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

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ABSTRACT

If country and currency risk premiums are positively correlated, a negative international liquidity shock harms twice the 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.

Keywords: Country Risk, Currency Risk, 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, some emerging markets are burdened with higher real interest rates precisely when growth is faltering.[1] 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 markets, as some countries are more vulnerable than others. In order to overcome these fragilities, it is imperative to identify their sources.

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 between 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 and currency risk premiums can be used to analyze the effect of shocks to both the supply of

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[1] The same argument applies to foreign borrowing in hard currency.

and the demand for international capital flows. Under this framework, vulnerability to external shocks is identifiable through the high level and volatility of both premiums.

Nonetheless, it is very plausible that an additional fragility comes up when a country presents positive correlation between country risk and forward premium. 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 the relation between currency risk and country risk in light of dollarization. Their target was to find a causality relation. Based on event-study methodology, they 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 held that this result is probably due to the fact that those risks share a common generator factor. For them, an important implication of this fact is that if one country improves the fundaments responsible for the risks, a sharp decline of the interest rate would follow, since the country would be killing two birds – country and currency risks – with one stone. 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 main goals. The first one relates to the analysis of the correlation pattern of those two risks among a sample of countries, 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.

Such an empirical study only recently became possible, since it presupposes the existence of forward exchange rate markets in different currencies. Notwithstanding the creation of forward exchange rate markets in many currencies, the binding restriction to construct the sample remains the existence of daily data on the forward exchange rate. Usually, studies of currency risk have relied on the nominal interest differential between countries to proxy for the forward premium. This is valid only under covered interest parity, which does not hold for the emerging markets that exhibit country risk. The sample we were able to put together has 25 countries.

This paper has five sections, including this introduction. Section 2 puts the term cousin risk in context, showing a decomposition of the interest rate, and presenting a brief survey of the relevant literature. 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. Finally, Section 5 concludes and draws policy implications.

2. Cousin Risks

2.1. The Determinants of Interest Rates and the Covered Parity Decomposition

Capital account liberalization requires that the domestic interest rate obey a parity condition with the international interest rate. For countries that are internationally financially integrated and have no credit risk, covered interest parity (CIP) holds.[2] However, mainly for emerging markets, there is usually a positive differential, which is a measure of the country credit risk premium. Accordingly, the domestic interest rate may be broken into three components: the international interest rate, the forward premium, and the country risk premium.[3] In turn, the forward premium may be decomposed into the expected depreciation and the currency risk premium.

$$1+i_t = (1+i^*_t)\,(f_{t+1}/\,s_t)\,(1+\theta_t) \qquad i \cong i^* + (\textit{Forward Premium}) + (\textit{Country Risk}) \quad (1)$$

Where:

- *(Forward Premium)* = (Expected Depreciation) + (Currency Risk Premium);
- i_t is the internal interest rate of a domestic bond denominated in its own currency, from t to t+1;
- i_t^* is the risk free international interest rate from t to t+1;
- f_{t+1} is the forward exchange rate traded in t;
- s_t spot exchange rate in t;
- θ_t is the country risk or sovereign default risk premium.

Therefore, through CIP, it is possible to decompose the interest rate and identify how its components account for its statistical moments. Moreover, it is also possible to identify which of its components are responsible for the shocks. Many papers analyze the decomposition of the interest rate through the aforesaid theoretical framework.[4] In the following sections we present the methods for decomposing these risks and analyze their determinants.

2.2. Forward Premium and Currency Risk Premium

Studies of the currency risk premium (e.g., Fama (1984)) have traditionally made use the nominal interest differential between countries to proxy for the forward premium. This approximation assumes covered interest parity, which does not hold for the emerging markets that exhibit country risk. Recently, the development of derivative markets for emerging market currencies has rendered possible the direct calculation of forward premiums on a daily basis.

It is a stylized fact that forward exchange rates are biased estimators for the actual spot exchange rate in the future. This puzzle, known as the *Forward Premium puzzle*, has even more intriguing results. Indeed, Fama's (1984) classical paper found a negative correlation between forward premium and actual depreciation in developed countries. Bansal and Dahlquist (2000) used Fama's (1984) methodology to analyze emerging countries and found that these do not present the above-mentioned negative correlation. Nevertheless, they also found evidence that forward exchange rates were biased estimators for those countries' actual spot exchange rate in the future.

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[2] Frankel (1991).

[3] Henceforth, we shall drop the term "premium" and refer only to country risk, as it became usual in international finance jargon.

[4] Domowitz, Glen, and Madhavan (1998) and Garcia and Didier (2003) analyzed Mexico and Brazil, respectively.

The literature considers many possible explanations for the forward premium puzzle: existence of a risk premium, market inefficiency, lack of rational behaviour, learning, the peso problem, and others.[5] We focus on the first explanation, i.e., the existence of a currency risk premium. Finance theory tells us that investors decide their portfolio allocation based on the trade-off between expected return and risk, which can be understood as an asset's non-diversifiable potential variation. In fact, celebrated models such as the Capital Asset Price Model, indicates that the higher the non-diversifiable potential volatility of an asset,[6] the higher its implied return.

Based on such models of risk diversification, we can justify the statement that the forward premium is equal to expected depreciation plus currency risk premium, which, in turn, is a result of exchange rate uncertainty. Thus, in order to analyze the forward premium determinants, we should study its two components.[7]

$$FP = (expected\ depreciation) + (risk\ premium) \qquad (2)$$

However, the measurement of this unobservable currency risk premium is not a trivial task, requiring econometric estimation[8] or other forms of identification, as surveys of market expectations. Nevertheless, the expected depreciation and the currency risk premium are jointly captured by the forward exchange rate traded in derivative markets. In this paper, so long as the evolution of interest rates components and determinants are concerned, exchange rate analysis will be concentrated on forward premium as a whole, i.e., on the expectation of depreciation and the risk premium relating to its uncertainty. We do that because we consider that the available econometric frameworks to disentangle the currency risk premium from the expected depreciation would not lead to results that we could rely on. Therefore, we prefer to conduct the analysis using the observable forward premium. Thus, henceforth "currency risk" and "forward premium" will be used interchangeably.

2.3 Country Risk

If agents foresee a possibility of default, i.e., the possibility of no payback at some time during the bond's life, another premium must enter the analysis: the credit risk premium. In the case of a sovereign government, this risk is called sovereign credit risk or country risk. One of the ways of measuring it is through 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. This is called Covered Interest Rate Parity Differential (CID), and is calculated as following:

$$CID_t = i_t - i^*_t - (Forward\ Premium)_t \qquad (3)$$

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[5] For a review, see Engel (1995).

[6] The non-diversifiable potential volatility of an asset is understood as the covariance between the returns of the asset and market portfolio's.

[7] Garcia and Olivares (2001) estimated a forward premium decomposition as being the depreciation plus a Brazil's exchange rate risk premium for a fixed period of time. As we already said, we do not follow this decomposition analysing these two components jointly instead.

[8] Garcia and Olivares (2001) presents a brief review of the literature that tries to disentangle the currency risk premium from the expected depreciation.

CID is a measure of country risk,[9] but it is not the only one. Alternatively, we could measure a country's sovereign credit risk through one of 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, instead, is subject to 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.:

$$\textit{Country Risk}_t = i_t^{us} - i^*_t \quad (4)$$

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.

The best measure of country risk depends on how liquid the markets of each of the financial instruments are. For most of the countries, the secondary market of emerging-markets-dollar-denominated bonds suitably expresses investors' perception of sovereign default risk because these markets are, in general, very liquid and not subject to domestic government interventions that could affect prices.

The literature on the determinants of country risk is very large. Many papers resort directly to econometric modeling[10] without an explicit model. The aim 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 a few 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.

2.3 Why these risks should follow a similar trend? Theoretical arguments for the existence of *Cousin Risks*

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[9] Frankel (1991) claims that the differential (or deviation) of the covered interest rates parity is the best measure of the lack of perfect capital mobility *...because it captures all barriers to integration of financial markets across national boundaries: transactions costs, information costs, capital controls, tax laws that discriminate by country of residence, default risk, and risk of future capital controls*.

[10] Another framework is bond pricing under credit risk models, such as structural and reduced models. In structural models such as Merton (1974), Longstaff and Schwartz (1995) and Saá-Requejo and Santa-Clara (1999) default occurres if the difference between assets and liabilities (modelled as Ito processes) gets smaller than a threshold. Rocha and Moreira (2001) use a structural model to Brazil's sovereign risk. They analyzed what should be the most suitable macroeconomic variable for explaining C-Bond spread behaviour. They conclude that net external debt over tradable GDP is the best variable to explain its behaviour. In reduced models, such as Duffie and Singleton (1999), default is defined as the first 'jump' of a Poisson process. Even though it allows asset pricing, it is not possible to directly identify which factors are responsible for risk premium dynamics. Duffie, Pedersen, and Singleton (1999) uses reduced models for dollar-denominated Russian bonds before and after the 1998 default. After having decomposed country risk, they analyzed the evolution of the determinants of that risk, estimating a simple linear regression and a VAR model to show that risk premium presents a correlation with level of international reserves and the international oil price.

So far, besides having analyzed covered interest parity condition, this section has briefly reviewed the literature on the determination of the forward premium and the country risk premium. In regard to the analysis of their co-movement, the literature is still very incipient. In this subsection, we present some theoretical arguments that could justify a correlation between forward premium and country risk.

From a logical point of view, a strong correlation between forward premium and country risk – or between any two series – can only arise under 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 influence 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 well known. 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 (level of net indebtedness, fiscal deficits, etc.), 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 support in the literature. Two papers have examined how forward premium shocks could trigger off country risk shocks. In the aftermath of a *dollarization*, i.e., the abandonment of local currency in favor of a hard currency, the US dollar, the disappearance of the *forward premium* is uncontestable. But what is the effect on country risk? Powell and Sturzenneger (2000) and Neumayer and Nicolini (2000) try to answer this question.

Making use of event-study methodology, Powell and Sturzenneger (2000) analyzes the causality effect of currency risk on country risk. Basically, they choose a date when an event had undoubtedly influenced (positively or negatively) the forward premium and estimate the evolution of the abnormal country risk return.[11] Their next step was to observe the direction of country risk movements relative to forward premium movements. Their result indicates that there are various patterns. Some countries present positive correlation while others present negative correlation or no-correlation at all. Positive causality was found in Argentina, Austria, Belgium, Brazil, Ecuador, Ireland and Mexico. Negative causality was found in Denmark, Portugal and Sweden.

Section 3 presents an analysis of forward premium and country risk joint behavior for a larger sample of countries. However, it will not proceed to an empirical analysis of causality relation between those two variables.

Regarding the theoretical reasons for positive or negative relation between the two risks, there are arguments in favor of both effects. Indeed, in the case of a negative impact (an increase of country risk), two factors stand out. The first one is still on *dollarization*. The abandonment of national currency means the abolition of *seignoriage* and, as a consequence, a possible worsening of the country's credit rating. The second factor argues that the absence of monetary policy (due to the adoption of another currency) implies less

[11] Generally, abnormal return is calculated as the observed return above the expected return predicted by CAPM model. Therefore, it is imperative to estimate every country's 'beta'.

nominal flexibility and higher real response to shocks, causing GDP's volatility to increase. In turn, this volatility could result in a soaring 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. The benefit of the abolition of speculative attacks is immediate. Increase financial efficiency, whether achieved by dollarization[12] or not, ease government funding, which could lead to a reduction of future solvency uncertainty, ultimately reducing the country risk.

The most interesting argument 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 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. Following this, the main channel through which the forward premium might affect country risk is established. Krugman (1999)[13] highlights the importance of currency mismatches. 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. In Neumayer and Nicolini (2000), theoretical arguments are presented 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.*

Eichengreen, Hausmann, and Panizza (2002) create an index to measure the degree of 'original sin' for every country, which is defined by the degree of aggregated exchange rate mismatch. Thus movements in the exchange rate would cause an income effect, and so GDP and solvency conditions become more volatile (causing a worsening in country's credit rating). By the same reason, Hausmann (2002) claims that the composition and currency-denomination of the 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 of 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

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[12] Dollarization makes the country become financially more integrated and that is why it is usually argued that dollarization increases financial efficiency.

[13] In fact, Krugman (1999) only considered firms.

premiums.[14] Such an analysis will be carried out in Section 4, where we will estimate the pattern of currency and country risks' joint behavior in a sample of countries. The initial objective is to identify the extent of the cousin risks phenomenon.

3 How widespread is the cousin risks phenomenon?

3.1 The risks' decomposition, the sample and the difference between the two measures

We now investigate the extent of the cousin risks phenomenon, through an analysis of the country and currency risks' joint behaviour in a sample of the following 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. The sample[15] contains daily data, with the exception of data related to the analysis of deviations from covered interest parity condition in Colombia, which are weekly. The United States is excluded from the sample since every exchange rate was denominated in terms of US dollars[16]. Basically, the time frame analyzed is January 1995 to January 2004, but it varies substantially across countries according to the data availability.

In order to calculate the correlation between the risks for each country in the sample, we first have to calculate the time-series currency risk and country risk. This can be done through a myriad of financial instruments quoted daily in international financial markets subjected to different kinds of risk and by consequence with different prices and different implicit rates of return.

In order perform such decomposition, five financial indicators were used:

1. 1 year forward exchange rate (source: Bloomberg);
2. Spot exchange rate (source: Bloomberg);
3. 1 year Swap rate (source: Bloomberg);
4. 1 year US Treasury rate (source: Federal Reserve);
5. EMBI+ and EMBI GLOBAL stripped spread (source: JPMorgan).

Currency risk (i.e., the forward premium) was calculated as follows: [17]

$$\textit{Forward Premium}_{\text{1 year,t}} = (\textit{forward rate}_{\text{1 year, t}} - \textit{spot rate}_{\text{t}}) / \textit{spot rate}_{\text{t}} \quad (5)$$

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

[15] Appendix 1, avaible at www.econ.puc-rio.br/mgarcia, provide details of the dataset, including the number observations and period analyzed for each country.

[16] Moreover, unfortunately, many European countries could not be included in the sample since they had adopted Euro currency since 1999.

[17] The Brazilian forward premium is calculated from interpolated dollar coupon "DDI" rates and Brazil's "DI" interest rates term structure.

The country risk was calculated through two procedures:

1. EMBI+ spread or EMBI GLOBAL spread;
2. Covered interest parity differential.

EMBI+ is an index constructed by JPMorgan, which tracks total returns for the most liquid U.S. dollar-denominated Brady bonds, loans, Eurobonds, and U.S. dollar-denominated local market instruments. JPMorgan's EMBI global tracks total returns for U.S. dollar-denominated Brady Bonds, Eurobonds, traded loans, and local market debt instruments issued by sovereign and quasi-sovereign entities. EMBI's stripped spread[18] is simply the difference between that index and a US Treasury rate of similar duration. Therefore, it is an instrument subject to country risk but not subject to currency risk since it is denominated in dollars. Thus, as mentioned in Section 2, the deviation of this index from the international risk free interest rate of same duration is a measure of country risk.

EMBIs are a very important variable for our analysis for two reasons. The first one is that this variable is calculated from the country's most liquid bonds, thus if investors change their preferences during the period of analysis, JPMorgan adjusts the sample accordingly. EMBI is also interesting because it is a variable calculated from secondary market data, where governments have little or no influence at all. Thus EMBIs accurately depict investors' risk perception. JPMorgan computes the EMBIs for thirteen countries in our sample, which can be seen in table1.

The other risk measure used in our analysis is the covered interest rate differential (CID). This measure is calculated from Equation 3 presented in Section 2 and repeated below:

$$CID_{1\text{ year }t} = i_{1\text{ year},t} - i^*_{1\text{ year},t} - (Forward\,Premium_{1\text{ year},t}) \qquad (6)$$

Where:

- $i_{1\text{ year},t}$ is the 1 year swap rate,[19]
- $i^*_{1\text{ year},t}$ is the one-year US Treasury rate.

The swap rate, used in the CID calculation, follows a similar trend to the rate determined by each country's central bank since the swap rate is the expectation (in risk neutral terms) of future spot rates. Therefore, the Central Bank has a great influence over this variable.

Concerning these measures, the results in Garcia and Valpassos (1998) and Garcia (2002) indicate that, at lest for Brazil, CID is a risk variable that responds more slowly than the EMBI+ spread does. The implication being that the EMBI+ spread is a more reliable variable for capturing quick changes in investors' risk perception on a daily basis[20]. Besides

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[18] The EMBIs stripped spread data series were computed by JPMorgan.

[19] There are some exceptions: Brazil (one-year dollar coupon rate), Mexico (TIIE 28 days), Colombia (CD 360 days), Peru (Deposit Rate one-year) and Turkey (Overnight).

[20] 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

that, an unfortunate characteristic of CID is that this variable usually exhibits a negative correlation with the country risk because of the calculation procedure used: the forward premium is calculated as the residual of Equation 3. Therefore, whenever the forward premium is impacted by a shock, unless the domestic interest rate instantly reacts by at least the same magnitude of the forward premium's shock, their correlation (forward premium and CID) is diminished. These findings are very important for the interpretation of results presented later in this paper since, *ipso facto*, we can expect that the correlation between the forward premium and the EMBI+ spread to be higher than the correlation between the forward premium and CID.

3.3 Results

We now turn to the analysis of the two risks' co-movement. The following graphs[21] indicate how different the patterns of joint behavior can be from one country to another. Based on them, we can confirm that the *cousin risks phenomenon* is **not** pervasive for emerging economies.

Fig 1a: Brazil Risks Evolution

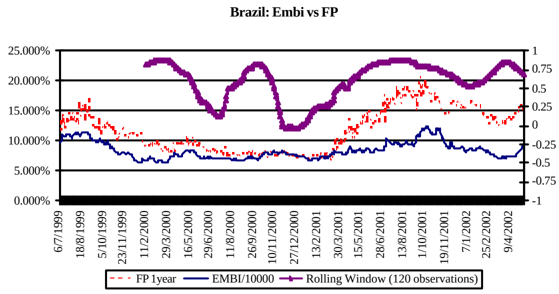


Fig 1b: Brazil Risks Scatter Diagram

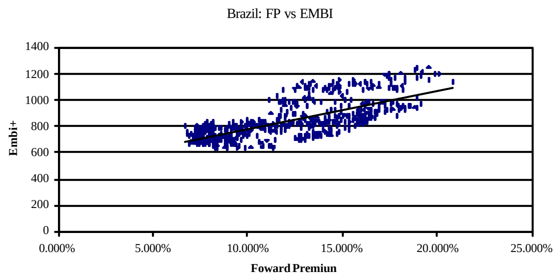


Fig 2a: Colombia Risks Evolution

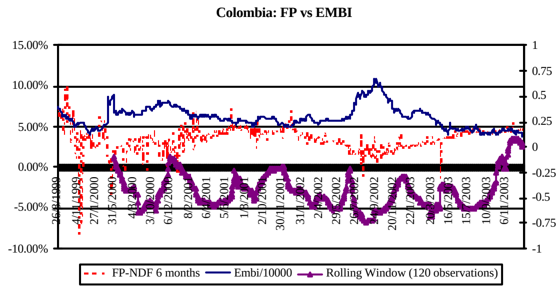
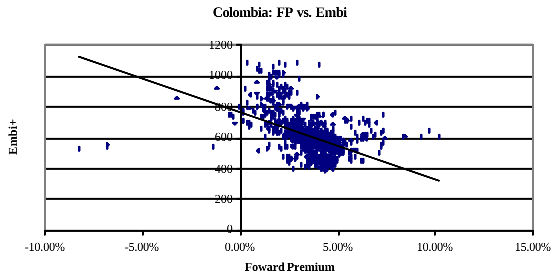


Fig 2b: Colombia Risks Scatter Diagram



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.

[21] The graphs for all countries are presented in Appendix 2, which is available at www.econ.puc-rio.br/mgarcia.

Fig 3a: South Korea Risks Evolution

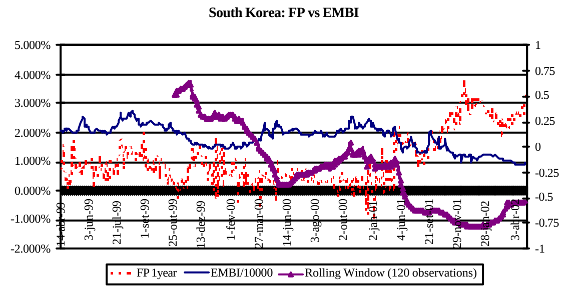


Fig 3b: South Korea Risks Scatter Diagram

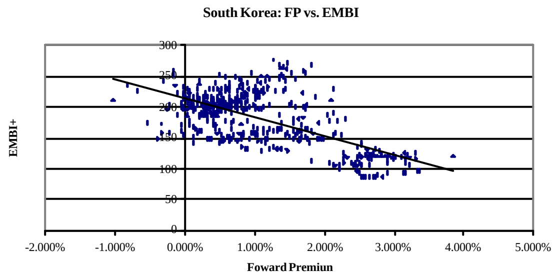


Fig 4a: Mexico Risks Evolution

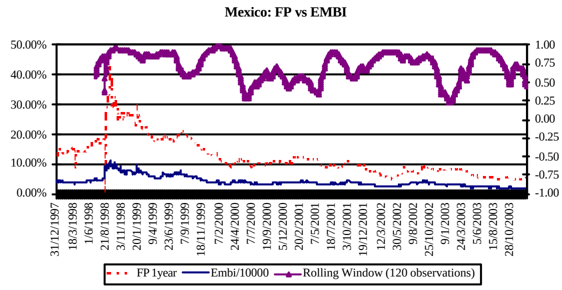
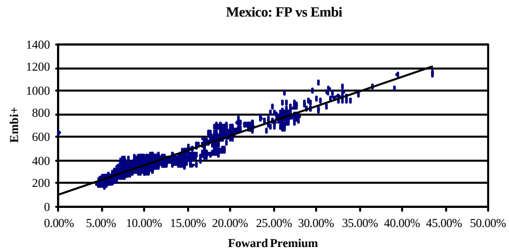


Fig 4b: Mexico Risks Scatter Diagram



From the graphs we can infer that there is a strong positive correlation between country risk and currency risk in Brazil and Mexico while in other countries, 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 where each risk refers to a separate axis.[22] 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 of the strong relationship between the two risks in these countries. The positive linear pattern in Brazil, Mexico, and Philippines is remarkable. Even though this result stands out clearly from the graphs[23] we shall carry out a formal econometric analysis.

Table 1 presents the statistics of correlation coefficients and in Appendix 2[24] is displayed the time-series evolution of the correlation coefficient in a 120-days rolling window analysis. We do so to capture the degree of linear association between the series[25]. A positive correlation is an indication of the presence of cousin risks phenomenon.

We also perform cointegration[26] analysis on the series that were pairwise non-stationaries[27], in order to identify if there is a stable long run relationship between them.

[22] This is done because we are mostly interested in jointly co-movements, not so much in levels. When we work with two axes is easier to perceive their co-movements.

[23] These graphs for each country analyzed are in Appendix 2, available at www.econ.puc-rio.br/mgarcia

[24] The appendix to this paper is available at www.econ.puc-rio.br/mgarcia.

[25] Since most of the series are non-stationary, we are not able to implement hypothesis test. Nonetheless, when the series are cointegrated, we can ascertain that the correlation coefficient is super-consistent, i.e., asymptotically it converges to the true populational value faster than if the two series were stationary.

[26] Appendix 4, available at www.econ.puc-rio.br/mgarcia, presents the cointegration tests results.

[27] We perform the Phillips-Perron unit root test and the results are presented in appendix 3 available at www.econ.puc-rio.br/mgarcia.

The so-called cointegration vector[28] estimated through the Johansen test measures this relation. Through this methodology, 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 country risk and currency risk.

For all countries, we analyzed the relation between the forward premium and CID, which is a measure of country risk. For those countries with an EMBI+ index, we also analyzed the relation between the respective EMBI+ spread and the forward premium. As stated earlier, the EMBI+ spread is a better proxy for country risk and, moreover, it must be taken into account that the analysis with CID is expected to have lower correlation values.

For Argentina, Brazil, the Philippines, Mexico, Peru, Russia and Venezuela, the correlation coefficient between the EMBI+ spread and the forward premium is very high: 0,96, 0.73, 0.53, 0.95, 0.71, 0,74 and 0,72 respectively. Moreover, for Argentina, Brazil, Mexico and Peru these two series are non-stationary and we cannot reject the null hypothesis of cointegration. In turn, the cointegration vector indicated a positive long-term relation between the EMBI+ spread and the forward premium. The estimated relation between CID and the forward premium is positive for all these countries, with exception of Russia and Venezuela (since these two countries do not have liquid swap rate historical data needed to calculate CID)[29]. So, in the light of this evidence, we label the country risk and the forward premium as *cousin risks* in all of these seven countries.

South Korea and Colombia present a strong negative correlation, not only between the EMBI+ spread and the forward premium, but also between CID and the forward premium. For South Korea we accepted the hypothesis of cointegration with the cointegration vector, Indicating long-term negative relation between the EMBI+ spread and the currency risk. Therefore, for these two countries, there is no evidence of the cousin risks phenomenon.

Indonesia, the Czech Republic, Singapore, Thailand, Australia, Canada, the United Kingdom, Japan, Norway, New Zealand, Sweden, and Switzerland did not present the pattern that indicate a positive relation between country risk and currency risk. With the exception of the Czech Republic[30], whose coefficient of correlation is zero, all countries presented a negative correlation between these risks. Indeed, in the United Kingdom, this result is enhanced by the non-rejection of the null hypothesis of cointegration, with the cointegration vector indicating a negative relation between the risks. In short, in these countries, the cousin risks phenomenon is not observed.

The classification of these risks' behavior in Chile, Poland, South Africa, and Turkey are less immediate since we obtained opposite signs depending on which proxy for country risk we used (EMBI+ or CID). For Turkey, the correlation between the EMBI+ spread and the forward premium is positive and high, 0.62. Indeed, we did not reject the cointegration hypothesis and the cointegration vector indicated a positive long-term relation between the risks so this evidence corroborates with the correlation coefficient, which can be said to be super-consistent. The observed CID and forward premium negative correlation is mitigated by some factors. First, the non-stationarity of the Turkish CID renders the correlation coefficient uninterpretable. Second, the EMBI+ spread is preferred to CID as we explained

[28] Whenever we refer to cointegration vector, we mean normalised cointegration vector.
[29] The fact that in Brazil the correlation is only slightly positive is attenuated by the long-term positive relation detected by the co-integration vector
[30] These series are non-stationary and the cointegration tests do not indicate a positive relation..

earlier. Third, we do not have a one-year swap rate for Turkey as most countries do, and so the overnight interest rate was used instead (since it is the only rate quoted on a daily basis).

TABLE 1
Correlations and Risk's Statistics

Group		Country	Cousin Risks1: (CID vs. FP) Forward Premium *mean (s.e.)*	Cousin Risks1: (CID vs. FP) Covered Interest Differential *mean (s.e.)*	Cousin Risks1: (CID vs. FP) Correlation Coeficient	Cousin Risks 2: (Embi+ Stripped Spread vs. FP) Forward Premium *mean (s.e.)*	Cousin Risks 2: (Embi+ Stripped Spread vs. FP) Embi+ Spread *mean (s.e.)*	Cousin Risks 2: (Embi+ Stripped Spread vs. FP) Correlation Coeficient
Emerging economies with embi+	1	**Argentina**	97,710% (40,50%)	-6.39% (16,33%)	**+0,124**	29,860% (43.05%)	1704,2 (1818.1)	**+0,967**
	2	**Brazil**	11,814% (3,599%)	4,573% (1,750%)	**+0,059**	11,810% (3.553%)	833,4 140,6	**+0,739**
	3	**Colombia**	3,408% (1,667%)	5,329% (2,380%)	**-0,450**	3,516% (1,491%)	616,9 (135,5)	**-0,478**
	4	**Chile**	2,460% (0,29%)	-1,060% (0,33%)	**-0,674**	2,616% (1,236%)	170,6 (40,9)	**+0,456**
	5	**Mexico**	12,236% (6,227%)	-0,117% (2,163%)	**+0,465**	12,206% (6,323%)	412,0 (169,2)	**+0,959**
	6	**Phillipines**	6,229% (1,960%)	2,101% (1,942%)	**+0,187**	6,266% (1,804%)	476,2 (94,6)	**+0,535**
	7	**Peru**	4,389% (2,141%)	0,767% (2,026%)	**-0,246**	4,379% (2,153%)	573,8 (144,5)	**+0,715**
	8	**Poland**	4,848% (1,279%)	4,732% (1,609%)	**+0.829**	4,888% (1,160%)	238,5 (41,8)	**+0,049**
	9	**South Africa**	8,232% (2,594%)	0,281% (2,461%)	**-0,547**	9,876% (1,815%)	198,4 (49,6)	**+0,754**
	10	**South Korea**	1,662% (1,034%)	0,381% (0,422%)	**-0,722**	1,066% (0,925%)	181,9 (43,1)	**-0,646**
	11	**Turkey**	57,76% (27,36%)	-0,38% (20%)	**-0,798**	47,183% (20,814%)	659,2 192,2	**+0,626**
	12	**Russia**	-	-	-	16,937% (27,397%)	850,0 (528,1)	**+0,743**
	13	**Venezuela**	-	-	-	23,220% (16,797%)	969,8 (161,2)	**+0,726**
Emerging economies without embi+	14	**Indonesia**	15,394% (13,581%)	0,346% (1,758%)	**-0,611**			
	15	**Czech Republic***	0,533% (1,112%)	1,883% (2,899%)	**-0,030**			
	16	**Singapore***	-1,583% (1,464%)	0,265% (0,290%)	**-0,267**			
	17	**Thailand**	4,528% (5,492%)	0,648% (0,654%)	**-0,271**			
Developed economies	18	**Australia**	1,028% (1,529%)	0,347% (0,214%)	**-0,756**			
	19	**Canada**	-0,032% (1,105%)	0,372% (0,235%)	**-0,389**			
	20	**England**	1,136% (1,053%)	0,523% (0,263%)	**-0,806**			
	21	**Japan**	-4,224% (1,596%)	0,280% (0,214%)	**-0,392**			
	22	**Norway***	1,077% (2,177%)	0,468% (0,260%)	**-0,145**			
	23	**New Zealand**	1,997% (1,518%)	0,462% (0,246%)	**-0,805**			
	24	**Sweden**	-0,147% (1,658%)	0,461% (0,249%)	**-0,579**			
	25	**Switzerland**	-2,510% (1,410%)	0,313% (0,241%)	**-0,284**			

Even though overnight interest rates are annualized, we are actually comparing different points on the term structure: overnight interest rates have zero duration and the forward premium has a one-year duration. Thus the calculated CID for Turkey reflects this fact and its mean is negative. Turkey was therefore placed in the cousin risks countries based on the positive cointegration coefficient between its EMBI+ spread and its forward premium.

For South Africa, the correlation between the forward premium and CID is negative, and the correlation between the forward premium and EMBI+ spread is positive. The cointegration test between the EMBI+ and the currency risk indicated that these two series do not cointegrate. Thus South Africa is placed together with those countries not exhibiting cousin risks phenomenon

Chile presents only a small positive correlation coefficient (0.30) between the EMBI+ spread and forward premium. The correlation of CID and FP for Chile is very negative. Since Chile's EMBI and FP positive correlation is small, we follow Powell and Sturzenneger (2000) and classify Chile as not exhibiting cousin risks.[31]

For Poland, the correlation between the forward premium and CID is positive, and so is the long-term relation. However, EMBI+ spread and forward premium correlation indicated the absence of any definite relation between these variables, and the same result was found when we applied cointegration vector analysis. Since we believe that EMBI+ spread is a more reliable proxy for country risk, Poland is placed into the group of countries that do not exhibit the cousin risks phenomenon.

Having said that, 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,Czech Replubic, Indonesia, Japan, Norway, New Zealand, Poland*, Singapore, South Africa*,South Korea, Sweden, Switzerland Thailand and UK

** classification subject to robustness test*

Powell and Sturzenneger (2000) results´ strength our classification proposal. They also studied Argentina, Brazil, Chile, Colombia, Mexico and Sweden and their results are all compatible with ours.

One of the main goals of our taxonomy is to permit the implementation of a statistical test to justify which variables determine the cousin risk phenomenon, and such task is undertaken in the next section. Therefore, a country's classification is vital for the next section's results. For this reason, we implement robustness test concerning the determinants of the classification[32] where we check how the results would differ if Chile, Poland, South Africa and Turkey were excluded from the sample. The tests carried out in the appendix do not point to significant changes in the results.

4 Determinants of the Cousin Risks Phenomenon

4.1 Methodology and Data Description

[31] In view of the unit root test, the correlation coefficients are all spurious, since the forward premium is stationary, while the two measures of country risk for Chile are not.
[32] This is done in the appendix 4 available at www.econ.puc-rio.br/mgarcia.

Once identified which countries present the cousin risks phenomenon, the next step is to apply a "DNA test" and determine what links their behavior. In other words, what are the determinants[33] of country risk and currency risk co-movement?

The most intriguing feature of last section's results is the fact that the cousin risks phenomenon does not constitute a rule among emerging countries. Therefore, we will exploit the cross-sectional dimension 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 test if they are empirically associated with the presence of the phenomenon. This is done first trough the presentation of their statistics among the different groups and a non-parametric hypothesis test. Then, in last subsection, we present an econometric binary choice model.

The main data sources 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.[34]

4.2 Descriptive Statistics, Non-Parametric Densities, QQ Plots and Kolmogorov-Smirnov tests

This subsection presents macroeconomic and financial data from the countries in our sample. The data analyzed are the countries means[35] from 1995 to 2001,[36] almost the same time horizon we used in the last section to identify cousin risks phenomenon. The statistics are presented not only by country but also classified into three groups:[37]

1. Countries that exhibit the cousin risks phenomenon, following the last section's taxonomy.
2. Countries that do not present the cousin risks phenomenon, following the last section's taxonomy.
3. Emerging market countries that do not exhibit the cousin risks phenomenon, following the last section's taxonomy.

We present each group's means and medians in tables in the following subsections. Non-parametric kernel density estimation[38] and QQ-plots are also and presented.

The aim is to compare the distribution of each variable among the group of countries exhibiting cousin risk phenomenon and the group of countries not exhibiting cousin risks. The test used is the Kolmogorov-Smirnov[39], which tries to determine if the distribution that originated two datasets differ significantly. The null hypothesis is that the samples have the same continuous distribution. To illustrate it graphically, we also plot the kernel densities and the qq plot.

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[33] Since we will not perform causality tests, we are, strictly speaking, only uncovering which variables are associated with the cousin risks phenomenon.
[34] Appendix 4 provides the data source for every series, as well descriptions for some of the variables, and is available at www.econ.puc-rio/mgarcia.
[35] WDI data are on annual basis while IFS data are on quarterly basis. Public debt data, whose sources are central banks and statistical agencies, are on monthly or quarterly basis.
[36] Until July 2003, World Bank (our main data source) had not released data referring to 2002.
[37] In some cases, we also compute the averages for emerging and developed countries for comparison.
[38] The bandwidth of this estimation is chosen as suggested by Silverman (1986)
[39] This test makes no assumption about the distribution of data, i.e., it is a non parametric test.

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 emerging countries not exhibiting cousin risks.

4.2.1 Balance of Payment

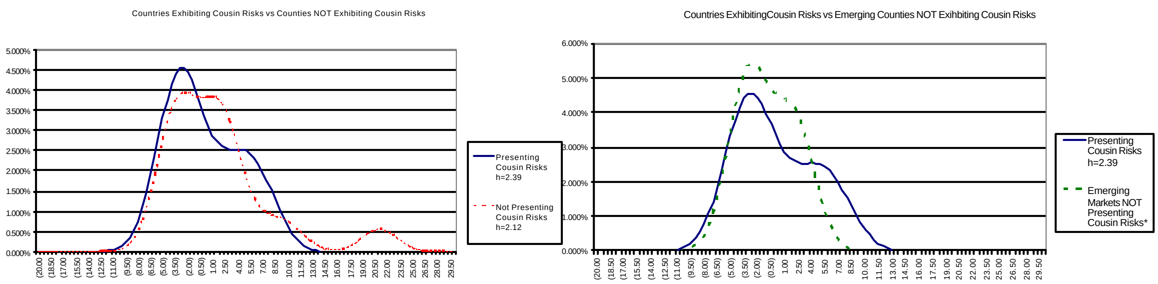
This subsection analyzes if a country's external 'health' (which is believed to be the main determinant of exchange rate expectations) is an important factor for the explanation of cousin risks phenomenon. Table 3 below presents some Balance of Payments accounts statistics[40], the graphs below display their density and table 4 present Kolmogorov-Smirnov test results.

TABLE 3
Macroeconomic Statistics - External Sector

mean 1995-2000		Exports (% GDP)	Imports (% GDP)	Exports + Imports (% GDP)	Current Account Balance (% GDP)	Mean Import Tariff 1999 - 2000	International Reserves (% GDP)
Countries exhibiting Cousin Risks	mean	31,44%	30,58%	61,98%	1,28%	6,48%	13,47%
	median	31,66%	30,21%	61,82%	-0,47%	7,13%	12,71%
Countries without Cousin Risks*	mean	32,43%	30,11%	62,79%	0,30%	9,83%	12,84%
	median	31,21%	28,63%	59,83%	-0,14%	10,16%	12,43%
Emerging Countries without Cousin Risks*	mean	26,92%	23,59%	51,07%	1,09%	10,83%	10,98%
	median	25,91%	23,14%	49,30%	0,62%	12,24%	10,10%
Emerging Countries*	mean	29,63%	27,79%	57,61%	1,21%	8,22%	12,47%
	median	29,07%	28,82%	57,91%	-0,22%	9,30%	11,48%
Developed Countries	mean	36,84%	35,33%	72,17%	-0,34%	9,02%	14,32%
	median	33,56%	32,06%	65,62%	-1,13%	9,30%	15,26%

* without Singapore

Fig 5. Non-Parametric Kernel Density: Current Account Balance



40 Appendix 6, available at www.econ.puc-rio.br/mgarcia, present the same statistics disaggregated by country.

Fig 6: QQ-plot

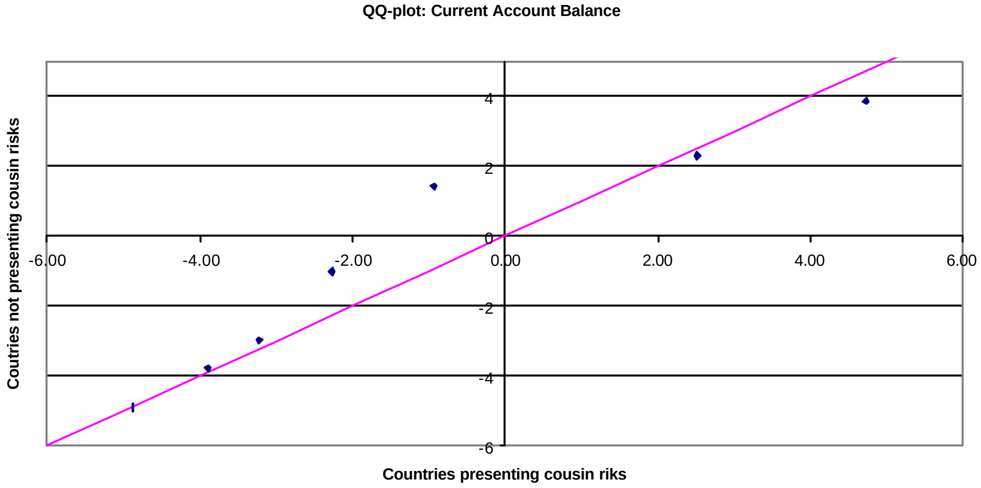


TABLE 4
Kolmogorov-Smirnov Test on Balance of Payment

H_0	K-S stat	p-value
Current Account (% GDP) Density of Coutries Exhibiting Cousin Risk = Current Account (% GDP) Density of Coutries NOT Exhibiting Cousin Risk	0,1544	0,9984
Current Account (% GDP) Density of Coutries Exhibiting Cousin Risk = Current Account Density of Emerging Coutries Exhibiting Cousin Risk	0,1528	0,9998
Exports+Imports (% GDP) Density of Coutries Exhibiting Cousin Risk = Exports+Imports (% GDP) Density of Coutries NOT Exhibiting Cousin Risk	0,4044	0,2586
Exports+Imports (% GDP) Density of Coutries Exhibiting Cousin Risk = Exports+Imports (% GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,4306	0,3145
Mean Import Tariff Density of Coutries Exhibiting Cousin Risk = Mean Import Tariff Density of Coutries NOT Exhibiting Cousin Risk	0,5882	0,0265
Mean Import Tariff Density of Coutries Exhibiting Cousin Risk = Mean Import Tariff Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,5139	0,1441

The above data change only slightly as we move from one group to another. Although table 3 values indicates that countries exhibing positive correlation between the country and the currency risk present a smaller degree of openness[41] than emerging countries that do not exhibit the phenomenon, their densities on every variable, (all the densities are presented in Appendix 7[42]) are almost coincidental. This evidence can also be inferred from QQ-plots,

[41] For the cousin risks countries, exports plus imports over GDP is 49.15% and import tariff is 11.88% on average while on emerging countries not presenting cousin risks these figures are 71.41% and 10.16%, respectively.

[42] The appendix to this paper is available at www.econ.puc-rio.br/mgarcia.

where the quantile[43] of the cumulative densities of the two samples are compared. If they both came from the same distribution, the result would be forty five degree slope line.

Indeed, Kolmogorov-Smirnov test results, presented in Table 4, 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 exhibing and not exhibing 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.

These results only change when we analyze the 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 we compare only emerging markets we cannot reject the hypothesis that their sample are the same. We can conjecture that this result can be due to the fact that the sample of countries not exhibiting cousin risk is largely composed by developed countries that usually have smaller import tariffs than emerging economies.

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. We now analyze solvency variables.[44]

Table 5 indicates that countries exhibiting cousin risks are more indebted than the ones without cousin risks. Total government debt medians are 46.40% where the phenomenon is observed, 30.45% where it is not and 20.42% in emerging economies without the phenomenon. In the above graphs, we can also see that the cousin risks countries density is more leftish than the non-cousin risks countries densities. Indeed the Kolmogorov-Smirnov test rejects the hypothesis that total government debt sample from countries exhibiting cousin risks is equal to emerging countries not exhibiting cousin risks at 10% 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.

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[43] Since there are only seven countries classified as presenting cousin risks, the QQ-plot can only have seven points.

[44] Appendix 6, which is available at www.econ.puc-rio.br/mgarcia, present the same statistics disaggregated by country.

TABLE 5
Macroeconomic Statistics - Government Solvency

mean 1995-2000		Total Public Debt (Internal + External %GDP)	Overall Budget Balance (% GDP)	Total External Debt (Government + Private % GDP)	External Government Debt (% GDP)	Internal Government Debt (% GDP)
Countries exhibiting Cousin Risks	mean	56,03%	-3,12%	46,26%	37,02%	20,30%
	median	46,40%	-2,16%	46,57%	37,94%	9,33%
Countries without Cousin Risks*	mean	25,91%	-1,39%	44,83%	10,04%	17,24%
	median	30,45%	-0,92%	37,34%	4,96%	16,78%
Emerging Countries without Cousin	mean	26,71%	-1,85%	44,83%	12,03%	14,67%
	median	20,42%	-1,41%	37,34%	5,00%	11,70%
Emerging Countries*	mean	41,37%	-2,48%	45,55%	24,53%	17,49%
	median	42,06%	-1,66%	40,51%	21,07%	10,56%
Developed Countries	mean	24,85%	-0,93%	-	7,38%	20,16%
	median	35,45%	-0,34%	-	4,05%	26,75%

* without Singapore

Fig 7: Non-Parametric Kernel Density: Total Government Debt (%GDP)

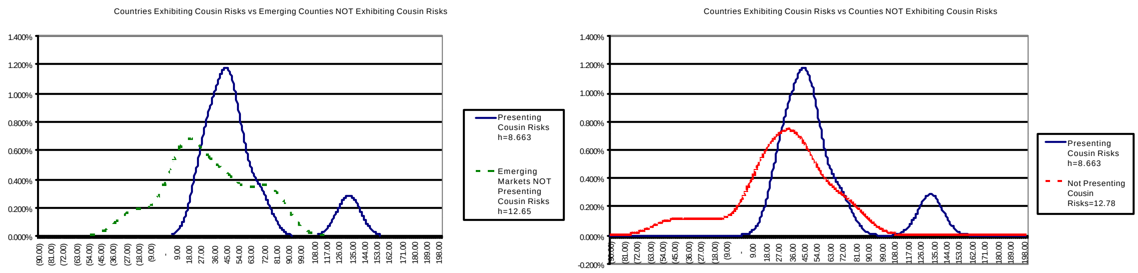

Fig 8: QQ-plot

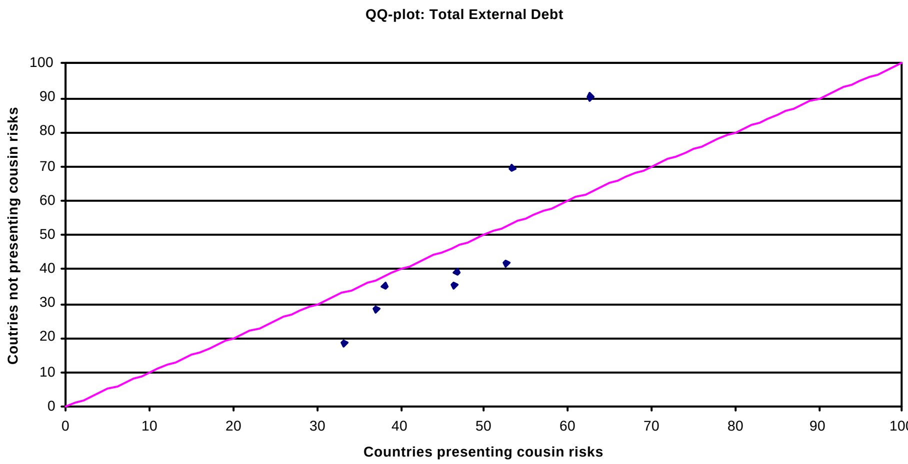

TABLE 6
Kolmogorov-Smirnov Test on Solvency Variables

H_0	K-S stat	p-value
Overall Budget Balance (% GDP) Density of Coutries Exhibiting Cousin Risk = Overall Budget Balance (% GDP) Density of Coutries NOT Exihbiting Cousin Risk	0,3456	0,4446
Overall Budget Balance (% GDP) Density of Coutries Exhibiting Cousin Risk = Overall Budget Balance (%GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,2917	0,7907
Total Government Debt (% GDP) Density of Coutries Exhibiting Cousin Risk = Total Government Debt (% GDP) Density of Coutries NOT Exhibiting Cousin Risk	0,4667	0,1456
Total Government Debt (% GDP) Density of Coutries Exhibiting Cousin Risk = Total Government Debt (% GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,5556	0,0925
Total External Debt (%GDP) Density of Coutries Exhibiting Cousin Risk = Total External Debt (%GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,375	0,5189

Kolmogorov-Smirnov test results shows that there is no distinction between these two groups in terms of the overall budget balance and total external indebtness. In the case of total government debt this can also be seen in the above densities graphs, almost coincidental, and in the QQ-Plot, where the cumulative quintiles of the distributions almost form a 45 degree line. Therefore, solvency variables do not seem to determine the presence / absence of the cousin risk phenomenon. The only doubt is about the total indebtness, which seems to have some effect (p-value of 0.09 in the comparison of the samples of emerging countries), so this will be further investigated with its net effect, i.e., controlling for the effect of other variables, in binary choice models in next section.

4.2.3 Financial Development and Currency Mismatch Variables

Table 7, the following density distribution graphs and Table 8 display the comparison of patterns of currency mismatch and financial development among the countries included in our sample.

TABLE 7
Macroeconomic Statistics - Financial Deepening and Currency Mismatch

mean 1995-2000		**Govt. External Debt - International Reserves (% GDP)**	**Gross Domestic Savings (% GDP)**	**Domestic credit to private sector (% GDP)**	**Market capitalization (% GDP)**
Countries exhibiting Cousin	mean	26,15%	21,03%	24,33%	29,10%
	median	26,04%	19,27%	20,66%	28,95%
Countries without Cousin	mean	-1,10%	24,36%	92,18%	77,98%
	median	-1,50%	23,52%	84,22%	60,06%
Emerging Countries	mean	-2,05%	24,77%	67,95%	50,88%
	median	-1,56%	25,54%	55,52%	34,13%
Emerging Countries	mean	12,05%	22,90%	46,14%	39,99%
	median	11,47%	21,47%	33,25%	28,95%
Developed Countries	mean	0,17%	23,95%	116,42%	105,07%
	median	-0,61%	22,72%	101,76%	90,42%

Fig 9: Non-Parametric Kernel Density: Domestic Credit to Private Sector (%GDP)

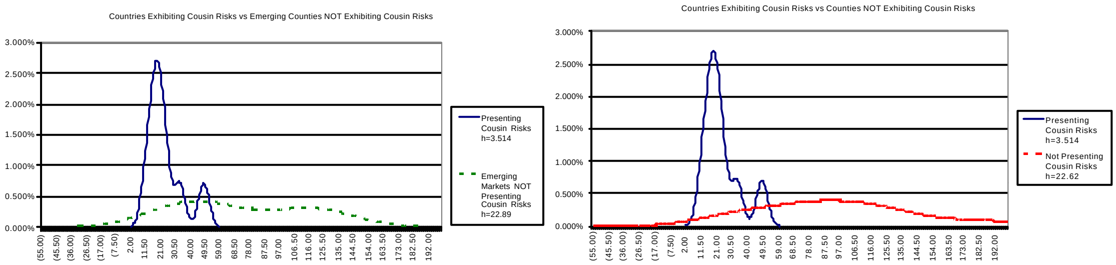

Fig 10: QQ-plot

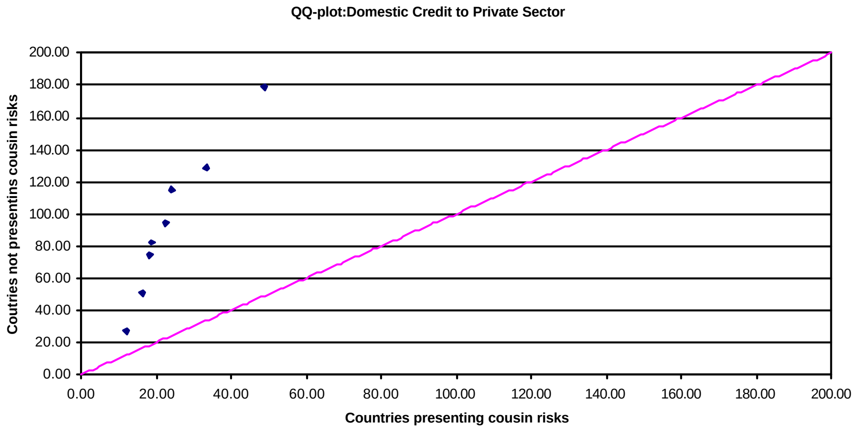

TABLE 8

Kolmogorov-Smirnov Test on Currency Mismatch and Financial Deepening

H_0	K-S stat	p-value
Goverment External Debt - International Reserves (% GDP) Density of Coutries Exhibiting Cousin Risk = Goverment External Debt - International Reserves (% GDP) Density of Coutries NOT Exhibiting Cousin Risk	0,8824	0,00012
Goverment External Debt - International Reserves (% GDP) Density of Coutries Exhibiting Cousin Risk = Goverment External Debt - International Reserves (%GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,8889	0,00077
Domestic Credit to Private Sector (% GDP) Density of Coutries Exhibiting Cousin Risk = Domestic Credit to Private Sector (% GDP) Density of Coutries NOT Exhibiting Cousin Risk	0,8235	0,00042
Domestic Credit to Private Sector (% GDP) Density of Coutries Exhibiting Cousin Risk = Domestic Credit to Private Sector (% GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,6667	0,02390
Domestic Savings (%GDP) Density of Coutries With Cousin Risk = Domestic Savings (%GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,4485	0,16180
Domestic Savings (%GDP) Density of Coutries Exhibiting Cousin Risk = Domestic Savings (%GDP) Density of Emerging Coutries NOT Exhibiting Cousin Risk	0,4306	0,31450

The above results highlight a striking difference between net exposure to exchange rate movements among the countries. The median of net external liabilities, calculated as the government external debt minus international reserves, is 26.15% for countries that exhibit the cousin risks phenomenon and –1.56% for the remaining emerging countries that do not exhibit cousin risks. The currency mismatch density from the cousin risks countries is to the right of the densities of countries not exhibiting this phenomenon (be they only emerging or not). The hypotheses that currency mismatch sample from cousin risks countries is equal to the ones from countries not presenting cousin risks (be they only emerging or not) are rejected at the 1% significance level.

Financial development is less intense in countries classified as having cousin risks phenomenon. These countries displayed 24.33% of mean domestic credit for the private sector over GDP, while the countries without the presence of cousin risk phenomenon registered 92.18%. Even emerging countries without cousin risks exhibit a much higher mean domestic credit to private sector (67.55%). These observations are reinforced by the location of the density distributions of cousin risk countries on the left of the non-cousin risk countries. Indeed, the Kolmogorov-Smirnov 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 3% significance level.

When we analyze gross domestic savings, although the means and medians are smaller on countries presenting cousin risks, Kolmogorov-Smirnov tests do not reject the hypothesis that their samples are equal.

Thus the data indicate that the presence of 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).

4.3 Binary Choice Models

In this section we apply a binary choice model[45] 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

45 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.45 However, in doing so, our already small sample would be tremendously reduced, thus rusting 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.

those that do not[46].Our results refer to the *Probit* model output but the adoption of the *Logit* model does not significantly alter the results[47].

TABLE 9
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 (% GDP)	-	-	-	0,020622	-	-	-	-
p-value	-	-	-	*0,0791*	-	-	-	-
Overall Budget Balance (% GDP)	-	-	-	-	-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*
Akaike criteria	0,76305	1,292842	0,687510	1,259113	1,290124	1,289907	1,397313	1,079025
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 10
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	Model 15
constant	-0,320948	1,909751	1,873102	0,898335	-36,34646	-1,628293	1,755246
p-value	*0,8459*	*0,0427*	*0,0301*	*0,5943*	*0,2439*	*0,0046*	*0,0244*
External Debt-Reserves (%GDP)	0,083882	0,115055	0,106144	-	0,66633	0,080556	-
p-value	*0,0016*	*0,0557*	*0,0022*	-	*0,2732*	*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 (% GDP)	-	-0,007048	-	-	-	-	-
p-value	-	*0,8495*	-	-	-	-	-
Overall Budget Balance (% GDP)	-		-	-	-	-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	2,050597	-	-
p-value	-		-	*0,4508*	*0,2054*	-	-
Akaike criteria	0,833229	0,619004	0,514671	0,622699	0,365617	0,814875	0,750368
Schwartz criteria	0,979494	0,815347	0,660936	0,722177	0,511882	0,961140	0,896633
McFadden's R2	0,526832	0,775597	0,780918	-	0,899806	0,541471	0,592924

[46] A robustness test was carried out on our models, and the results are presented in Appendix 9, available at www.econ.puc-rio.br/mgarcia, where we excluded from the analysis the countries subjected to doubts concerning their classification.

[47] *Logit* model was estimated and coefficients' signs did not change. The only difference was that p-value sometimes increased. *Logit* model outputs are showed in Appendix 3, which is available at www.econ.puc-rio.br/mgarcia.

As mentioned in Section 2, the explanatory variables are the same ones analyzed in the previous sections. Models contemplating different combinations of explanatory variables were estimated. The two tables below present the results. Table 9 presents models with only one explanatory variable while Table 10 shows the results of multivariate analysis.

Due to the adoption of the *Probit* model, the estimated coefficients have to be carefully interpreted since their meaning differs from the meaning of those coefficients estimated through the classical least square linear regression model. A positive coefficient –and significantly different from zero – indicates that an increase in the explanatory variable should increase the probability of the country to exhibit the phenomenon.[48] Moreover, a negative and significantly different from zero coefficient indicates that the reduction in the explanatory variable should decrease the probability of the country to present cousin risks.

The results presented in Tables 9 and 10 support the findings in the last subsection. Univariate models, showed in Table 9 indicate that, with 5% significance level, no solvency variable (Total debt or Fiscal result) significantly contributes to the explanation of the presence (or the absence) of the cousin risks phenomenon. Further more, the only external accounts variable that is significantly different from zero is the tariff level: the bigger the mean import tariff, the bigger the probability of a country to exhibit cousin risks. Current account, as well as exports plus imports over GDP ratio, does not affect the country's probability of having the cousin risks phenomenon even at the 10% significance level. The results also show that gross domestic savings do not affect the probability of the cousin risks phenomenon occurrence on 10% significance level.

Government external debt minus international reserves, domestic credit for private sector, and import tariffs are all statistically significant at 1% significant level. The higher the currency mismatch – understood 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 risk and currency risk.

Multivariate models´ results are presented in Table 10. 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, except for model 13. Indeed, under Akaike and Schwartz criteria the best model is model 11 (again except for model 13 where no variable shows up significant[49]) and these two variables jointly explain[50] more than 78% of the presence of cousin risks phenomenon. In all of the models, currency mismatch increases while domestic credit to private sector reduces the probability of a country present cousin risks.

Model 9 indicates that when we analyze currency mismatch and gross domestic saving jointly, the former is positive and significant (p-value 0.0016) while the latter is not significantly different from zero (p-value 0.5429). Model 10 jointly estimates the effect of currency mismatch, financial deepening and total government debt. While the first two remain significant, the total government debt is not significantly different from zero (p-

[48] Note that the convention was to apply 'zeros' for countries that do not exhibit cousin risks and 'ones' to countries that do exhibit cousin risks. In the case of the opposite convention, say 'zeros' for countries that exhibit cousin risks and 'ones', otherwise, coefficients interpretation would have to be inverted as well.

[49] Probably, due to multicollinearity problem.

[50] McFadden´s R2

value 0.8495). Models 14 and 15 show that overall budget balance is not significantly different from zero in multivariate analysis. In sum, these results 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.

Univariate models suggested that mean tariff import was important in determining the phenomenon. But Models 12 and 13 indicate that when we jointly analyze it with currency mismatch or domestic credit, the tariff is no longer statistically significant[51].

All the models are robust *vis-à-vis* the exclusion of Chile, South Africa, Poland, and Turkey[52]. 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. Except for model 13, in all other models, these two factors were significant (the biggest p-value is 0.0557). Their sign indicate that the higher the government currency mismatch is, the higher the probability of positive correlation between country risk and the forward premium. Excluding model 13, where no variable is significant, Model 11 is the most suitable to analyze the positive correlation between country risk and currency risk under Akaike and Schwartz criteria. Furthermore this model explains more than 78%[53] of the probability of the presence of cousin risks.

Based on the results we can conjecture that under the presence of currency mismatch, exchange rate shocks also affect the sovereign credit risk since it changes a country's level of indebtedness, subsequently influencing investors' risk perception. Since a higher level of gross domestic savings embodies a higher level of domestic credit supply, we also conjecture that the existence of domestic credit supply reduces the need for external funding in moments of crisis.

4.4 Adherence Analysis, Marginal Effects and Policy Implications

We can see how well does the model fits the data for each country by checking its adherence. This is done to model 11, our best model. The graph bellow presents the probability of the presence 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. So evidence suggests that we had a nice fit but there are some countries, such as Russia and Indonesia, for which our model does not perform well.

One of the niceties of the model estimated is that it captures non-linearities. Each country represents a different point, so, the marginal effect of the independent variables are different for each country. The marginal effect analysis tell us for, each country, what is the effect on the probability of occurrence of the cousin risks phenomenon of a marginal variation on the independent variables.

Moreover, the estimated binary choice models allow us to perform another interesting exercise: to check the necessary variation, *ceteris paribus*, on currency

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[51] Import tariff level has p-value equal to 0.4508 in model 12 and 0.2054 in model 13.

[52] This can be seen in Appendix 9, available at www.econ.puc-rio.br/mgarcia.

[53] According to McFadden's R^2 of model 1.

mismatch or on financial deepening in order to make the cousin risks phenomenon vanish, that we defined as forcing the probability of occurrence of the phenomenon to become less than 5%.

We implement both exercises for models 1 and 11. The tables bellow present the results of marginal effect and the needed variation in each variable necessary to make the cousin risks phenomenon vanish in each country.

Fig 11: Adherence Analysis

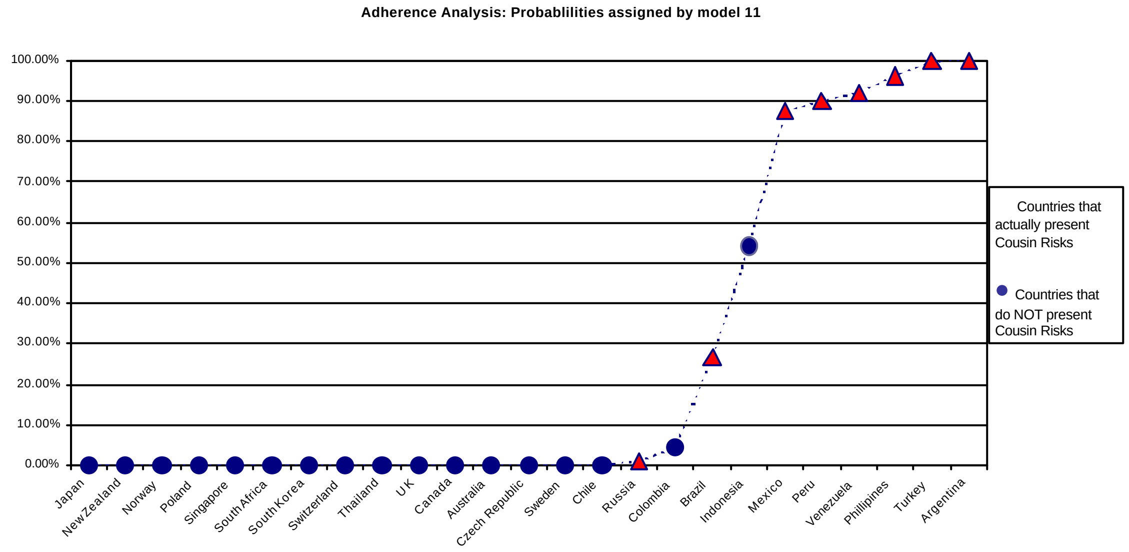

TABLE 11
Policy Implication

Variation needed in the each variable to decrease the probability of the cousin risks phenomenon's presence to 5% for each country :

	Model 1	Model 11	
	Govt. External Debt - International Reserves (% GDP)	Govt. External Debt - International Reserves (% GDP)	Domestic credit to private sector (% GDP)
Argentina	-36,10%	-44,10%	39,30%
Australia	-5,40%	0,00%	0,00%
Brazil	-18,10%	-9,60%	8,60%
Canada	-2,40%	0,00%	0,00%
Chile	-1,80%	0,00%	0,00%
Colombia	-7,40%	0,00%	0,00%
Czech Republic	0,00%	0,00%	0,00%
Indonesia	-33,00%	-16,50%	14,70%
Japan	0,00%	0,00%	0,00%
Mexico	-17,80%	-26,30%	23,50%
New Zealand	-4,50%	0,00%	0,00%
Norway	0,00%	0,00%	0,00%
Peru	-25,70%	-27,60%	24,60%
Phillipines	-58,00%	-32,30%	28,80%
Poland	-10,30%	-17,90%	16,00%
Russia	0,00%	0,00%	0,00%
Singapore	0,00%	0,00%	0,00%
South Africa	-2,50%	0,00%	0,00%
South Korea	0,00%	0,00%	0,00%
Sweden	-25,40%	0,00%	0,00%
Switzerland	-4,10%	0,00%	0,00%
Thailand	0,00%	0,00%	0,00%
Turkey	-38,30%	-42,10%	37,60%
UK	-4,10%	0,00%	0,00%
Venezuela	-13,30%	-28,80%	25,70%

TABLE 12
Marginal Effects Analysis

Variation on the probability of the cousin risks phenomenon's presence in each of the countries analyzed when we increase in 1% the following

	Model 1	Model 11	
	Govt. External Debt - International Reserves (% GDP)	Govt. External Debt - International Reserves (% GDP)	Domestic credit to private sector (% GDP)
Argentina	1,38%	0,04%	-0,06%
Australia	1,61%	0,00%	0,00%
Brazil	3,18%	3,59%	-3,75%
Canada	1,18%	0,00%	0,00%
Chile	1,10%	0,00%	0,00%
Colombia	1,93%	1,09%	-1,00%
Czech Republic	0,03%	0,00%	0,00%
Indonesia	1,85%	4,18%	-4,74%
Japan	0,61%	0,00%	0,00%
Mexico	3,16%	2,07%	-2,64%
New Zealand	1,48%	0,00%	0,00%
Norway	0,20%	0,00%	0,00%
Peru	2,89%	1,73%	-2,25%
Phillipines	0,03%	0,80%	-1,09%
Poland	0,00%	0,00%	0,00%
Russia	0,03%	0,31%	-0,27%
Singapore	0,00%	0,00%	0,00%
South Africa	1,17%	0,00%	0,00%
South Korea	0,00%	0,00%	0,00%
Sweden	2,92%	0,00%	0,00%
Switzerland	1,42%	0,00%	0,00%
Thailand	0,07%	0,00%	0,00%
Turkey	1,08%	0,07%	-0,10%
UK	1,42%	0,00%	0,00%
Venezuela	2,79%	1,46%	-1,92%

5 Conclusion

The positive correlation between country and currency risk premiums is referred to as cousin risks. Both risks are components of the domestic interest rate. Therefore, a country is 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. 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 a positive correlation between these two risks premiums. Therefore, the cousin risks phenomenon is not omnipresent 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 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, the high levels of credit to the private sector may represent a substantial domestic supply of funds and efficiency in using this supply of funds. The higher the level of financial deepening, the smaller the necessity of borrowing in international capital markets, ultimately resulting in reduced expectations concerning the deleterious effect of the currency mismatch. In this event, market participants may not associate the forward premium with the country risk premium, leading to the conjecture that financial deepening softens the cousin risk problem even under the presence of currency mismatch[54].

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[54] Indeed we can see from table 13 that the marginal effect of an increase in currency mismatch is smaller in the model 11 that accounts for both factors in model 1, that only takes into account the currency mismatch.

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