DOI: http://dx.doi.org/10.1590/0103-6351/7668

Push and *pull* determinants of the country risk premium for emerging economies: an econometric appraisal

Determinantes push *e* pull *do prêmio de risco-país para economias emergentes: uma avaliação econométrica*

Daniel Consul de Antoni [1]
Julia de Medeiros Braga [1]
[1] Universidade Federal Fluminense

Abstract

This article aims to identify the main determinants of the country risk premiums CDS 5 Years and EMBI+ for eight emerging economies. Econometric estimations relied on autoregressive GMM (time series) and GMM-DIFF (panel data). The analysis period is 2003-2019 and depends on the country and the data availability (monthly and quarterly data). We have tested *push* (exogenous) and *pull* (country-specifics) regressors. The empirical results have shown that some *push* factors have significant effects, which indicates that the global financial and trade cycles play an essential role in determining emerging country risk premiums. However, those economies may mitigate global influences through some internal macroeconomic policies. In our models, the international reserves stock growth rate was the primary statistically significant *pull* variable, highlighting the importance of external sound accounts for emerging countries.

Keywords

CDS 5 Years, EMBI+, country risk, emerging economies, *push* and *pull* factors.

JEL Codes F02, F62, G15.

Resumo

Este artigo tem como objetivo identificar os principais determinantes dos prêmios de risco-país CDS 5 Anos e EMBI+ de uma amostra de oito economias emergentes. As estimativas econométricas basearam-se em modelos GMM autorregressivos (séries temporais) e GMM-DIFF (dados em painel). O período de análise, a depender do país e da disponibilidade de dados, é de 2003 a 2019 (dados mensais e trimestrais). Foram testadas variáveis explicativas do tipo push *(exógenas) e do tipo* pull *(específicas dos países). Os resultados empíricos demonstraram que alguns fatores* push *têm efeitos significantes, o que indica que os ciclos financeiros e comerciais globais têm importante papel para a determinação dos prêmios de risco-país emergentes. Todavia, essas economias podem mitigar influências globais através de políticas macroeconômicas internas. A principal variável do tipo* pull *foi a taxa de crescimento do estoque de reservas internacionais, o que destaca a importância de sólidas contas externas para as economias emergentes.*

Palavras-chave

CDS 5 anos, EMBI+, risco-país, economias emergentes, fatores push *e* pull*.*

Códigos JEL *F02, F62, G15.*

1 **Introduction**

Country risk premiums measures are essential in evaluating emerging economies' external sustainability. Those economies usually are more exposed to external shocks and international capital flow reversals than advanced economies. Standard metrics used as proxies for the country risk premiums are credit rating, the one classified by Standard & Poor's, Moody's, and Fitch agencies, financial vulnerability and currency indicators, external debt, default probability, and indexes such as CDS (Credit Default Swap)[1] and EMBI+ (Emerging Markets Bond Index Plus)[2].

CDS is a security contract against assets credit risk negotiated bilaterally between the seller, usually a bank, and the purchaser. In this sense, the purchaser seeks protection against credit risks from the reference entity, *i.e*. the entity that issues the asset. Currently, CDS is the primary credit derivative in global terms (PIMCO, 2017).

EMBI+ is part of a family of indexes whose methodology was developed by the J.P. Morgan Chase bank in the 1990s. This index calculates the spread between the daily return of emerging sovereign bonds and U.S. (The United States) risk-free bonds with the same maturity and characteristics. The bonds must meet other requirements to be part of the index calculation (J.P. Morgan, 2018; 2021).

This paper aims to identify the main determinants of the country risk premiums using CDS 5 Years and EMBI+ as indicators. We use time series and panel data methods and specifications suggested in the empirical literature for a sample of emerging economies from 2003 to 2019, depending on the country (time series models), and from 2008 to 2019 (panel data models). The panel data econometric strategy uses only the variables that have presented better statistical significance in the time series models. The variables (regressors) will be both *push* (exogenous, external, global) and *pull* (country-specifics, domestic). The *push* and *pull* approach comes from the capital flows literature (Chuhan *et al*., 1993; Hannan, 2018; Naqiv, 2018). We hypothesize that some external variables play essential roles as determinants of the emerging country risk premium, while country-specific variables can mitigate in some measure those exogenous effects.

1 CDS indexes are available on different maturities. In this paper we use CDS 5 Years.

2 CDS and EMBI+ are measured by basis points, *i.e*. one basis point is equivalent to 0,01%. The higher the index, the higher the perception of the country risk premium.

We follow the suggestion of the Brazilian Central Bank (2020) that have classified two groups of emerging countries as low and high-risk. We then selected Chile, Indonesia, and Russia (low-risk countries, according to that methodology) and Brazil, Colombia, Mexico, South Africa, and Turkey (high-risk countries) for our econometric proposals. The countries' sample is also based on data availability for monthly and quarterly frequency.

As far as we know, based on the literature review we have done, no papers have analyzed the countries of our sample. Also, the period from 2003 to 2019 covers almost all of the last two decades – a period of intense changes in the emerging integration in the financial and trade markets. Finally, we believe that the combination of time series and panel data, running monthly and quarterly models, may be a vital sign of the robustness of our econometric results. Therefore, it contributes to the empirical literature on emerging country risk premiums determinants.

The paper is organized as follows: after this introduction, the next section presents a literature review of empirical works about country risk premiums determinants. Section 3 presents our econometric specifications' data, methodology, and results. Section 4 analyzes those models' results and the final section contains the conclusions.

2 **Literature review**

In the last twenty years, there has been a relevant empirical production in Economics about the determinants of the emerging economies' country risk premiums. However, the *theoretical* aspects have not yet been well developed, and there is no theoretical paradigm to follow. For this reason, we start by analyzing some central results of the empirical literature, usually through time series and panel data applications. The empirical literature generally uses the concepts of international capital flows, the so-called *push* and *pull* debate that influences capital inflows and outflows, and emerging economies' country risk premiums. We believe a critical (inverse) relationship exists between international capital flows to/from emerging economies and their country risk premiums.

Calvo *et al*. (1993) were pioneers in analyzing the main drivers of capital inflows and capital outflows to/from emerging countries. Based on that work, Chuhan *et al*. (1993), for the first time in the literature, used the terms *push* and *pull* to denominate the factors that have an essential role in determining the capital flows to and from emerging economies. In short, *push* factors are related to external/global events such as monetary policy and economic growth in the world's most powerful economies, risk aversion by international investors, international oil prices, and so on. The *pull* factors are country-specific factors. They are related to domestic economic growth, international reserves stock, industrial production, monetary and fiscal policies, external debt, and so on.

Given the expected inverse relationship between capital flows and country risk premiums, we believe that the *push* and *pull* approach can also be adapted to analyze country risk premiums. Although simple, Koepke (2019) argues that this distinction is useful in economic literature. Hannan (2018) believes that the *push* and *pull* factors will continue to have an essential role in the capital flows literature.

Aronovich (1999) conceptualized the country risk spread of emerging economies as

> *[...] the compensation required by a foreign investor for assuming the risk of default implicit in a bond issued by a government* i*, which matures in* n *years and yields* R_{in}*, when compared to the alternative return of purchasing a default risk-free bond of the same maturity (* R_{fn} *), when compared to the alternative return of purchasing a default risk-free bond of the same maturity* $S_{in} = R_{in} + R_{fn}$ *(*Ibidem*, 1999, p. 466).*

According to the author, that spread is useful because it describes the economic agents' perceptions of the financial market about the long-term fundamentals of the economy. His empirical work analyzed Argentina, Brazil, and Mexico from June 1997 to September 1998. The author has found that positive variations in the default probability of the economies have increased external borrowing costs. Furthermore, the author has argued that the country risk spreads of the three countries in that period were superelastic concerning the long-term interest rate of The U.S. (*Ibidem*, 1999).

García-Herrero and Ortíz (2005) assessed if the global risk aversion (GRA, proxy to the yield of USA corporative bonds with high relative risk) and some of its determinants, such as short and long-term interest rates and economic growth in the U.S., were responsible for impacting the sovereign spreads in a sample of nine Latin American countries from May 1994 to October 2003. The authors have used as proxies for the sovereign spreads the EMBI Global (Chile) and EMBI+ (other countries). They found a significant positive relationship between GRA and Latin American sovereign spreads. In contrast, U.S. economic growth and long-term interest rate (10-Year Treasury Bond Rate) had significant negative effects. However, when the authors tested the econometric application with the short-term U.S. interest rate – Federal Fund Rate – the effect was immediate: when that interest rate has risen, the Latin American sovereign spread has risen also.

Andrade and Teles (2006) developed a beta country risk model to assess the Brazilian country risk premium from January 1991 to December 2002. The authors found that the stock of international reserves was relevant only when Brazil had a fixed exchange rate; when it floated, the coefficient associated with that variable lost significance. Furthermore, fiscal variables (public debt and public sector primary net lending/borrowing) and the international oil price were insignificant in the author's beta model.

Baldacci *et al*. (2008) empirically analyzed the main determinants of the country risk premium EMBI through panel data with 30 emerging countries from 1997 to 2007. To the authors, fiscal and political factors were relevant in the model: fiscal consolidation has contributed to limiting the emerging spreads; however, the authors found that the composition of the public expenditure matters: public investment, for example, presented a negative impact on the spreads while the fiscal position was sustainable and the fiscal deficit did not become worse. On the other hand, political risks such as violence, expropriation, and instability have increased the country risk premiums of those countries.

Rocha and Moreira (2010) developed a panel data approach with 23 emerging countries from 1998 to 2007. The authors aimed to assess the external (exogenous) and domestic determinants of the external vulnerability of those countries. The authors have used the VIX Index and the J.P. Morgan Domestic High Yield Spreads (H.Y.) as proxies for the global aversion to risk. The main finds of the paper were that those exogenous factors are relevant and produce different impacts on each economy: macroeconomic fundamentals are *multipliers* of those impacts.

> *The results support policies towards financial liberalization, public debt management, consistent economic growth, development of the domestic financial market, and improvements in governance indicators, especially the rule of law and regulatory quality (*Ibidem*, 2010, p. 181).*

Aidar and Braga (2020), through a principal component analysis, have shown that the financial cycles in peripheral economies are subordinated to the global financial cycles. In a model with ten emerging countries from January 1999 to January 2019, the authors aimed to present the main drivers of the country risk premiums (EMBI+ and CDS) for that sample of countries. The *push* and *pull* approach was the center of the debate. The authors have argued that *push* factors such as VIX Index and the U.S. 5-Year T-Note Interest Rate (with a positive sign) and international oil price (with a negative sign) have played relevant roles as determinants of the country risk premiums.

Finally, the International Monetary Fund (IMF) developed a non-balanced panel data analysis in its Global Financial Stability Report (October 2019). The institution's researchers studied 71 countries, intending to explain the main determinants of the EMBI Global Index (proxy to the country risk premium) from 1996 to 2019. The model had exogenous variables (US BBB corporate spread, proxy to the global risk appetite, and external real GDP growth (one-year forward forecasts)). It also considered some country-specific variables: domestic real GDP growth and domestic CPI inflation (one-year forward forecasts), current account, external debt, net issuance of foreign currency government debt, and foreign currency reserves, all as a percent of GDP. Domestic credit rating has interacted with the variable associated with global risk appetite.

In the results, the model has shown that domestic fundamentals are essential in explaining the sovereign spreads of those economies. For example, higher real GDP growth, lower inflation, higher stock of international reserves, and lower external debt reduce sovereign spreads. Furthermore, countries with better credit ratings were less susceptible to external instabilities:

> *Lower-rated issuers are more sensitive to global risk appetite. A 100 basis point increase in the US BBB corporate bond spread could widen spreads of B-rated EM bonds by more than 200 basis points, compared to only 50 basis points for A-rated EM issuers (IMF, 2019, p.14).*

Based on this literature review, in the next section, we present the methodology and data of our empirical analysis.

3 **Methodology and data**

This paper developed time series and panel data econometric applications to verify the main determinants of the country risk premiums EMBI+ and

CDS 5 Years for a sample of emerging economies. At first, we ran time series models to select the main variables – both *push* and *pull* – that in the period 2003-2019, depending on the country, were more critical in that determination. Those variables were selected through the literature review (Section 2 above), but this procedure was mainly based on IFM (2019) and Aidar and Braga (2020). In this sense, the models proposed were the following:

$$LN\_CDS\_5Y_t = \beta_0 + \beta_1 LN\_CDS\_5Y_{t-1} + \beta_2 X_t + \beta_3 W_t + + u_t, u_t \sim N(0,1) \quad (1)$$

$$LN\_EMBI_t = \beta_0 + \beta_1 LN\_EMBI_{t-1} + \beta_2 X_t + \beta_3 W_t + u_t, u_t \sim N(0,1) \quad (2)$$

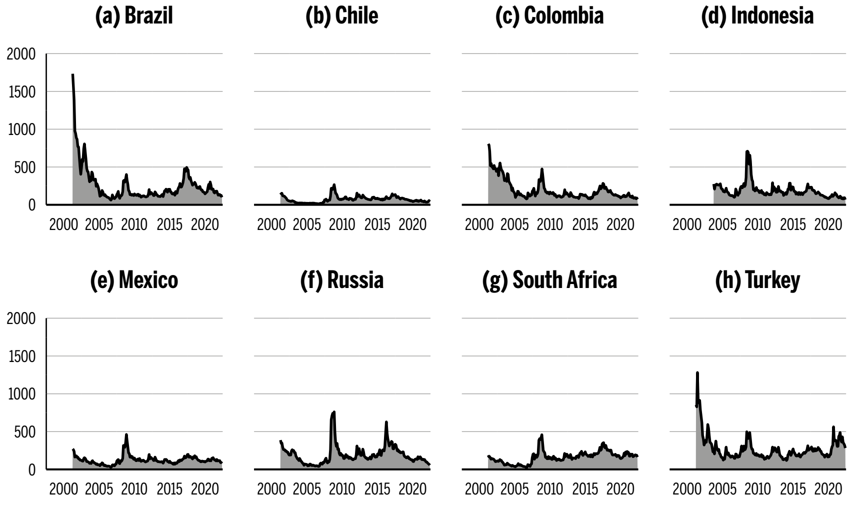
where $t = 1,\ldots,T$; the number of observations depending on the country and the model, if it has monthly or quarterly data.[3] In this sense, we have four models for each of the eight countries of our sample: two for monthly data and two for quarterly data, which totalizes 32 models. Because of their correlograms (autoregressive processes of order one), all the models have the dependent variables with one lag as regressors (Bueno, 2015). Figures 1 and 2 show the path of CDS 5 Years and EMBI+ indexes (basis points) for the countries in the sample.[4]

As already accepted in the economic literature (Rezende, 2009; Lavoie, 2013; Serrano and Pimentel, 2017), a country issuer of its own currency cannot face a default on its public debt. In this sense, we do not consider internal fiscal variables relevant to the external solvency indicators. However, the possibility of a country with a fiscal expansion or monetizing its public debt may be assessed by international investors as a risk for the domestic inflation rate. Although not necessarily representing a cost for the investor, this possible increase in the inflation rate has adverse macroeconomic consequences, mainly in emerging economies, which can cause capital outflows. Also, we do not use external debt variables because of data unavailability for the needed frequency. We believe that the variable associated with the international reserves stock fulfills well that external issue.

3 See Table 2 on Appendices. The period of the models varies among countries basically because of data availability.

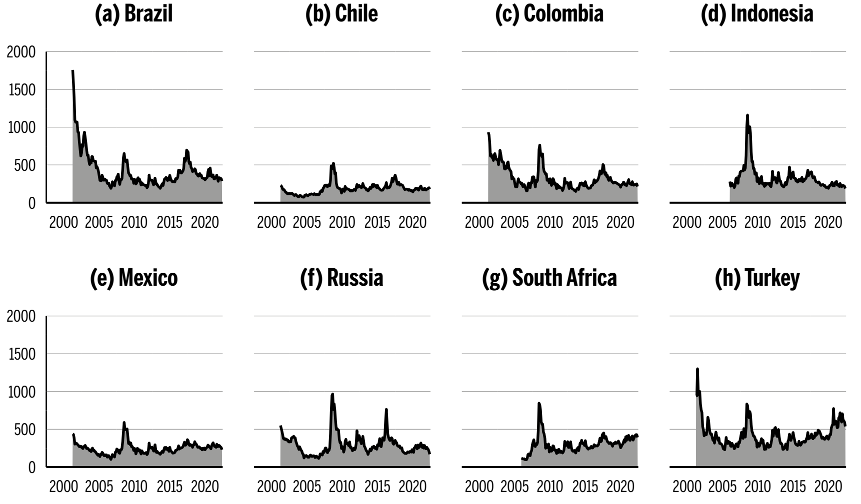
4 End of period monthly data.

Figure 1 **CDS 5 Years country risk premium**



Source: own elaboration with data from the Bank for International Settlements (BIS).

Figure 2 **EMBI+ country risk premium**



Source: Own elaboration with data from the J.P. Morgan Bank.

In this sense, we have selected the following variables for our econometric specifications (1) and (2): X_t is a *pull* matrix with the following variables: GDP yearly growth rate (GDP_DOM_YOY), domestic industrial production (IND_PROD_YOY)[5] and domestic manufacturing industrial production yearly growth rates (IND_PROD_MANUF_YOY)[6], international reserves stock yearly growth rate (RT4_LN_INT_RES and RT12_LN_INT_RES), yearly inflation rate (INF_YOY), and current account net balance (C.A.). W_t is a *push* matrix with the following variables: U.S. GDP yearly growth rate (GDP_US_YOY), U.S. industrial production yearly growth rate (IND_PROD_US_YOY), U.S. 5-Year interest rate (LN_INTEREST_5Y_US), international oil price (Brent crude – LN_OIL), and VIX Index (LN_VIX) – an index usually used to measure the global aversion risk; u_t is the error term[7].

We expect the coefficients associated with the dependent variables with one lag LN_CDS_5Y(–1) and LN_EMBI(–1), INF_YOY, LN_INTEREST_5Y_US, and LN_VIX positively affect the dependent variables. More specifically, we expect an inertial process of the series LN_CDS_5Y and LN_EMBI over time. We also believe that an increase in the inflation rate can cause a deterioration of the emerging country risk premium (IMF, 2019). An increase in the U.S. long-term interest rate may also trigger a *flight to quality* (international capital flow reversals) toward U.S. bonds and increase the emerging country risk (Aronovich, 1999; Aidar and Braga, 2020). VIX Index is a proxy for global turbulence in the U.S. financial markets. A worse index may also increase the emerging country risk (Rozada and Yeyati, 2006; IMF, 2019; Aidar and Braga, 2020), mainly because of the above-referred *flight to quality* movement.

On the other hand, we expect that the coefficients associated with the variables GDP_US_YOY, IND_PROD_US_YOY, IND_PROD_YOY, IND_PROD_MANUF_YOY, RT4_LN_INT_RES and RT12_LN_INT RES, CA, GDP_DOM_YOY, and LN_OIL have significant *negative* effects on those dependent variables.[8] More specifically, we expect that the vari-

5 Variable used as proxy for the monthly economic growth in the models for Brazil, Chile, Mexico, Russia, and Turkey.

6 Variable used as proxy for the monthly economic growth in the models for Colombia, Indonesia, and South Africa. In the International Financial Statistics (IMF) there was not data available for total industrial production for those countries.

7 See Table 1 on Appendices for more details about the variables we have used on the models.

8 We also have tested a dummy variable in the period from September 2008 to June 2009 (monthly data) and from 2008.Q3 to 2009.Q2 (quarterly data) regarding to the global financial crisis. That dummy variable, however, was not significant in almost all the specifications we have tested. We believe this happened because the effects of the crisis were already present in other variables, like VIX Index and GDP growth rates.

ables associated with the external production, such as GDP_US_YOY and IND_PROD_US_YOY, proxies for the global economic performance, and GDP_DOM_YOY, IND_PROD_YOY, and IND_PROD_MANUF_YOY, that represent the domestic economic growth, may contribute to lower the country risk of emerging markets (IMF, 2019). Additionally, we believe that the variables associated with the hoarding of international reserves and the current account are essential to reduce country-risk premiums because they improve the external accounts of the emerging economies, moving away, for example, from the balance of payments constraints. Finally, we expect an inverse relationship between the international oil price and the emerging country risk premium. As many emerging economies depend on international commodities markets, the lower the oil price, the lower the export revenues – mainly denominated in the U.S. dollar – absorbed by them. Therefore, there is a link between international oil prices and the capacity of emerging economies to deal with their external accounts and the global economic cycles (Aidar and Braga, 2020).

We ran the Generalized Method Of Moments (GMM) for each one of the models of our time series econometric specifications.[9] We did it because GMM deals better with endogeneity problems, *i.e.*, $cov(u_t, x_t) \neq 0$, serial correlation, and heteroskedasticity (Hansen, 1982; Wooldridge, 2001b). According to Wooldridge (2001a, pp. 50-51), endogeneity occurs because of omitted variables, measurement errors, or simultaneity.[10] In our approach, we consider all of the *pull* variables as endogenous, and then we instrumentalize them; also, we consider all of the *push* variables as exogenous. A good instrument z_t has to be valid in two cases: $cov(u_t, z_t) = 0$ and $cov(x_t, z_t) \neq 0$. Thereby, we can be sure that the estimated GMM coefficients converge in probability to the true parameters, $plim\ \hat{\beta}_i = \beta_i$.[11] However, Deaton (2018) argues that it can be hard to find instruments that fulfill the two hypotheses above. For this reason, we follow Johnston and DiNardo (1996), that suggest that lags of the independent variables may be

9 The usual unit root tests are available with the authors upon request.

10 There are other approaches based on instrumental variables (IV) to deal with the endogeneity issue. However, Wooldridge (2001b) arguments that in the presence of heteroskedasticity, GMM is asymptotically at least so efficient than another IV estimator, the two-stage least squares.

11 It is important to highlight that this situation is asymptotically valid.

used as instruments of the model, considering that those variables match the two cases mentioned above. It is important to highlight that many instruments, compared to the number of observations, may cause bias in the model, mainly if some of the instruments have a weak correlation with the potentially endogenous variables. In this case, we sought to be parsimonious and add a not very large proportion between instruments and the number of observations of the models.[12] The J-statistic was used as a test of overidentifying restrictions (Cragg, 1983), *i.e.*, when the number of instruments is greater than the number of regressors of the true model (Hansen, 1982). It presents a test for the validity of the instruments. GMM also deals better with common issues in econometric estimations, serial autocorrelation and heteroskedasticity (Hansen, 1982; Newey-West, 1987). For this reason, we have applied the covariance HAC Newey-West matrix to the models to control those issues.[13]

Table 1 summarizes the aggregate results of models (1) and (2), both month and quarter specifications, considering the adequacy of the coefficients to what we have hypothesized. In bold, we highlight the main variables that have presented expected signs on at least 50% of the specifications. In this sense, we have two *push* variables: LN_VIX and LN_OIL, and two *pull* variables: RT_12_LN_INT_RES and INF_YOY. Moreover, the dependent variables with one lag also have presented expected effects in all specifications we have tested, demonstrating the inertial character of the processes.

We then specified a balanced panel data model with those variables that have presented better adequacy to the expected signs in the GMM autoregressive specifications. We ran a GMM-DIFF, as proposed by Arellano and Bond (1991), for the period from 2008 to 2019 with monthly and quarterly data. Such as in the time series models, the GMM method was chosen because it deals better with the endogeneity problem (Roodman, 2009). More common models like fixed and random effects, which use ordinary least squares, present difficulties in dealing with that problem and are not recommended for dynamic panel data.

12 The instrumental variables of the models are available with the authors upon request.

13 GMM can present problems in the presence of small samples. That issue is appointed by Deaton (2018), whereas Wooldridge (2001b) argues that the GMM estimators are sensible to outliers observations.

Table 1 **Summary of time series models**[14]

DEPENDENT VARIABLES: LN_CDS_5Y and LN_EMBI

Regressors	Expected coefficient signal	Total of specifications	Sign of the coefficient as expected		Sign of the coefficient different from the expected		Insignificant	
			Quant.	%	Quant.	%	Quant.	%
LN_CDS_5Y(−1)	**+**	**16**	**16**	**100,0**	**0**	**0,0**	**0**	**0,0**
LN_EMBI(−1)	**+**	**16**	**16**	**100,0**	**0**	**0,0**	**0**	**0,0**
GDP_DOM_YOY	–	16	2	12,5	5	31,3	9	56,3
IND_PROD_ MANUF_YOY	–	6	2	33,3	2	33,3	2	33,3
IND_PROD_YOY	–	10	1	10,0	1	10,0	8	80,0
RT12_LN_INT_RES	**–**	**16**	**8**	**50,0**	**2**	**12,5**	**6**	**37,5**
RT4_LN_INT_RES	–	16	6	37,5	2	12,5	8	50,0
GDP_US_YOY	–	16	4	25,0	3	18,8	9	56,3
IND_PROD_US_YOY	–	16	4	25,0	4	25,0	8	50,0
LN_VIX	**+**	**32**	**32**	**100,0**	**0**	**0,0**	**0**	**0,0**
CA	–	16	4	25,0	1	6,3	11	68,8
LN_OIL	**–**	**32**	**24**	**75,0**	**1**	**3,1**	**7**	**21,9**
INF_YOY	**+**	**32**	**23**	**71,9**	**0**	**0,0**	**9**	**28,1**
LN_INTEREST_5Y_US	+	32	9	28,1	10	31,3	13	40,6

Source: Own elaboration.

Note: Prob. < 0.10.

Other problems arise because we have a small sample of countries. According to Arellano (2002) and Roodman (2009), many instruments may cause problems to the GMM estimation, including the overidentifying J test. In this sense, we have limited the instruments to seven (since the number of countries of our sample is eight) and used the same strategy of the time series models: lagged variables as instruments, following Johnston and DiNardo (1996). Because of that, we had just four (static specifications) or five (dynamic specifications) explanatory variables in the models that presented better adequacy to the expected effects in the time series models. We also transformed all the variables in growth rates concerning the previous period, month or quarter, to solve the panel data unit root issue.

14 Quarterly model for Russia took the growth rate from previous period for the dependent variable CDS 5 Years and for the regressors VIX Index, current account balance, international oil price, and the autoregressive variable. We did it to solve the unit root problem.

Dynamic specification:

$$Y_{it} = \beta_0 + \beta_1 Y_{it-1} + \beta_2 RT1\_LN\_INT\_RES_{it} + \beta_3 INF\_QOQ_{it} + \\ + \beta_4 RT1\_LN\_VIX_{it} + \beta_5 RT1\_LN\_OIL_{it} + \mu_i + u_{it} \tag{3}$$

Static specification:

$$Y_{it} = \beta_0 + \beta_1 RT1\_LN\_INT\_RES_{it} + \beta_2 INF\_QOQ_{it} + \\ + \beta_3 RT1\_LN\_VIX_{it} + \beta_4 RT1\_LN\_OIL_{it} + \mu_i + u_{it} \tag{4}$$

where Y_{it} represents both dependent variables, the growth rate of the indexes CDS 5 Years and EMBI+; Y_{it-1} defines the autoregressive variables. The regressors are the growth rate of the international reserves stock (RT1_LN_INT_RES) and the inflation rate (INF_QOQ) (*pull* variables). The growth rate of the VIX Index (RT1_LN_VIX) and the international oil price growth rate (RT1_LN_OIL) are the *push* variables. i = 1,…,8 eight countries) and t = 1,…,T (1.152 observations for monthly models, from January 2008 to December 2019, and 384 observations for quarterly models, from 2008.Q1 to 2019.Q4). All the variables were transformed by their natural logarithm, except inflation μ_i represents country specifics effects and u_{it} is the error term.

It is worth mentioning that the GMM-DIFF method, taking the first difference of the variables, rules out those variables that are time-invariant (Baltagi, 2005). In our models, there are no estimations for intercept terms and country specifics effects then.

Tables 2 and 3 summarize the GMM-DIFF results. In the next section, we present some considerations about our results.

Two of the eight models had problems with the AR(2) Arellano-Bond Serial Correlation Test: the dynamic quarterly model for the dependent variable CDS 5 Years and the dynamic monthly model for the dependent variable EMBI+ have rejected the null hypothesis of the test (p-value < 0,10).

> *Arellano and Bond (1991) propose a test for the hypothesis that there is no second-order serial correlation for the disturbances of the first-differenced equation. This test is important because the consistency of the GMM estimator relies upon the fact that* $E[\Delta v_{it} \Delta v_{it-2}] = 0$ *(Baltagi, 2005, p. 141).*

The first-order serial correlation AR(1) is expected by the construction of the test and it is not an issue.

Table 2 **Panel data results for the dependent variable CDS 5 Years**

Models	Monthly		Quarterly	
	Dynamic	Static	Dynamic	Static
RT1_LN_CDS_5Y(−1)	−0.0667	–	0.1296	–
	(0.0583)	–	(0.1059)	–
RT1_LN_INT_RES	−4.3108***	−4.7381***	−9.5894***	−8.5432***
	(0.8263)	(0.5883)	(1.5191)	(1.2165)
INF_QOQ	0.4056	0.3220	1.3536	1.3997
	(0.3225)	(0.3218)	(1.1205)	(1.0846)
RT1_LN_VIX	0.1488***	0.1555***	0.2101***	0.1900***
	(0.0135)	(0.0149)	(0.0384)	(0.0303)
RT1_LN_OIL	−0.1477***	−0.1269***	−0.4141***	−0.4110***
	(0.0349)	(0.0315)	(0.0601)	(0.0550)
Number of observations	1.152	1.152	384	384
Jarque Bera Test	109.4634	122.9289	32.6177	36.3554
Prob. Jarque Bera Test	0.0000	0.0000	0.0000	0.0000
AR (1) – m-Statistic	−2.7727	−2.7339	−3.0919	−2.6513
Prob. AR (1)	0.0056	0.0063	0.0020	0.0080
AR (2) – m-Statistic	0.3759	1.3575	−6.9103	−1.1055
Prob. AR (2)	0.7070	0.1746	0.0000	0.2689
J-Statistic	0.2365	0.1384	2.2476	2.3000
Prob. J-Statistic	0.6267	0.7099	0.3250	0.3166
Instrument rank	6	5	7	6

Source: Own elaboration.

Notes: Significance: (***) 0.01; (**) 0.05; (*) 0.10. Coef. Covariance method: White period.

Table 3 **Panel data results for the dependent variable EMBI+**

Models	Monthly		Quarterly	
	Dynamic	Static	Dynamic	Static
RT1_LN_EMBI(−1)	0.1708***	–	0.2112***	–
	(0.0571)	–	(0.0764)	–
RT1_LN_INT_RES	−2.4281***	−1.8646***	−2.8984*	−1.9107
	(0.5328)	(0.3308)	('−1.8839)	(1.2826)
INF_QOQ	0.6839	0.7785	0.7505	0.7850
	(0.4814)	(0.5181)	(0.8894)	(0.7760)

(continues on the next page)

Table 3 **(continuation)**

Models	**Monthly**		**Quarterly**	
	Dynamic	**Static**	**Dynamic**	**Static**
RT1_LN_VIX	0.1306***	0.1160***	0.1984***	0.1701***
	(0.0089)	(0.0083)	(0.0218)	(0.0143)
RT1_LN_OIL	−0.0989**	−0.1462***	−0.2462***	−0.2540***
	(0.0393)	(0.0397)	(0.0419)	(0.0430)
Number of observations	1.152	1.152	384	384
Jarque Bera Test	25.3680	38.7822	10.0059	32.0611
Prob. Jarque Bera Test	0.0000	0.0000	0.0067	0.0000
AR (1) – m-Statistic	−2.7395	−2.7791	−3.0526	−2.7641
Prob. AR (1)	0.0062	0.0055	0.0023	0.0057
AR (2) – m-Statistic	2.2029	−1.2039	0.0588	−0.5688
Prob. AR (2)	0.0276	0.2286	0.9531	0.5695
J-Statistic	0.0962	0.5759	3.9341	4.0806
Prob. J-Statistic	0.7564	0.4479	0.1399	0.1300
Instrument rank	6	5	7	6

Source: Own elaboration.

Notes: Significance: (***) 0.01; (**) 0.05; (*) 0.10. Coef. Covariance method: White period.

4 **Empirical analysis**

Our econometric approaches, both time series and panel data, have tested some *push* and *pull* variables to analyze the main determinants of the country risk premiums for a sample of emerging economies. At first, we computed all the results from time series models. In the previous section, we have neither exhibited the individual models for each of the eight countries nor the coefficients that the GMM models estimated. Table 1 just summarized the most crucial information about those estimated models.

In that table, we have the degree of adequacy of each one of the independent variables concerning the coefficient sign we have expected. *Push* and *pull* variables such as GDP_DOM_YOY, IND_PROD_YOY, GDP_US_YOY, and CA have demonstrated poor suitability (in all models that were tested, more than 50% had insignificant coefficients). Other variables such as IND_PROD_MANUF_YOY, IND_PROD_US_YOY, and

LN_INTEREST_5Y_YOY have demonstrated mixed results according to the signs of the expected coefficients.

However, econometric models developed by Nogués and Grandes (2001), Afonso (2003), and FMI (2019) have found economic growth as an essential factor that improves emerging economies' country risk premiums. We believe that U.S. GDP growth and U.S. industrial production growth did not match the function of being good proxies for international economic growth. Perhaps we should have used another proxy weighting the participation of other relevant economies such as Germany, China, France, and others that have a great economic relationship with the countries of our sample. GDP and domestic industrial production growth rates had poor suitability in the models proposed. As GDP is an aggregate variable, we believe this feature may affect its impacts on emerging country risk premiums, which are daily variables. Additionally, it is possible that industrial production is not a good proxy for monthly economic performance. It is important to highlight that the services sector is the most important in most economies worldwide.

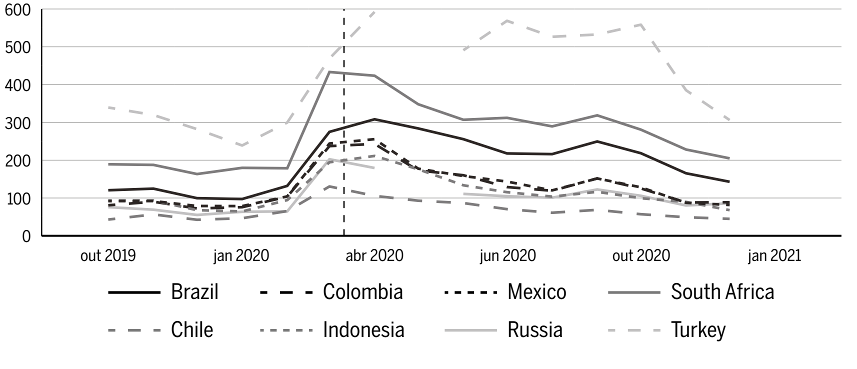
Furthermore, econometric estimations by Aronovich (1999), Arora and Cerisola (2001), Nogués and Grandes (2001), González-Rozada and Yeyati (2008), Dailami *et al*. (2008), Aidar and Braga (2020), and Hartelius *et al*. (2008) have found evidence that a rise in the U.S. interest rate can cause increases in the emerging country risk premiums. For Aronovich (1999), emerging economies' spreads are *superelastic* to the long-term U.S. interest rate. Dailami *et al*. (2008) finds that the relation between U.S. monetary policy and emerging country risk is positive. Still, the countries with moderate debt levels are generally less impacted by the U.S. interest rate movements. Aidar and Braga (2020, p. 99) argued: *"The empirical exercise suggests that an increase in the interest rate associated with the 5-Year T-Note coincides with a higher perception of risk captured by the first principal component"*. In our estimations, using the variable Market Yield On U.S. Treasury Securities at 5-Year Constant Maturity, only 28,1% of the models have demonstrated evidence of a significant positive relationship between that interest rate and emerging country risk premiums. García-Herrero and Ortíz (2005), in turn, found a positive and instantaneous relationship between the U.S. *short-term* interest rate and the emerging sovereign spread. In future works, we should test the *real* interest differential – short and long terms – between emerging economies and the United States. It may be more relevant in our context.

In the case of the autoregressive independent variables tested in the 16 specifications, all of them had the expected positive sign. It shows the *inertial* character of the series, as their correlograms have already demonstrated. In other words, the current level of the dependent variables depends in great measure on their previous levels.

Push variables LN_VIX and LN_OIL coefficients estimated also had the expected signs. VIX Index has presented significant positive coefficients in all 32 monthly and quarterly models. It shows that global economic turbulence impacts risk perception in the emerging world. The international oil price, in turn, has demonstrated significant negative coefficients, as expected, in 3/4 of the monthly and quarterly specifications. The economic dependence of emerging economies on commodities and international export markets explains the importance on the risk perception of those economies (Aidar and Braga, 2020). Our models captured it.

In this sense, the VIX Index and international oil price were the main *push* variables we found through time series specifications. This situation emphasizes the relevant role some global factors play in emerging country risk premiums pricing.

Figure 3 **CDS country risk premiums from October 2019 to December 2020**



Source: Own elaboration with data from the Bank for International Settlements (BIS).

The role of international liquidity, captured in those *push* variables, implies that there is a common cause for the country risk premium dynamics, as noted by Aidar and Braga (2020). Although 2020 data was not included in our sample, we can use the first months that followed the outburst of the COVID-19 pandemic to illustrate that joint movement. Figure 3 shows that the country risk premiums, measured by the CDS 5 Years, increased in all our sample countries.

On the other hand, the coefficient signs of the primary *pull* variables were as expected: the inflation rate, with positive effects, and the growth rate of the international reserves stock (monthly models), with negative effects. Our results for both variables align with IFM (2019). Still, they contradict Andrade and Teles' (2006) study about the Brazilian economy because the authors have argued that the international reserves stock was relevant in explaining the country risk premium only for fixed exchange rate periods. However, according to the Assessing Reserve Adequacy methodology by IMF (2021), all the countries in our sample have floating exchange rates.

In this sense, the time series models have suggested that lower inflation and a growing stock of international reserves are the main *pull* variables that can mitigate some effects of the global financial cycles on emerging country risk premiums.

Static and dynamic GMM-DIFF panel data estimations were produced out of the time series results using the main variables verified in those estimations. In this sense, for both dependent variables, we have tested as independent variables: autoregressive variables (dynamic models), two *push* regressors (growth rates of the VIX Index and international oil price), and two *pull* regressors (international reserves stock growth rate and the inflation rate).

The results were similar in all eight models we estimated. For the dependent variable associated with the CDS 5 Years, neither monthly nor quarterly models have demonstrated significant positive effects in the coefficient related to the autoregressive regressors. However, for the dependent variable EMBI+, it happened as expected. Furthermore, both dynamic and static, monthly and quarterly estimations, have demonstrated the same results: *push* variables VIX Index (positive effects) and international oil price (negative effects) have played important roles in explaining the emerging economies' country risk premiums for the reasons discussed above.

Accumulating international reserves is an important economic tool to reduce the country risk premium and deal with the exogenous shocks from the international markets, like those from variations in the VIX Index and international oil price. It is worth mentioning that in all models, the coefficients estimated for the international reserves variable were larger than those associated with the *push* variables: considering the models that did not present problems with the AR(2) statistics, the coefficients ranged from –1.86 (static month EMBI+ model) to –8.54 (static quarter CDS model). It suggests the great relevance of accumulating international reserves in lowering the emerging country risk premiums since it acts as a financial backing for futures market transactions and safety against capital outflows (flight to safety or flight to quality).

Contrary to most of the time series results, the inflation rate concerning the previous period was insignificant in all models we have tested. The panel data models did not capture the effects of the rising prices, as they were captured through the time series models.

In this sense, besides the inertial characteristic of both dependent variables, our GMM-DIFF estimations have demonstrated that the movements of the VIX Index, the international oil price, and the growth rate of the international reserves stock played essential roles as drivers of the emerging economies' country risk premiums movements throughout the last two decades.

5 **Concluding remarks**

Based on the empirical literature, mainly on works by IMF (2019) and Aidar and Braga (2020), this paper presented a model with two different econometric approaches to evaluate the main drivers of the country risk premium for a group of emerging economies in the last two decades. In the time series models, we have found that the two main external or *push* variables were the VIX index and the international oil price. The first variable had a positive or direct effect on emerging country risk premiums; the second, in turn, had a negative or inverse effect on those premiums. Furthermore, the *pull* variables that stood out were the growth rate of international reserves stock (negative effects) and the inflation rate (positive effects).

In the panel data GMM-DIFF approach, the *push* variables related to the VIX Index and international oil price kept playing the same role as determinants of the emerging country risk premiums. However, among the country-specific variables we have selected for the panel data models, the growth rate of the international reserves stock and the inflation rate concerning the previous period, only the first demonstrated negative significant effects on the emerging country risk premiums. We highlight the large coefficients estimated for that variable, mainly in the CDS 5 Years panel data models, which explain the importance of accumulating international reserves for emerging economies. International investors can consider it as a sign of external sound accounts of the emerging economies and a necessary condition for an economy growing without the balance of payments constraints. The inflation rate, in turn, was insignificant in all eight models we tested.

Although 2020 data was not included in our sample, we can interpret what happened with CDS 5 Years and EMBI+ during the COVID-19 pandemic based on our findings. In the first four months of 2020, emerging economies' country risk premiums measured by CDS 5 Years and EMBI+ increased in all our sample countries – an expected result given our models. According to FRED Economic Data, VIX Index increased by 34.7 points from January to March 2020, the period when the first impacts of the pandemic started to be globalized. From January to April 2020, the international oil price decreased, in nominal terms, by $ 40.26. The effect of the reversal of international liquidity, mainly through the VIX Index and the international oil price, was sizeable in the emerging country risk premiums. Between January and March 2020, except for Mexico and Russia, all countries lost international reserves to deal with the pandemic economic impacts. However, the effect on the international reserves stocks was not so strong according to IMF. Throughout 2020, the most impacted country in terms of international reserves stock was Chile, which lost almost 8 billion dollars. According to our econometric results, it was another force contributing to elevating the country risk premium at the beginning of the pandemic.

In a financialized world, we conclude that emerging economies are exposed to global shocks, which can be reflected in their country risk spreads. Besides, country-specific variables such as the positive growth rate of the international reserves stock (mainly) and the low inflation rate may act as a buffer for those external shocks. In this sense, we expect that our econometric findings may contribute to the empirical literature about the determinants of emerging economies' country risk premiums.

References

AFONSO, A. Understanding the determinants of sovereign debt ratings: evidence for the two leading agencies, *Journal Of Economics and Finance*, vol. 27, No. 1, pp. 56-74, 2003.

AIDAR, G.; BRAGA, J. Country-risk premium in the periphery and the international financial cycle 1999-2019. *Investigación Económica*, 79, No. 313, pp. 78-111, 2020, https://www.jstor.org/stable/26917176.

ANDRADE, J.; TELES, V. K. An empirical model of the Brazilian country risk – an extension of the beta country risk model, *Applied Economics*, 38:11, pp. 1271-1278, 2006, DOI: 10.1080/00036840500426843.

ARELLANO, M. Sargan's instrumental variables estimation and the generalized method of moments, *Journal of Business & Economic Statistics*, vol. 20, No. 4, pp. 450-459, 2002.

ARELLANO, M.; BOND, S. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, *The Reviews of Economic Studies*, vol. 58, No. 2, pp. 277-297, 1991.

ARONOVICH, S. Country risk premium: theoretical determinants and empirical evidence for Latin American countries. *RBE*, 53(4), pp. 463-498, 1999.

ARORA, V.; CERISOLA, M. How does U.S. monetary policy influence sovereign spreads in emerging markets? *IMF Staff Papers*, vol. 48, No. 3, pp. 474-498, 2001.

BALDACCI, E.; GUPTA, S.; MATI, A. Is it (Still) Mostly Fiscal? Determinants of Sovereign Spreads in Emerging Markets. *IMF Working Papers* 2008/259, International Monetary Fund, 2008.

BALTAGI, B. H. *Econometric analysis of panel data*. West Sussex: John Wiley & Sons, 2005.

BRAZILIAN CENTRAL BANK. *Inflation Report*, vol. 22, No. 4, 2020.

BUENO, R. de L. da S. *Econometria de Séries Temporais*. São Paulo: Cengage Learning, 2015.

CALVO, G. A.; LEINDERMAN, L.; REINHART, C. M. Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors. *Staff Papers International Monetary Fund*, vol. 40, No. 1, 1993.

CHUHAN, P.; CLAESSENS, S.; MAMINGI, N. Equity and bond flows to Asia and Latin America, *World Bank Working Papers WPS 1160*, 1993.

CRAGG, J. G. More efficient estimation in the presence of heteroscedasticity of unknown form. *Econometria*, Vol. 51. No. 3, pp. 751-763, 1983.

DAILAMI, M.; MASOON, P. R.; PADOU, J. J. Global monetary conditions versus country-specific factors in the determination of emerging market debt spread, *Journal of International Money and Finance*, No. 27, pp. 1325-1336, 2008.

DEATON, A. *The analysis of household surveys*. Washington, World Bank Group, 2018.

FRED ECONOMIC DATA. Available on https://fred.stlouisfed.org. Access on 23 May 2022.

GARCÍA-HERRERO, A.; ORTÍZ, Á. The role of global risk aversion in explaining Latin American sovereign spreads. *Banco de España Working Papers*, No. *0505*, 2005.

GONZÁLEZ-ROZADA, M.; YEYATI, E. L. Global Factors and Emerging Market Spreads.

The Economic Journal, vol. 118, No. 533, pp. 1917-1936, 2008, http://www.jstor.org/stable/20485283.

HANNAN, S. A. Revisiting the determinants of capital flows to emerging markets – A survey of the evolving literature, *IMF Working Papers*, No. 18/214, 2018.

HANSEN, L. P. Large sample properties of Generalized Method of Moments estimators. *Econometrica*, vol. 50, No. 4, pp. 1029-1054, 1982.

HARTELIUS, K.; KASHIWASE, K.; KODRES, L. E. Emerging market spread compression: is it real or is it liquidity? *IMF Working Paper*, No. 08/10, 2008.

INTERNATIONAL MONETARY FUND. *Assessing Reserve Adequacy – ARA* (2021). Available on https://www.imf.org/external/datamapper/datasets/ARA. Access on 25 Jan. 2022.

INTERNATIONAL MONETARY FUND. *Data Template on International Reserves and Foreign Currency Liquidity (IRFCL)* (2022). Available on https://data.imf.org/?sk=2DFB3380-3603-4D2C-90BE-A04D8BBCE237. Access on 23 May 2022.

INTERNATIONAL MONETARY FUND. *Global Financial Stability Report*: *Lower for Longer*. Available on https://www.imf.org/en/Publications/GFSR/Issues/2019/10/01/global-financial-stability-report-october-2019. Access on 16 Sep. 2021.

J.P. MORGAN. *J.P. Morgan Emerging Markets Bond Index Global Core*. Available on https://www.jpmorgan.com/content/dam/jpm/cib/complex/content/markets/composition-docs/pdf-22.pdf. Access on 02 Nov. 2021.

J.P. MORGAN. J.P. *Morgan Emerging Markets Bond Index Plus (EMBI+)*. Available on https://www.jpmorgan.com/content/dam/jpm/cib/complex/content/markets/composition-docs/pdf-31.pdf. Access on 02 Nov. 2021.

JOHNSTON, J.; DINARDO, J. *Econometric Methods*. McGraw-Hill/Irwin, 4th edition, 1996.

KOEPKE, R. What drives capital flows to emerging markets? A survey of the empirical literature, *Journal of Economic Surveys*, vol. 33, pp. 516-540, 2019, https://doi.org/10.1111/joes.12273.

LAVOIE, M. The monetary and fiscal nexus of neo-chartalism: a friendly critique. *Journal of Economic Issues*, vol. 47, No. 1, pp. 1-32, 2003.

NAQIV, N. Manias, Panics and Crashes in Emerging Markets: An Empirical Investigation of the Post-2008 Crisis Period, *New Political Economy*, 2018, DOI: 10.1080/13563467.2018.1526263.

NEWEY W. K.; WEST, K. D. A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, Vol. 55, No. 3, pp. 703-708, 1987.

NOGUÉS, J.; GRANDES, M. Country Risk: Economic Policy, Contagion Effect or Political Noise? *Journal of Applied Economics*, vol. 4, No. 1, pp. 125-162, 2001, DOI: 10.1080/15140326.2001.12040561.

PACIFIC INVESTMENT MANAGEMENT COMPANY (PIMCO). *Understanding Investing – Credit Default Swaps*. Available on https://global.pimco.com/en-gbl/resources/education/understanding-credit-default-swaps. Access on 28 Oct. 2021.

REZENDE, F. C. The nature of government finance in Brazil. *International Journal of Political Economy*, vol. 38, No. 1, pp. 81-104, 2009.

ROCHA, K.; MOREIRA, A. The role of domestic fundamentals on the economic vulnerability of emerging markets, *Emerging Markets Review*, vol. 11, issue 2, pp. 173-182, 2010, https://doi.org/10.1016/j.ememar.2009.11.004.

ROODMAN, D. A note on the theme of too many instruments. *Oxford Bulletin Of Economics and Statistics*, vol. 71, issue 1, pp. 135-158, 2009, DOI: 10.1111/j.1468-0084.2008.00542.x.

SERRANO, F.; PIMENTEL, K. Será que "acabou o dinheiro"? Financiamento do gasto público e taxas de juros num país de moeda soberana. *Rev. Econ. Contemp.*, vol. 21, No. 2, pp. 1-29, 2017, DOI: 10.1590/198055272123.

WOOLDRIDGE, J. M. *Econometric analysis of cross-section and panel data*. London: The MIT Press, 2001a.

WOOLDRIDGE, J. M. Applications of Generalized Method Of Moments estimation. *Journal Of Economic Perspectives*, Vol. 15, No. 4, pp. 87-100, 2001b.

About the authors

Daniel Consul de Antoni – danielconsul@id.uff.br
Graduate Program in Economics, Fluminense Federal University, Niterói, RJ, Brazil.
ORCID: https://orcid.org/0000-0002-2593-4956.
Julia de Medeiros Braga – jbraga@id.uff.br
Graduate Program in Economics, Fluminense Federal University, Niterói, RJ, Brazil.
ORCID: https://orcid.org/0000-0002-7743-0725.

Acknowledgements

The authors are grateful to an anonymous reviewer for suggestions to improve the text. Any remaining errors are the sole responsibility of the authors.

Contribution of the authors

Daniel Consul de Antoni: data collection, econometric modeling, data analysis, text writing.
Julia de Medeiros Braga: data collection, data analysis, text writing, supervision.

About the article

Submission received on July 7, 2022. Approved for publication on February 9, 2023.

APPENDIX

Table A1 **Time series and panel data variables: descriptions and sources**

Variable	Description	Source
LN_CDS_5Y*	Natural logarithm of the country risk premium *CDS 5 Years*.	J.P. Morgan
LN_EMBI*	Natural logarithm of the country risk premium *EMBI+*.	J.P. Morgan
LN_CDS_5Y(–1)*	One lag of the country risk premium *CDS 5 Years* natural logarithm.	J.P. Morgan
LN_EMBI(–1)*	One lag of the country risk premium *EMBI+* natural logarithm.	J.P. Morgan
GDP_DOM_YOY*	GDP growth rate (%) concerning the same quarter of the previous year. Quarterly models.	FRED Economic Data
IND_PROD_YOY*	Industrial production growth rate (%) concerning the same month of the previous year. Variable used for Brazil, Chile, Mexico, Russia, and Turkey. Monthly models. Proxy for the monthly economic growth.	International Financial Statistics (IMF)
IND_PROD_MANUF_YOY*	Manufacturing industrial production growth rate (%) concerning the same month of the previous year. Variable used for South Africa, Colombia, and Indonesia. Monthly models. Proxy for the monthly economic growth.	International Financial Statistics (IMF)
RT4_LN_INT_RES*	Natural logarithm of the international reserves stock (constant prices) concerning the same quarter of the previous period (growth rate (%)). Quarterly models.	International Financial Statistics (IMF)
RT12_LN_INT_RES*	Natural logarithm of the international reserves stock (constant prices) concerning the same quarter of the previous period (growth rate (%)). Monthly models.	International Financial Statistics (IMF)
INF_YOY*	The growth rate of inflation concerning the same period of the previous year. Monthly and quarterly models.	FRED Economic Data and OECD
CA*	Net balance (constant prices) of the balance of payments current account. Quarterly models.	International Financial Statistics (IMF)
GDP_US_YOY*	US GDP growth rate (%) concerning the same quarter of the previous year. Quarterly models.	FRED Economic Data

(continues on the next page)

Table A1 **(continuation)**

Variable	Description	Source
IND_PROD_US_YOY*	U.S. industrial production growth rate (%) concerning the same month of the previous year. Monthly models. Proxy for the U.S. monthly economic growth.	FRED Economic Data
LN_INTEREST_5Y_US*	Natural logarithm of the Market Yield On U.S. Treasury Securities at 5-Year Constant Maturity. End of period for monthly and quarterly models.	FRED Economic Data
LN_OIL*	Natural logarithm of the international oil price (Brent crude). End of period constant prices for monthly and quarterly models.	FRED Economic Data
LN_VIX*	Natural logarithm of the VIX Index, end of the period. Monthly and quarterly models.	FRED Economic Data
RT1_LN_CDS_5Y**	Growth rate (%) of the country risk premium CDS 5 Years natural logarithm concerning the previous period.	J.P. Morgan
RT1_LN_EMBI**	Growth rate (%) of the country risk premium EMBI+ natural logarithm concerning the previous period.	J.P. Morgan
RT1_LN_INT_RES**	Growth rate (%) of the international reserves stock natural logarithm concerning the previous period.	International Financial Statistics (IMF)
INF_QOQ**	Inflation rate (%) concerning the previous period.	FRED Economic Data and OECD
RT1_LN_VIX**	Growth rate (%) VIX Index natural logarithm concerning the previous period.	FRED Economic Data
RT1_LN_OIL**	Growth rate (%) international oil price (Brent crude) natural logarithm concerning the previous period.	FRED Economic Data

Source: Own elaboration.

*Notes: * Time series models. ** Panel data models.*

Table A2 **Number of observations and period of the time series models**

Country	Monthly model	Quarterly model
South Africa	140 (Jan/07 to Ago/18)	46 (2007.Q1 to 2018.Q2)
Brazil	204 (Jan/03 to Dec/19)	68 (2003.Q1 to 2019.Q4)
Chile	156 (Jan/07 to Dec/19) (CDS_5Y) and 168 (Jan/06 to Dec/19) (EMBI)	55 (2006.Q1 to 2019.Q3)
Colombia	201 (Jan/03 to Sep/19)	55 (2006.Q1 to 2019.Q3)
Indonesia*	124 (Jan/09 to Apr/19)	41 (2009.Q1 to 2019.Q1)
Mexico	204 (Jan/03 to Dec/19)	68 (2003.Q1 to 2019.Q4)
Russia	156 (Jan/07 to Dec/19)	56 (2006.Q1 to 2019.Q4)
Turkey	204 (Jan/03 to Dec/19)	68 (2003.Q1 to 2019.Q4)

Source: Own elaboration.

*Notes: * The 2008 level data for Indonesia presents the unit root problem. Because of this, we choose only to use data from 2009 onwards.*

Table A3 **Unit root tests for monthly and quarterly panel data models**

Monthly Models		Constant				Constant and trend			
		LLC	IPS	ADF	PP	LLC	IPS	ADF	PP
RT1_LN_ CDS_5Y	Stat.	−38.6466	−34.3393	646.4200	646.6140	−44.4444	−35.9866	613.8880	613.6130
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RT1_LN_ EMBI	Stat.	−38.7579	−35.0172	659.7110	660.0260	−43.9617	−36.3998	622.2140	622.5530
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RT1_LN_ INT_RES	Stat.	−24.0273	−22.5298	405.9360	561.8510	−30.5693	−25.2666	415.7900	542.2510
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INF_QOQ	Stat.	−16.0959	−18.7547	325.7150	304.9940	−18.1665	−19.0303	299.6060	274.2720
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RT1_LN_ VIX	Stat.	−52.1809	−45.5979	771.5430	695.9780	−59.4011	−48.0350	735.2480	655.5150
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RT1_LN_ OIL	Stat.	−27.7227	−22.0507	398.4230	384.6160	−31.6231	−22.0012	356.8180	342.8180
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Own elaboration.

Notes:

Lags according to Schwarz information criterion.

Newey-West automatic bandwidth selection and Bartlett kernel.

1.152 observations – 2008M01 to 2019M12.

LLC: Levin, Lin and Chu t – H0: common unit root.

ADF – Fisher Chi-square – H0: individual unit root (for each i).

IPS: Im, Pesaran and Shin W-stat – H0: individual unit rott (for each i).

P.P. – Fisher Chi-square – H0: individual unit root (for each i).

Table A4 **Unit root tests for monthly and quarterly panel data models**

Quarterly Models		Constant				Constant and trend			
		LLC	IPS	ADF	PP	LLC	IPS	ADF	PP
RT1_LN_ CDS_5Y	Stat.	–15.7529	–15.1617	203.8440	203.8460	–15.7801	–14.6600	177.3570	177.9890
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RT1_LN_ EMBI	Stat.	–14.6371	–16.1398	220.0460	233.4340	–11.8573	–14.1919	175.3530	199.8410
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RT1_LN_ INT_RES	Stat.	–11.2639	–10.9524	140.8530	152.2080	–12.9944	–11.6666	141.9780	142.1530
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INF_QOQ	Stat.	–7.8254	–7.5620	93.2836	159.1770	–8.0962	–7.1857	85.2438	144.5380
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RT1_LN_ VIX	Stat.	–3.6111	–19.7831	278.5020	332.4910	0.2123	–18.9879	249.0830	1.123.90
	Prob.	0.0002	0.0000	0.0000	0.0000	0.5841	0.0000	0.0000	0.0000
RT1_LN_ OIL	Stat.	–19.3460	–15.8067	214.2930	217.1740	–19.2942	–14.7149	177.8470	179.7170
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Own elaboration.

Notes:

Lags according to Schwarz information criterion.

Newey-West automatic bandwidth selection and Bartlett kernel.

384 observations – 2008.Q1 to 2019Q4.

LLC: Levin, Lin and Chu t – H0: common unit root.

ADF – Fisher Chi-square – H0: individual unit root (for each i).

IPS: Im, Pesaran and Shin W-stat – H0: individual unit rott (for each i).

P.P. – Fisher Chi-square – H0: individual unit root (for each i).