	Banco de la República - Colômbia	Banco de la República - Colômbia
Czech Rep.	IFS - IMF	IFS - IMF
Indonesia	World Bank	World Bank
Japan	OECD	Ministry of Finance - Japan
Mexico	Secretaria de Hacienda - Mexico	Secretaria de Hacienda - Mexico
New Zealand	OECD	Reserve Bank of New Zealand
Norway	SDSS IMF	SDSS IMF
Peru	Banco Central de Reserva del Perú	Ministerio de Economia y Finanzas
Phillipines	Department of Economic Research - Bangko Sentral ng Pilipinas	Department of Economic Research - Bangko Sentral ng Pilipinas
Poland	IFS - IMF	IFS - IMF
Russia	Ministry of Finance	Ministry of Finance
Singapore	Singapore Department of Statistics	Singapore Department of Statistics
South Africa	IFS - IMF	IFS - IMF
South Korea	Ministry of Finance - Korea	Bank of Korea
Sweden	Statistiska centralbyrán	Statistiska centralbyrán
Switzerland	-	-
Thailand	IFS - IMF	IFS - IMF
Turkey	Central Bank of the Republic of Turkey	Central Bank of the Republic of Turkey
UK	OECD	-
Venezuela	The Ministry of Finance	The Ministry of Finance

6.5 Models and tests with Chile classified as cousin risk country:

Kolmogorov-Smirnov Test: Balance of Payment Variables	**Cousin Risks Countries =** **Non-Cousin Risk** *(p-value)*	**Emerging Non-Cousin Risks** *(p-value)*
Exports + Imports (% GDP)	0.1367	0.1400
Current Account Balance (% GDP)	0.8315	0.9836
Mean Import Tariff 1999 - 2000	0.0329	0.5327
International Reserves (% GDP)	0.5412	0.7249
Total Public Debt (Internal + External %GDP)	0.5506	0.1400
Overall Budget Balance (% GDP)	0.7490	0.8938
Total External Debt (Government + Private % GDP)	0.2763	0.5327
External Government Debt (% GDP)	0.0100	0.0224
Internal Government Debt (% GDP)	0.2540	0.8938
Govt. External Debt - International Reserves (% GDP)	0.0018	0.0224
Gross Domestic Savings (% GDP)	0.3345	0.1400
Domestic credit to private sector (% GDP)	0.0012	0.0435
Market capitalization (% GDP)	0.0511	0.8938

Probit Univariate Models

Dependent Variable: Cousin Risks (1=Presenting, 0=Not presenting)
number of observations: 25

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
constant	-0.685837776	1.360195864	1.816484019	-0.924017084	-0.59628719	0.62644411	-0.33478807	-2.1264817
p-value	*0.0606*	*0.206853213*	*0.005748296*	*0.02405861*	*0.050146512*	*0.382862093*	*0.198697462*	*0.001042083*
External Debt-Reserves (%GDP)	0.046850804	-	-	-	-	-	-	-
p-value	*0.0169*	-	-	-	-	-	-	-
Savings (% GDP)	-	-0.073595921	-	-	-	-	-	-
p-value	-	*0.100873966*	-	-	-	-	-	-
Domestic Credit to Private Sector (% GDP)	-	-	-0.042533996	-	-	-	-	-
p-value	-	-	*0.000495571*	-	-	-	-	-
Total Debt (% PIB)	-	-	-	0.014771431	-	-	-	-
p-value	-	-	-	*0.050027866*	-	-	-	-
Overall Budget Balance (% PIB)	-	-	-	-	-0.13458361	-	-	-
p-value	-	-	-	-	*0.078165038*	-	-	-
Exports+Imports (% GDP)	-	-	-	-	-	-0.01620215	-	-
p-value	-	-	-	-	-	*0.170592538*	-	-
Current Account Balance (% GDP)	-	-	-	-	-	-	-0.04667611	-
p-value	-	-	-	-	-	-	*0.305229593*	-
Mean Tariff Import	-	-	-	-	-	-	-	0.19769194
p-value	-	-	-	-	-	-	-	*0.00640766*
Schwartz criteria	1.161322345	1.452017281	0.890716702	1.474008485	1.471393074	1.38741708	1.53006311	1.18056845
McFadden's R2	0.308396762	0.08595504	0.515466021	0.086126166	0.071128553	0.09877009	0.02623385	0.29366951

Probit Multivariate Models

Dependent Variable: Cousin Risks (1=Presenting, 0=Not presenting)
number of observations: 25

	Model 9	**Model 10**	**Model 11**	**Model 12**	**Model 13**	**Model 14**
constant	-0.23292992	1.314544955	1.311995	-0.205439069	-0.783989595	1.653985725
p-value	*0.848909608*	*0.094869485*	*0.104682113*	*0.85093611*	*0.069647695*	*0.038865045*
External Debt-Reserves (%GDP)	0.045522465	0.020077341	0.019727	-	0.044759871	-
p-value	*0.031523995*	*0.386581423*	*0.327883684*	-	*0.021913755*	-
Savings (% GDP)	-0.019461132	-	-	-	-	-
p-value	*0.695825764*	-	-	-	-	-
Domestic Credit to Private Sector (% GDP)	-	-0.035709787	-0.035819617	-0.031595297	-	-0.040769326
p-value	-	*0.003234299*	*0.00230323*	*0.001081259*	-	*0.001657743*
Total Debt (% PIB)	-	-0.000569151	-	-	-	-
p-value	-	*0.960926186*	-	-	-	-
Overall Budget Balance (% PIB)	-	-	-	-	-0.057332939	-0.042542086
p-value	-	-	-	-	*0.528991694*	*0.708578544*
Exports+Imports (% GDP)	-	-	-	-	-	-
p-value	-	-	-	-	-	-
Current Account Balance (% GDP)	-	-	-	-	-	-
p-value	-	-	-	-	-	-
Mean Tariff Import	-	-	-	0.16098981	-	-
p-value	-	-	-	*0.044403712*	-	-
Schwartz criteria	1.286666	1.144395	0.976422	0.962757421	1.281479	1.016191
McFadden's R2	0.311007483	0.535403976	0.548408217	0.558864196	0.314976283	0.517976743

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