BRAZILIAN SOVEREIGN RISK DETERMINANTS: AN ANALYSIS ON THE POST-REAL PLAN PERIOD

Everton Anger Cavalheiro*, Kelmara Mendes Vieira**, Carlos Costa***

Abstract

The country risk has a significant importance for the equity market of a specific country since it works as the tax indicator in that market. Granted, this subject's importance, several international agencies try to measure it, e.g., JPMorgan that created EMBI+BR. In this research, we sought to identify its determinant factors in the post-real plan period. Initially, we analyzed the existence of structural breaks in the series, where three different breaks and four regimes were found. In this research, we sought to analyze 29 explanatory variables, five of which were selected via the stepwise method: two dummy variables (one for the American crisis and another one for the political crisis in 2004) and three other continuous variables: Current Transactions Balance, Exchange Rate, and Debt Balance to the IMF. The most relevant is the Exchange Rate when explaining the country risk. These five variables explain 86% of the Brazilian credit risk variation between November 2003 and December 2014.

Keywords: Risk, Sovereign Risk, Determinants

* *Professor at Federal University of Pelotas*
** *Professor at Federal University of Santa Maria*
*** *Professor at School of Management - Faculty Meridional - IMED*

Introduction

The 70s watched a loans explosion to countries in Latin America and other less developed countries. This boom was a response, not only to the resource demand by these countries, but also to the support provided by the International Monetary Fund (IMF) and the World Bank to them. Besides, the western banks needed to move the petrodollars from countries like Saudi Arabia and Kuwait, where credit decisions were often made without considering the borrower's credit quality (Hoti & McAleer, 2005). As a result, there were problems regarding payment of the polish debt and other countries in the communist bloc, in the early 80s, as well as the debt moratoria of the Mexican and Brazilian governments, in 1982, with significant and long-term effects on the commercial banks' balance-sheets and profits in some countries (Lange, 2007).

Krayenbuehl (1985) comments that, considering these events, the concept of country risk, or the probability that a Sovereign State cannot meet its compromises to one or more foreign creditors and/or investors became a major concern for the international financial community.

On the other hand, it is known that the sovereign titles work like benchmarks for the recovery of bonds in companies belonging to each country and, as a consequence, they act like catalyzers for a nation's development (Fabella & Madhur, 2003). According to Dittmar e Yuan (2008), the expectation of changes when classifying a country's sovereign debt especially affects the financial markets of emerging economies.

On the other hand, more recently, the profusion regarding global liquidity, and the good economic performance of developing countries were responsible for the minimum country risk in the history of these countries (Rocha & Moreira, 2010). Even during the world subprime crisis, the emerging nations showed a greater resistance to the crisis, and were the last ones to feel its effects. At its peak, the most elevated EMBIG (*Emerging Markets Bond Index Global, calculated by* JP Morgan) was significantly lower than those recorded during the crisis in Russia (1998), Brazil (1999/2002), and Argentina (2001/2002). The country risk level in these countries rapidly returned to levels under 300 base points, halfway through 2009.

In Brazil, one of the most important emerging economies in the world, the country risk measured by JP Morgan reached its lowest – an historical value on June 18 2007, 138 base points. During the global financial crisis, the Brazilian country risk did not exceed 500 base points and rapidly returned to levels under 250 in the second semester of 2009; considering this to be a good performance by the Brazilian economy, during the subprime crisis, and the significant improvement of the macroeconomic factors for reducing the Brazilian country risk. In this sense, this article seeks to answer the following

research problem: *how do the international, macroeconomic, and political variables influence the country risk in the post-real plan period?*

The article is organized as follows: the next section shows a literature review on the country risk subject and its determinants. Section 3 shows the methodology outline, so that, after this section, we can show the results, and, eventually, in the last section, the main conclusions of this study are discussed.

Country Risk Definition

The oil crisis in the 70s and the world economic turmoil that came ever since were the first post-war events that emphasized the importance of the global risk factor for organization management, as well as for the countries socio-economic development. Since then, Kosmidou *et al.* (2008) comment that the country risk analysis has evolved like an important research topic within economics and finances, throughout the last three decades, focusing on the investigation of economic and financial difficulties that the countries face, which have a direct influence on the sovereign credit risk. The importance of the country risk analysis is clearly understood by the great number of credit rating agencies that provide country risk evaluations (Erb, Harvey, & Viskanta, 1996).

Overall, the country risk is defined as the probability of a country to meet its obligations towards foreign creditors (Cosset, Siskos, & Zopounidis, 1992). However, according to Kosmidou *et al*. (2008), this is a merely economic definition of country risk. Several researchers however, have emphasized the need to define country risk in a broader context, which can better depict the multidimensional character of the sovereign risk. To this respect, Mondt & Despontin (1986) argue that the economic dimension of country risk only shows the ability of a country to meet its responsibilities. Meanwhile, its will to honor its debts must also be considered in the analysis, by investigating the country's political environment, in order to evaluate its political risk, as argue Kosmidou *et al.* (2008). In this sense, Calverley (1985) defines country risk as the potential financial-economic losses due to difficulties stemming from the macroeconomic and/or political environment of a country.

Obviously, these definitions relate the country risk concept to the bonds a county has towards its foreign creditors (international banks or other countries, e.g.). Other researchers, on the other hand, introduced the impact of the economic and socio-political environment of a country, together with the decisions of international companies to carry out significant investments in new projects in these countries (Kosmidou, et al., 2008). In this context, Herring (1986), Kobrin (1981), and Ting (1988) referred to macro risks (sociopolitical), such as wars, price control, tax raising, or overtax, and the micro- and medium risks that investors face, such as the circumstantial risks that involve the company, the industry, or that specific project, such as cancelling import and export permits, discriminatory taxes, etc. It is understood, from the definitions above, the multiple facets of the country risk, which involve economic, financial, social, and political factors, which are relevant to countries, as well as the companies listed in those countries.

The first attempts to establish sovereign credit risk analysis systems were made by banking institutions. These attempts simply consisted of making lists, mainly based in economic variables (K. Saini & P. Bates, 1978). However, it was proved that such approach was not enough considering its inability to establish a solid methodological framework for selecting and pondering variables (Brewer & Rivoli, 1990).

The growing importance of risk analysis, both sovereign and of private institutions, stems from the fact that the market globalization and the greater equity market interconnection are risk elements that can cause financial crisis (Hoti & McAleer, 2005), where the contagious effect can threaten the international stability of the financial sector (Hayes, 1998). Besides, the increased number of financial crisis in developing countries, as well as their costs associated to official institutions and private entities are also important risk factors that should be analyzed. Considering this unfolding, the need for a thorough evaluation of the country risk is crucial for showing its impact on national and international businesses operations.

Hoti & McAleer (2005) emphasize that, ever since the solvency difficulties of Third World countries in the early 80s, the number of country risk ratings compiled by commercial agencies, such as Moody's, Standard and Poor's (S&P's), Fitch IBCA, has increased substantially. According to the authors, there are around 150 agencies all around the world that provide sovereign risk ratings, but these three are considered the main agencies in the risk rating industry (Setty & Dodd, 2003). Considering this topic's complexity and the need to look further into it, the next section will be on the details of the country risk indicators.

Country Risk Indicators

According to Marcela-Corneli (2009), in order to maximize the benefits obtained from their investments, investors take on a wide range of risks, which are systemically related, of which the country risk is among the most significant ones. The country risk is the expression of an accumulation of economic indicators: Gross National Product (GDP), Foreign Trade Balance, External Debt Levels, Unemployment Rate, Exchange Reserves, Inflation Index, and some qualitative evaluations of the political and social environment in the country.

According to the author, in order to evaluate

country risk, the following variables are used to calculate ratings: economic variables (GDP per capita, economic growth, inflation, budget balance regarding GDP, and the current account balance regarding GDP, reserves in importing months, changes in forex rate, current account balance); political variables (autocracy, democracy, government longevity, political competition, political opening, political independence, and players in the country's political context).

Regarding the influence of macroeconomic variables when determining country risk, Montes & Tiberto (2012) comment that, since the beginning of 2000, the developing countries have been benefited by an extremely favorable environment in the global economy, generated by world equity. The authors comment the existence of several studies that examined the relationship between country risk and internal and external factors of the economy.

In this sense, Montes & Tiberto (2012) point out that part of the international literature emphasizes the opinion that the shocks, originally from developed countries, are the main responsible for the evolution of the country risk and, thus, point out the factors external to countries (Calvo (2002), Calvo (2005); García-Herrero & Ortiz (2005); Kamin & Von Kleist (1999), Rozada & Levy-Yeyati (2005)). On the other hand, some literature studies the effects of the domestic economic grounds for determining country risk (Arora & Cerisola (2001); Culha, Ozatay, & Sahinbeyoglu (2006); Eichengreen & Mody (1998); Kamin (2002)).

Arora & Cerisola (2001), analyze the effects of the American monetary policy on the sovereign spreads, as well as the influence of domestic macroeconomic grounds on the country risk. The evidence found suggests that each country's macroeconomic grounds, such as adopting a responsible tax policy, are determinant for reducing country risk. A similar result was suggested by Culha, Ozatay, & Sahinbeyoglu (2006), who showed that the domestic macroeconomic variables have a significant influence on the short-term behavior of a country risk.

As far as Brazil is concerned, some studies tried to investigate the relationship between the country risk and the macroeconomic variables (Andrade & Teles (2006); Blanchard (2004); Favero & Giavazzi (2004); Teixeira, Klotzle, & Ness (2008)). The research by Andrade & Teles (2006) showed that the Brazilian monetary policy, as well as the international reserves, played a relevant role regarding the country risk, significantly reducing it. Favero & Giavazzi (2004) had already shown that, in Brazil, the tax policy has an intimate relationship to country risk and the efficiency of inflation objectives, on which the external shocks on the prize per Brazilian risk tend to depreciate the forex rate and elevate the expectation of the country's inflation. The authors also demonstrate that variables such as forex rates and internal interest rates float parallel to the Brazilian sovereign risk.

On the other hand, Teixeira, Klotzle, & Ness (2008) showed how some fundamental macroeconomic variables – such as GDP growth, fiscal superavit, public debt, inflation, current account balance, and international reserves – have influenced the Brazilian country risk. The results by Ferreira (2010) corroborate the research by Teixeira, Klotzle, & Ness (2008), who showed the macroeconomic grounds, such as the current account balance as a GDP percentage, public debt as GDP percentage, and the international reserves, vastly explain Brazil's country-risk evolution. On Table 1, we can see the list of variables that are commonly used in studies on sovereign risk.

Table 1. List of variable commonly used as sovereign risk indicators

Variable	Acronym	Variable	Acronym
Balance of trade	BC	GDP growth rate	TCPIB
Economic development	DE	Imports/GDP	I/PIB
Exports	E	Imports/Reserves	I/R
Exports growth rate	TCE	Inflation growth rate	TCINF
External debt	DE	Inflation	INF
External debt/GDP	DE/PIB	Political Stability	EP
Direct foreign investment per capita	EEDPC	Consumer prices increase rate	TAPC
World financial crisis	CFM	Real exchange rate	TCR
International Reserves	RI	IMF reserves position per capita	PRFMI
Central Bank Credibility	CBC	Reserves growth rate	TCR
Public Debt/GDP	DP/PIB	Stocks return	RA
Reserves Position at the IMF/Imports	PRFMI/I	Exports rate	TE
Current Transactions Balance	STC	GDP	PIB
Central Bank Reputation	RBC		

Source: adapted from Kosmidou *et al* (2008).

Kosmidou *et al* (2008) comment that the most quoted variables in scientific research are: inflation (I), imports/reserve ratio (I/R), External debt/Exports (ED/E), and the GDP growth rate (GDPGR). Table 2 shows a summary of the variables used in studies on the sovereign risk analysis.

Table 2. Studies on the sovereign risk and main variables used

Studies	Variables used				Studies	Variables used			
Frank Jr & Cline (1971)	I/R				Cooper (1999)	TCPIB	INF	DE/E	I/R
Grinols (1975)	DE/PIB	DE/E			Mumpower et al.(1987)	INF			
Feder & Just (1977)	INF	TCE			Balkan (1992)	EP	I/R		
Mayo & Barrett (1978)	PRFMI/I	TAPC	I/PIB		Lee (1993)	DE/PIB			
Saini & Bates (1978)	TAPC	TCR			Cantor & Parker (1996)	INF	DE/E	DE	
Abassi & Taffler (1982)	INF				Haque et al.(1996)	I/R	TCINF		
Taffler & Abassi (1984)	INF				Kaminsky & Schmukler (2002)	I/R			
Feder & Uy (1985)	TCPIB	TCE			Reinhart (2002)	TCR	RA	E	
Burton & Inoue (1985)	EEDPC	TCPIB	EP	INF	Goldberg & Veitch (2010)	TAPC	TE	E	RI
Citron & Nickelsburg (1987)	EP				Montes & Tiberto (2012)	DP/PIB	RBC	RI	CBC

Source: adapted from Kosmidou *et al* (2008).

Political factors and their influence on country risk

The political risk has been an important variable for international business decisions. Solberg (1992) comments that, although there is no consensus regarding the exact political risk definition, the political risk can be basically defined as the political behavior that can have a direct impact on the value invested, or on the possibility of repatriating foreign investments made in a specific country, or on the reimbursement possibility of international loans it made.

As it is pointed out by Kosmidou, *et al*. (2008), the decision to reset a country's risk reflects, not only the circumstances of its economy, i.e., its capacity of meeting its responsibilities, but also its will to meet them. This last aspect reflects the political environment of the borrower, where the decision of resetting the sovereign risk is a political decision. Besides, the main international institutions analyze and publish the country risk, as well as their credit ratings based on the effects of the political variables.

Balkan (1992) incorporated in his work, when analyzing the 1971-1984 period, two dimensions of the political environment: the democracy level and the political instability level, where the author found an inverse relationship between the debt renegotiation probability of a country and its democracy level, as well as a direct relationship between the sovereign debt rescheduling and the level of political instability. This result was corroborated by Lee (1993), who demonstrated that the political situation of a country is an indicator of its credit risk.

According to Miller (1992), social uncertainty can be the precursor of policies and of political uncertainty. Actually, social protests stem from the frustration on the basis of the social pyramid, and want to change the governmental policies or even, in a more extreme manner, the political regime. An example of this situation occurred on the so-called Arabian Spring, where the country risk in Egypt, for instance, increased 274% between 2010 and 2011 (IMF, 2012). Other two examples of the effect of political uncertainty on the country risk are Argentina and Venezuela, where, at the end of 2012, there was a 254% and 264% surcharge, respectively, when compared to the average Country Risk in Latin America.

As a consequence, the political risk concerns any harmful, unexpected actions, which are taken by local authorities and that have a direct impact on foreign companies settled in that country. In the Argentinian and Venezuelan cases, both countries have a clear nationalization policy for companies. As quoted by Miller (1992), the political risk includes the nationalization/expropriation of resources risk, breach of contract, exchange control, commercial restrictions, or commercial agreements that could benefit some foreign competitor, in detriment of others.

Materials and Methods

For this article we sought to analyze the risk in Brazil, and its possible falls, on a monthly basis, by using the *Emerging Markets Bond Index Plus Brazil* (EMBI+BR), calculated by JPMorgan. The period analyzed was from July 1994 to December 2014, and the data was extracted by IPEADATA (2012).

Before analyzing the risk indicators of sovereign risk, it is necessary to choose the period to analyze, so, we tried to identify the structural breaks in the analyzed series. The problem of structural changes detection in linear regression relationships has been an important topic in econometric and statistical research (Zeileis, Leisch, Hornik, & Kleiber, 2001), considering that a careless analysis can result in incorrect inferences in causality tests, co-integration and acceptance of incorrect models (Covas, 1997). The author completes by saying that, besides, these tests can determine the way exogenous shocks or political regime changes are felt in the behavior of

some economic indicators.

In order to adequately treat the time series, some authors have presented several tests that make it possible to identify and estimate the moments for structural breaks. Among the first works to be published, we can find the tests by Chow (1960) and CUSUM, by Brown, Durbin e Evans (1975), where the first test had the inconvenient of implying the a priori knowledge of where the structural break was. The second test is part of another class, which allows us to detect breaks of several types for interesting parameters and for which we do not have the need to specify the number of breaks in the series (Covas, 1997).

Dias & Castro Jr. (2005) comment that the CUSUM test is based in recursive residuals. The technique is adequate for time series data and can be used, even when there is an uncertainty on when the structural break occurred. The null hypothesis is that there is no structural break in the series, i.e., that the coefficient of a vector β, is the same for the whole period, as it is shown on Equation (1); and the alternative hypothesis is that the coefficient β varies through time.

$$H_0 : \beta_i = \beta_0 \quad (i = 1,...,n) \tag{1}$$

where β_i is the vector $k \times 1$ of the regression coefficients shown in (2):

$$y_i = x_i^{\mathrm{T}} \beta_i + \mu_i \tag{2}$$

where in time *i*, y_i is the observation of the dependent variable, $x_i = \left(1, x_{i2}, ..x_{ik}\right)^{\mathrm{T}}$ is the observations vector $k \times 1$ of the independent variable and μ_i is $iid\left(0, \sigma^2\right)$.

Next, $\hat{\beta}^{(i,j)}$ is the coefficient estimated by the ordinary least squares (OLS), based on the observations *i*+1,...,*i*+*j* e $\hat{\beta}^{(i)} = \hat{\beta}^{(0)}$ is the estimate based in all the observations until *i*. Similarly, $x^{(i)}$ is the matrix covariate based in all the observations after *i*, where the residues are denoted by $\hat{\mu} = y_i - x_i^{\mathrm{T}} \hat{\beta}^{(n)}$ with the estimated variance $\hat{\sigma}^2 = \frac{1}{n-k} \sum_{i=1}^{n} \hat{\mu}_i^2$. There is another type of residuals that are frequently used in structural change tests are recursive residuals, as shown on (3).

$$\tilde{\mu}_i = \frac{y_i - x_i^{\mathrm{T}} \hat{\beta}^{(i-1)}}{\sqrt{1 + x_i^{\mathrm{T}} \left(X^{(i-t)^{\mathrm{T}}} X^{(i-t)} \right)^{-1} x_i}} \tag{3}$$

that, under the null hypothesis, has zero average and variance σ^2, where the estimated variance is $\tilde{\sigma}^2 = \frac{1}{n-k} \sum_{i=k+1}^{n} \left(\tilde{\mu}_i - \bar{\tilde{\mu}} \right)^2$. The CUSUM test is shown in (4):

$$CUSUM = \sum_{r=K+1}^{t} \frac{w_r}{s} \tag{4}$$

where in the equation (1), t=k+1,...,t, w are the recursive residuals of regression and *s* is the error of the regression for all time *t*.

In this work, after identifying the structural breaks in the series, and their respective regimes, we sought to analyze the descriptive statistics (minimum, maximum, average, median, standard error, asymmetry, and kurtosis), as well as the non-linearity of data in each regime found. In order to test each regime's non-linearity, we used the Tsay Test, shown in Tsay (1986). This test investigates the existence of non-linearity for average, which considers the residuals ($\hat{\varepsilon}_i$) of the auto-regressive process, as shown in (5).

$$\hat{y}_i = \hat{\beta}_i y_{i-1} \cdots + \hat{\beta}_p y_{i-p+1} + \hat{\varepsilon}_i \tag{5}$$

where $\hat{y}_i$ is the estimated dependent variable and y_{i-1} is the lagged dependent variable in *t*-1, *p* is the number of lags, and $\hat{\varepsilon}_i$ stands for the estimated residuals of the model. Then, for each y_t observation, we built a vector z_t of the lagged variables cross products, i.e., y_{t-i}, y_{t-j} for *i*, *j* = 1, ..., *p* where $i > j$. For instance, if *p* = 2 then $z_t = \left[y_{t-1}^2, y_{t-1} y_{t-2}, y_{t-2}^2 \right]^T$. Subsequently, the parameters are estimated according to:

$$\hat{y}_i = \hat{\phi}_1 y_{i-1}^2 + \hat{\phi} y_{i-1} y_{i-2} + \hat{\phi}_3 y_{i-2}^2 + \hat{\eta}_i \tag{6}$$

where $\hat{\phi}_i$ stands for the estimated parameters and $\hat{\eta}_i$ stands for the estimated residuals of the model. Then, we make the regression for the estimated residuals $\hat{\varepsilon}_i$ in $\hat{\eta}_i$, as shown in Equation (7).

$$\hat{\varepsilon}_i = \gamma_0 + \gamma_1 \hat{\eta}_{t-1} + \gamma_2 \hat{\eta}_{t-2} \cdots + \gamma_p \hat{\eta}_{t-p} + \hat{\xi}_t \tag{7}$$

where γ_0 stands for the estimated parameters and $\hat{\eta}_{i-p}$ are the estimated residuals lagged in *p*. Considering the procedures shown in (5), (6) and (7), we calculated the Tsay Test statistics, as shown in (8).

$$\hat{F} = \frac{\left(\hat{\varepsilon}^{\mathrm{T}}\hat{\eta}\right)^{\mathrm{T}}\left(\hat{\eta}^{\mathrm{T}}\hat{\eta}\right)^{-1}\left(\hat{\eta}^{\mathrm{T}}\hat{\varepsilon}\right)/m}{\left(\hat{\varepsilon}^{\mathrm{T}}\hat{\varepsilon}\right)/(n-p-m-1)} \quad (8)$$

where $m = p(p+1)/2$ and test the null hypothesis of a linear series, i.e., $H_0 : \gamma_1 = \gamma_2 = \cdots \gamma_p = 0$.

The importance of linearity test is due to the fact that this criterion is determinant when it comes to choosing the methodology to be adopted when modeling a time series, since as quoted by Steyerberg (2009) a well-known problem in modeling is the search for an optimal model, which essentially depends on the adopted methodology, where a similar problem occurs when one examines different transformations, jeopardizing the variables linearity.

In order to verify the influence of macroeconomic and political variables for the country risk, we performed a multiple regression analysis. The Sovereign risk was considered as an explanatory variable. The variables demonstrated on Table 1 were considered explanatory variables. Two more binary variables were included:

- *Dummy:* for the American Crisis, where the unit represents the crisis period and zero indicates a previous and posterior period considering the international crisis. The American crisis was about an equity crisis, where there was, according to de Freitas (2009) a fear of risk and a preference for equity. This fear and this preference caused the international investors to seek safer applications, such as American treasury bills, e.g., decreasing the demand for Brazilian assets. It is hoped that there is a positive correlation between variables.
- *Dummy:* for the political crisis where the sub-secretary of parliamentary affairs, was accused of receiving funding from an illegal gambling operation for the Presidential campaign in 2002, thus generating political instability and a wide negative repercussion, where the government's image was associated to dirty money and decadence. We hope that this fact has a positive relation to the Sovereign risk. In this case, the unit represents the crisis period, and zero represents the periods before and after the national political crisis.

We estimated the regression model by using the ordinary least squares, where we opted for seeking the best model, via the stepwise model. Among the tests we used, after the linear regression, is the R^2, or multiple determination coefficient, used to measure how adjusted the sample regression line is, regarding the data obtained; R^2 was used to indicate how the independent variables explained the dependent variable. Limited between $0 \leq R^2 \leq 1$, when R^2 equals 1, the model is perfectly adjusted, i.e., the adjusted regression explains the dependent variable 100% (Gujarati, 2003).

In order to verify the normality, auto-correlation, multicollinearity, homoscedasticity assumptions, we used the Durbin Watson (DW), the tolerance index (TOL) and the variance inflation factor (VIF) and White test, respectively. In order to determine the equation's residuals normality, we tested the normality hypothesis using the test suggested by Doornik & Hansen (1994).

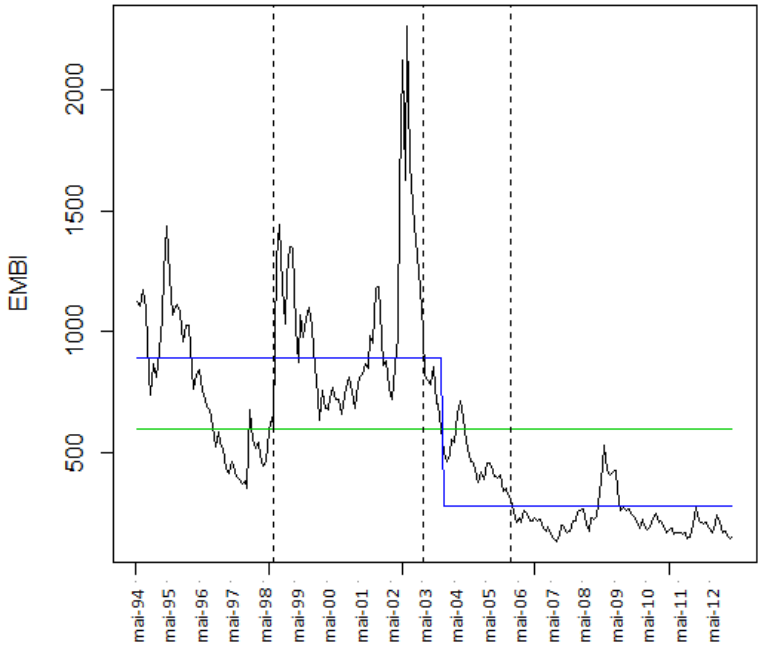
The GRETL software includes, in its computational database, the normality test suggested by Doornik & Hansen (1994). The Doornik-Hansen test includes a chi-squared distribution in order to test if the normality hypothesis is true. The variables multicollinearity assumption was verified using the VIF: the largest the VIF value was, the more co-linear the variable is (Gujarati, 2003). Eventually, in order to test homoscedasticity, we applied the White test, developed to verify whether or not the residuals variance remained constant (Corrar, Paulo, & Dias Filho, 2007).

Results, Discussion, and Conclusions

Initially, we tested the hypothesis of existence of structural breaks in the EMBI+BR series, and rejected the null hypothesis stating that the vector *b* variance were constant throughout the whole series (stats = 3,1465, *sig*. 0,000), indicating the existence of structural breaks in the time series. In this research, we used the Bai & Perron (1998) method so as to estimate the structural breaks in the data series. The Bai-Perron method allows one to simultaneously estimate multiple breaks as well as their priory unknown dates. Results are shown in Picture 1.

Picture 1 shows three rupture points on the EMBI+ series, in period comprised between January 200 and December 2014, where, having *m* breaks we will have *m*+1 regimes, as described on Table 3.

Figure 1. Structural Breaks in EMBI+BR**.**



Source: own data organization

Table 3. Dates to each regime identified

Regime	From	To
1st	May 2004	July 1998
2nd	August1998	April 2003
3rd	May 2003	January 2006
4th	February 2006	December 2014

It is clear on Picture 1 that the main structural break occurred in November 2003 (see blue line), but before commenting on this main break, it necessary to first analyze the first regime. The first regime, which is outlined in the picture, is comprehended between May 1994 (beginning of the real plan) and July 1998 (end of the President Fernando Henrique Cardoso's mandate).

It is also understood from Picture 1 that the country risk showed a peak on this first regime (reaching a maximum score of nearly 1,500 points), for this period (late 1994 and early 1995), when the country suffered a speculative attack, influenced by the Mexican crisis; furthermore, the country's international reserves, between the fourth quarter 1994 and the first quarter 1995, were reduced in over 10%, implying an increase of the financial dimension of the sovereign risk. We would also like to point out that the Real Plan was in its early stages, when the country showed a low level of international reserves, especially when compared to the country's GDP (the lowest level found in March 1995: 49.32% of that month's GDP).

In the first regime, there were several changes, with a special focus on the significant decrease of inflation and a greater value of the Brazilian currency, facing the dollar. However, according to Tavares *et al.*(2012), between 1995 and 2008, Brazil experienced moments of significant increase of country risk, which culminated in the Russian crisis in the second semester 1998 (period close to the first structural break that we found). The inflation decrease was partly due to the exchange floatation bands regime, between 1995 and January 1999, when Brazil adopted a system where the exchange rate was authorized to float within certain preset intervals.

The idea was reducing the inflation rates, making a greater number of products available for consumer (imported products, i.e., taking advantage of the favorable exchange rate). Furthermore, in this same period, the new currency, the Real, suffered several speculative attacks; the most significant took place in September 1998, influenced by the Russian Crisis (Lopes & Moura, 2001). These constant speculative attacks, allied to the expressive increase of the Brazilian sovereign equity debt (from R$ 56.88 billion in June 1994 to R$ 305.52 billion in January 1999) forced the nation to eliminate the exchange bands strategy in January 1999, thus starting a second regime under a new macroeconomic panorama.

This second regime showed to be extremely volatile, when compared to the other regimes (as

described on Table 4), where the country risk showed its maximum peak on September 27, 2002 (2,436 points), nine days before the first Presidential election shift (on October 6, 2012). The months before the election of President Lula, there were important inflation peaks (the maximum occurred in November 2002, when IPCA registered 3.02% increase), followed by a record breaking elevation of Liquid Public Debt considering the GDP (57% in 2003 and when the first regime average was 32.98%).

In April 2003 there was the second structural break of the data series, since, after the speculation moment when it was thought that a new leader would apply measures that could harm the economy, it was clear that the economic policy would not change in such an abrupt manner, as expected, since the new President's and the Minister of Finance's inauguration speeches made it clear that they did not want to change the country's macroeconomic policy (Corazza & Ferrari Filho, 2004).

According to the authors, there was no doubt in the market that the continuity and the high orthodoxy level of the economic policy resulted in reestablishing trust in Brazil, by the IMF, and the international financial community. This trust was translated in the abrupt fall of the sovereign risk, in the short-term equity flow return, in the end of the speculative process against the national currency, in the consequent valuation of the exchange rate, and debt securities; concurrently, there was a decrease on the net public debt/GDP ratio, associated to the improvement of current account deficits, as well as an elevation of the reserve level, and the currency's overvaluation, due to a greater flow of foreign equity, which led to the third and last structural break.

The third structural break, occurred in January 2006 was a reflex of the last days of 2005, when the Brazilian government settled its debt to the IMF, and, in January 2006, besides honoring his debt to the Paris Club, Brazil was able to practically clear the outstanding value for the dollar associated internal debt (da Silva Bello, 2006). Such measures, together with so many others – such as, as of February the same year, exempting external investors' fixed income securities and public assets of taxes, as well as the intention of, in April, clearing the external debt *bradies* bonds –, that might have contributed for reducing the Brazil Risk, since the country benefited from the international liquidity, the favorable international economy, and the megasuperavits of the country's commercial balance in the last few years (da Silva Bello, 2006).

Besides settling its debt with the IMF and the Paris Club, the Government announced, for April 2006, the advance repurchase of all external debt bonds, known as *bradies*, which were still in the market, due between 2009 and 2024. We should point out that the *bradies bonds* were issued as of 1994 by the central banks in developing countries as part of their own external debts negotiation, where the issue of *bradies* is related to the Brazilian external debt moratorium, laid down in 1987. This repurchase, associated to others contributed for the extension of the Brazilian external debt, thus reducing the external vulnerability of the Brazilian economy. Furthermore, the increased cost of agricultural commodities in the international context had a positive influence on the entrance of dollars into the country, helping to strengthen the currency in this last regime even more.

As a way to identify the determinant factors of Brazil risk, we initially calculated the descriptive statistics for each one of the regimes previously analyzed.

Table 4. Descriptive statistics and linearity test for each one of the four regimes identified

Regime	Min.	Max.	Average	Median	Standard Error	Assymetry	Curtosis	Tsay Test
First	358.0	1441.0	758.2	739.0	28.9	0.376*	2.038	0.339**
Second	608.0	2.259.0	1.029.0	954.0	357.3	1.451*	5.074	3.424**
Third	311.0	853.0	526.8	464.0	154.1	0.636*	2.251	0.086**
Fourth	139.0	530.0	230.8	216.0	73.2	1.989**	7.205	1.044**

* 5% significance level.

By observing Table 4, it is clear that the greatest data volatility was shown on the second regime, where the sovereign risk varied between 608 points (min) and 2259 points (max), where there was e high kurtosis value (5.074), making the returns with leptokurtic features and a strong asymmetry to the left (1.451). Such results implied rejecting the null hypothesis of the Tsay linearity test, where, once you reject the null hypothesis, you are rejecting the time series linearity. We would like to point out that, after the main structural break in the series (which occurred in November 2003), the data showed linear behaviors. It is considered that, after the main structural break, the sovereign risk changed its behavior completely; in this research, we opted for analyzing its determinants from December 2003 to December 2014, as shown on Table 5.

Table 5. Coefficients' covariates. weights and significance of the minimum square model with corrected heteroscedasticity in order to explain Brazil's risk

		Interv. 95% de Conf.					
Regressors	Coefficient	Inf.Lim	Sup.Lim	Std.Coef.	*T* Teste	Sig.	VIF
Exchange rate	111.808	104.277	119.340	0.735	29.446	0.000	5.138
IMF debt balance	5.739	4.658	6.820	0.243	10.530	0.000	4.396
American Crisis	110.310	75.600	145.021	0.123	6.304	0.000	1.349
Political Crisis	89.047	25.813	152.281	0.074	2.793	0.000	1.653
Balance for Current Transactions	-4.034	-6.194	-1.874	-0.063	-3.704	0.000	1.706
Source: own data organization							

The estimated model presented five covariates, considering that two variables are *dummies* (the first one identifying the International Financial Crisis, and the second one is identifying a Political Crisis), and three continuous variables (Exchange Rate, IMF debt, and Current Transactions Balance). The determination coefficient (adjusted R^2) was 0.8652, i.e., 86,52% of the sovereign risk total variance is explained by the set of covariates, just like the *f* test (130.899 and *sig*. 0.000) shows that at least one of the independent variables has an influence on the dependent variable, considering the model to be significant as a whole. We would like to point out that the VIF index points to the non-existence of multicollinearity, since, according to Hair *et al.* (2005), a very common reference value is that a VIF value greater than 10 denotes high collinearity. On the other hand, the square-chi test (1.196 and sig 0.550), for the residual normality, accepted the null hypothesis of data even distribution with normal distribution.

It is clear in Table 5 that the Exchange Rate showed a higher standardized coefficient (0.735) and had a positive relation regarding the Sovereign risk, where, with a real foreign exchange rate increase, a 112 points increase is expected for sovereign risk. That can be explained as follows: a foreign creditor converts dollars to invest in the country. Regardless of his application's financial performance, the exchange depreciation implies a loss for those investors. This happens because, at the end of the investment period, the foreign investor must convert Real in Dollars. With the foreign exchange rate fall, foreign investors will have fewer dollars than they had in the beginning. Thus, the foreign exchange rate fall stimulates the foreign investors flee in the domestic equity market and, as a consequence, it leads to an increase of the sovereign risk.

On the other hand, the variations in how the sovereign risk is perceived are generally accompanied by variations of the net equity inputs, which contribute to increase or decrease the exchange rate. In this context, Gomes (2008) comments that Brazil's exchange rate has floated for a very long time to the market mood, and thus reflected the trust among economy agents, i.e., the foreign exchange rate has also worked as a risk measure, incorporating the same unobservable factors that have a direct effect on the risk. Granted the recent high equity mobility and the high interest differential in the Brazilian economy, the foreign exchange determination reflects the equity input/output and, as a consequence, the trust in the economy. The result of this research corroborates Saini & Bates (1978), de Bondt & Winder (1996), Haque *et al.* (1996), Reinhart (2002), Favero & Giavazzi (2004), and Hammoudeha *et al.*(2012), which indicate that the Foreign Exchange Rate is a determinant of the Sovereign Risk.

On the other hand, the American Crisis was about liquidity, where there was, according to de Freitas (2009) an aversion to risk and a preference for liquidity. This aversion to risk and preference for liquidity made the international investors seek safer applications, such as the American Treasury Bonds, e.g., decreasing the demand for Brazilian bonds, leading to less equity in this market – this meant a greater Sovereign risk. The international equity crisis was positively related to the sovereign risk; Table 5 shows that there was a 110 points increase, in average, for country risk. This research is corroborated by the results of Eaton & Taylor (1986), Maltritz (2010), and Rose & Spiegel (2012), who indicated that the international financial crisis, especially the one between 2008/2009, have a strong influence in the country risk.

The political context also had an influence on the Sovereign risk, as detailed by Marcela-Corneli (2009). Reuvid (2008) argued that corruption scandals can lead to political instability. In this research, we used a dummy variable to indicate a certain political instability, where the worldwide press brought out to the attention of the public that the existence of a high-ranked employee, supposedly corrupted, central for Lula's government (a fact occurred in mid 2004).

Dota (2006) comments that from January to June 2004, Brazil was a reason for a number of news articles, however the one that had the most impact was the so-called "Waldomiro Case", where Waldomiro Diniz was presented as the sub-secretary for Parliamentary Affairs of the Planalto Palace, who had allegedly received funds from an illegal gambling operation for the 2002 Presidential campaign. In this period, it had become public that the Minister of the Casa Civil had had knowledge of such irregular resources in the presidential campaign.

Another highlight of this period was the political corruption scandal that, according to the main

newspapers was destroying the achievements of Lula, whereas the government's image was associated to the idea of decadence and dirty contexts (Dota, 2006). In Brazil, the repercussions were no different, according to Azevedo & Chaia (2008). This ended up having a negative effect on the government's image, and it led to some political instability at the time. This episode, as shown on Table 5 had an influence on the Sovereign's risk political dimension, raising it in 89 points (average). This result is corroborated by Citron & Nickelsburg (1987) who had shown that political instability had an important role on sovereign risk.

Reuvid (2008) comments that the scandals should not influence the ruling economic policies as they did in Brazil. Despite the turmoil regarding the political period, it was understood that the macroeconomic policies would not be changed, causing their effect to be seasonal and the country risk would return to its previous levels. The result of this research corroborates the findings by Citron & Nickelsburg (1987), Alesina & Tabellini (1989), Burton & Inoue (1985), Brewer & Rivoli (1990) (1990), and Le & Zak (2006), who argued that the political instability was positively related to sovereign risk: the greater the instability, the greater was the political risk, and, eventually, the greater the country risk. In this context, Le & Zak (2006) argued that the political instability is one of the most important factors for equity floatation. The relationship between, political instability, equity floatation, and sovereign risk can be explained as follows: political instability would lead to equity flee off that country, currency weakening, and, eventually, to an increase of the sovereign risk.

Back in the 1990s and 2000s, Brazil signed four big agreements with the IMF: in order to face the Asian crisis (1997), the Russian crisis (1998), the Argentinean crisis (2001), and the Brazilian crisis (2002). Thanks to the elevated international equity, the improvement of the economic indexes, and the good solvency, Brazil settled the outstanding balance. The decrease of the this debt's balance (37.45 billion dollars in November 2003, to practically zero in December 2005) had an expressive influence on the country risk, leading to an average decrease of 2.15% of the American Treasure bonds spread, since, as demonstrated on Table 5, a 1 billion dollars payment to the IMF meant, in average, a 215 points reduction (considering a 95% trust interval, this would have an impact between 174.45 and 255.42 points, as it can be deducted from Table 5).

This evidence is corroborated by Dhonte (1975), Grinols (1975), Feder & Just (1977), Sargen (1977), Feder *et al*. (1981), Abdullah (1985), Burton & Inoue (1985), Balkan (1992), de Bondt & Winder (1996), Cooper (1999), Doumpos & Zopounidis (2001), Razin & Sadka (2002), and Kosmidou *et al*. (2008) who indicate that the payment of debt and the indexes that derive from that debt are tightly related to the country's breach of contract risk and country risk.

Eventually, the Current Transactions Balance showed a reverse relationship to the sovereign risk, where a one billion dollars increase of the current transactions balance implies an average 4 percentage points reduction of the country risk. The Current Transactions Balance is one of the main results on the balance of payments, where the balance of trade (export and import), and the balance of services (transportation, insurance, shipping, and income and interest income, rents, and unilateral transactions), however it does not account for direct investment and financial credits.

The Current Transactions Balance is seen from several perspectives: one can tell if the population in a specific country is asking for loans or loaning from the rest of the world, which denotes more or less international credit for the country, and, on the other hand, the post-Keynesian and structuralist models consider the Current Transactions deficit as one of the main restrictions to economic growth; this can denote a greater struggle when it comes to settling the debt, increasing the sovereign risk. On the other hand, we must point out that a foreign exchange appreciation process leads to competitiveness loss, contributes for current transactions deficits, and opens room for the possibility of a balance of payments crisis. The result of this research is corroborated by Cantor & Packer (1996), who indicate that the international agencies build their sovereign ratings by using, among other variables, each country's currents transactions balance.

Final considerations

Country risk has a significant importance for the equity markets of a specific country, since it acts like an indicator for rates to be executed in that market. Considering this topic's importance, several international agencies attempt to measure it, such as Moody's, Standard and Poor's (S&P's), Fitch IBCA, and JPMorgan; the latter created the EMBI+ (*Emerging Markets Bond Index Plus*), which is used to measure a country's capacity to honor its financial commitments. The financial market's interpretation is that the higher the indicator's score, the more dangerous it gets to invest in that country.

In this research, we used the EMBI+Br, for being considered the best Brazilian sovereign risk indicator. The EMBI+Br is an index that reflects the Brazilian external debt bonds' behavior. The variation of this index between two dates allows one to compute the return for a portfolio made up of these bonds. The EMBI+Br spread is the value usually used by investors and general public as a measure for Brazil-risk and it corresponds to the pondered average of the benefits paid by those bonds compared to securities equivalent to those of the US Treasure, which are considered risk-free.

In order to outline the country-risk determinants, we initially analyzed the series structural breaks, and we found three of them in four different regimes; the last regime worked like a source in order to identify

its determinants, and showed less volatility and linear features. We found five sovereign risk determinants between November 2003 and December 2014, and used two dummy variables (one for the American crisis, and another one for the political crisis occurred in the so-called Waldomiro Diniz case), and other four continuous variables: Current Transactions Balance, Foreign Exchange Rate, and Debt Balance to the International Monetary Fund – IMF, where the exchange rate showed a greater impact on the country risk formation. This can be explained by the persistent fall of the country risk which possibly reflected a better perception by the investors regarding the macro-economic perspective for that country, accompanied by a better access to long-term equity and a greater current operations balance. All this translated to a greater equity offer for the country, making it possible for the exchange rate to move towards a stronger currency (Real), making the sovereign risk more stable and in a lower degree.

The forex rate decrease from an average R$ 2.95, in November 2003, to, for example, an average R$ 2.03, in September 2012, had a major influence on the country risk, lowering spread in an average 1% on the American Treasure bonds. Considering a direct relationship to the research we found, this decrease meant, in average, a 103 point reduction (considering a 95% trust interval that would have a 95.79 to 109.63 point impact, as it can deduced from Table 5). Another important variable found in this study was the advance payment of debt to the IMF (from 37.45 billion dollars in November 2003, to close to nil in December 2005). In the period that was considered, this payment explains an average decrease of 2% on the American Treasure bonds spread. This is not a permanent result – it is suggested that the impact of these variables in a different period should be analyzed in order to validate the model.

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