EFFECTS OF POLITICAL UNCERTAINTY ON THE RISK PREMIUM IN THE BRAZILIAN MARKET

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ABSTRACT

This study analyzes how political uncertainty affects the risk premium in the Brazilian market between January 1996 and December 2019. The econometric model proposed by Pastor and Veronesi (2013) was adopted to analyze five approaches to measure risk premium in Brazil, a country where is difficult to estimate a reliable historical premium risk because of their short and volatile histories. We still consider a presidential impeachment in this period. Our findings show a positive and statistically significant relationship between political uncertainty and risk premium. Besides, the results suggest that the Brazilian and the American market seem different perceptions about the effect of political uncertainty. The political uncertainty has recently received increased attention from the media and academics, especially in Brazil due to the impeachment of President Dilma Rousseff. Our findings demonstrated that our variables of interest showed different behaviors in this period, changing the analysis trend. Our main contributions are the identification of the sensitivity of the risk premium to political uncertainty, regardless of the proxy used, as well as the verification of changes in robustness during the impeachment period. When there are a recession and greater uncertainty, the effects are stronger on the risk premium.

Keywords: Political uncertainty; Risk premium; Presidential impeachment.

1. INTRODUCTION

Business and market valuations consider not only company financial data but also a series of systematic risks that affect the market and are not under companies' control. According to Pastor and Veronese (2013), these risks can be associated with economic or non-economic events. Nonetheless, both affect the market risk premium. Among the non-economic events, one that can be mentioned is the political uncertainty, that in countries such as Brazil has gained relevance because of the political facts over the years, showing a capacity to affect the confidence of the investors in the local market (Costa Filho, 2014).

The definition of political risk in the literature is broad, involving the impact of social, political and economic aspects (Costa & Figueira, 2017). In the economic context, political uncertainty may be associated with how governments will shape politics to stimulate investments and establish regulatory milestones (Nunes & Medeiros, 2016). In this study, political uncertainty is considered as the risk that government actions, legislative or judicial institutions adversely affect firms' value in the local capital market (Bekaert et al., 2016; Pastor and Veronese, 2013). Thus, political uncertainty is a type of risk.

Intuitively, it is usual to consider that in moments of political crisis the capital markets become more volatile (Chau et al., 2014). In most cases, experts assess political uncertainty subjectively, which turns its incorporation into evaluation analyzes challenging (Bekaert et al., 2016). As capital markets utilize information disclosed in the media as a strong component of

asset pricing, some studies have considered the disclosure of news related to political uncertainty as an adequate proxy to quantify it (Pastor & Veronese, 2013). Also, there is evidence that capital market performance and political instability have a strong relationship in emerging markets, suggesting that they are more vulnerable to such events (Lehkonen & Heimonen, 2015).

In recent years, specifically in Brazil, there has been a series of turbulent events in the political scenario, which can be affecting directly the performance of its local capital market. In Brazil, for example, the political situation was especially troubled after the 2014 elections, until a presidential impeachment occurred in 2016 (Batista, Maia, & Romero, 2018). In this scenario emerges the motivation of this study, because its relevant to understand the effects of this high political uncertainty. So, this study aims to analyze how political uncertainty affects the risk premium in the Brazilian stock market. Our analysis is based on a sample of Brazilian market data from January 1996 to December 2019. This period represents the longest period of financial and economic stability in Brazil, after the creation of the Real currency. This allows us to have a more consistent analysis of the event of interest.

Our main findings evidence that the higher political uncertainty index (PU) occurs at the end of the year 2016, the year in which a presidential impeachment occurred. Besides that, there are some differences in the relationship between PU and the risk premium in the period' pre- and post-impeachment, but, in general, the trend is the same. Political uncertainty is a determinant of risk premium in Brazil. And this finding is independent of the inputs and the way of estimating the risk premium. This is the main contribution of our study, as well as the discussion about the impacts of PU in Brazil, an issue that is not much addressed locally, and increasingly considered by risk assessment agents as a highly relevant component for assets pricing and evaluation (Smales, 2014; Lehkonen & Heimonen, 2015).

Additionally, we expand the evidence related to political uncertainty in the Brazilian market, which still lacks empirical confirmation about its positive relationship with the risk premium. The sample covers a historical period for the country in terms of political uncertainty since it comprises changes of ideological orientation, significant changes in terms of the economic environment that influences the governability and the macroeconomic policies, and the impeachment of a president.

2. THEORETICAL BASIS

The concept of uncertainty is crucial to capital market development since the volatility of asset yield rates is strongly associated with the uncertainty of the future cash flows offered by assets (Copeland et al., 2005). Risk, in its turn, can be considered as a measurable uncertainty, which means that it has a distribution probability over the probable results (Damodaran, 2009). Thus, there is a clear distinction between these two concepts. Therefore, volatility (risk) should not be taken as a good approximation of uncertainty (Costa Filho, 2014).

The financial market players, as well as the academics that research issues in the capital market have as one of its main goals identify components that may cause volatility in asset prices. This interest is associated with the possibility of greater precision in projections and forecasts of asset variations, as it enhances the understanding of capital market behavior and enables better asset allocation, analysis, and management of investments (Seth & Chaudhary, 2015). Volatility may be associated with an unsystematic risk that is company-specific, or with systematic risks that affect the market (Copeland et al., 2005). Nonetheless, both affect the risk premium of an asset, that is, they can generate price volatility to the extent that relevant information is incorporated to reflect its potential effect on a firm's future performance (Pastor & Veronesi, 2013). Volatility may be more pronounced in the capital markets of emerging countries given its lower market efficiency generated by information asymmetries based on the use of inside information (Martins & Paulo, 2014).

Studies concerned with capital market volatility have focused their efforts on identifying components that are associated with systematic risk as it is not diversifiable (Damodaran, 2009). Among these components, it can be identified those that are associated with economic and non-economic events (Pastor & Veronese, 2013). Economic crisis events, like those in the early 2000s involving large corporations, such as Enron and WorldCom, and the US housing crisis in 2008 have shown how the degree of investor uncertainty enhances, which in turn increases market volatility, thus directly affecting the systematic risk (Ferreira & Martins, 2017).

Among the non-economic risks, political uncertainty has gained prominence in the global context and is one of the reasons for capital market slow recovery (Bekaert et al., 2016). The latter can be explained by the Efficient Market Hypothesis (EMH) theory since according to its new relevant information, such as those of political nature related to economy, is incorporated into stock prices. However, the intensity of this new information can vary across the time, generating higher volatility in the capital markets if the economic environment is also going through a more unstable scenario, as observed in the Brazilian case (Nunes & Medeiros, 2016; Pastor & Veronese, 2013).

Also, the information may contain a higher or lower degree of uncertainty regarding its impacts on the firm's performance. In this context, Brown, Halow, and Tinic (1988) supplemented the EMH by elaborating the Uncertain Information Hypothesis (UIH) theory, which states that even if the new information has a degree of uncertainty associated with its unfolding investors adjust stock prices setting values below their fundamental value since they are risk-averse. Although UIH is initially associated with the systematic risk of an individual stock, it is equally relevant for market indices since political uncertainty affects the market and there are no strategies for its diversification (Nunes & Medeiros, 2016). Still, Batista, Maia, and Romero (2018) observe that the Brazilian market is informationally efficient because there is evidence that there was no abnormal return (not even accumulated) during the 2016 presidential impeachment period.

2.1 Political Uncertainty and the Brazilian Context

Political uncertainty has a great diversity of definitions since it encompasses different characteristics depending on the object of study in question, varying between social, political and/or economic aspects (Costa & Figueira, 2017). The focus of this study is related to the economic aspect of the political events, more specifically to its impact in the capital markets. These events concern changes in local policies and regulations, which can adversely affect the future performance of the companies and, potentially increase the volatility of its risk premium (Smales, 2014; Nunes & Medeiros, 2016). For this reason, in this study political uncertainty is restricted to political events and actions of the government, legislative or judicial institutions that generate adverse effects on firm's value in the local capital market, as outlined by Pastor and Veronese (2013) and Bekaert et al. (2016).

Real events suggest that political uncertainty has a strong impact on the capital market, increasing its volatility (Lehkonen & Heimonen, 2015). Thus, many studies seek to select a specific political event and analyze potential changes in market volatility during that period, mostly identifying a strong relationship between political uncertainty and market volatility (Chau et al., 2014). Others have sought to analyze historical series in one or more countries to identify the impact of different events related to political uncertainty on the behavior of capital markets (Pastor & Verone, 2013, Nunes & Medeiros, 2016, Lehkonen & Heimonen, 2015). The present study is part of the second group of studies.

The growing relevance of political uncertainty in valuation and asset pricing can also be observed in the role it plays in the definition of ratings by major risk agencies. Standard & Poor's, for instance, pointed out in 2011 that the political uncertainty was the crucial factor for the US Treasury debt paper lose its AAA status for the first time in history since it jeopardized

the US government's ability to manage its finances (The Washington Post, 2011). In the Brazilian case, the country rating had some cuts since 2013, being the main driver of the political challenges that affect its fiscal ability and the deteriorations of the economic scenario (Bloomberg, 2016).

Also, the effects of political uncertainty in emerging markets have been identified as statistically significant, which combined with the increasing internationalization of capital flows, can reinforce the impact of political turbulences on capital markets (Lehkonen & Heimonen, 2015). Specifically, in Brazil, from 2010 on, there is an increasing justification for negative economic results associated with issues related to economic policy and political events (Costa Filho, 2014). Thus, if government actions and events influence the expected profitability of firms, the stock market is also expecting to react to such political factors. These movements suggest that political uncertainty has gained strength as a factor that affects economic results and investor confidence in the Brazilian stock market, and therefore its measurement becomes relevant to understand and predict the movements of the capital market.

2.2 Political Uncertainty and Measurement Methods

The studies that investigate the relationship between the capital market and the political environment have multiple interpretations of how political uncertainty can be measure, although it is visible when it occurs (Lehkonen & Heimonen, 2015). Given that, they offer limitations for generalizations, although they identify important effects for the construction of knowledge in this area. In most of the cases, the assessment of the political uncertainty is made by experts in a subjectively way, which makes difficult to incorporate it into valuation analyzes (Bekaert et al., 2016), given the opacity of its constitution and the accessibility to these analyzes mostly restricted to closed bases.

Given the Efficient Market Hypothesis (EMH) theory that stands that capital markets have as a strong component of assets pricing the incorporation of information disclosed in the media, some studies have considered the disclosure of news related to political uncertainty as an adequate proxy to quantify it (Pastor & Veronese, 2013). This is because this information gives an early indication of the potential risks of modifications in the business environment, locally or internationally, resulting from political changes (Lehkonen & Heimonen, 2015). However, the interpretation of this impact has been limited by the lack of theories related to political uncertainty (Pastor & Veronese, 2013), which emphasizes the relevance of a growing number of studies to increase empirical evidence to base its construction and foundation.

Baker, Bloom, and Davis (2016) develop an index to quantify political uncertainty based on newspaper news. Since its publication, the index has been widely accepted by researchers in general, which has driven studies in this area internationally (Bekaert et al., 2016). This wide use may be associated with the availability of the data series used by the authors, as well as the flexibility of the index in the incorporation of new media channels to quantify the political uncertainty. In the present study, political uncertainty is quantified based on this index, which, in the Brazilian case, seeks to analyze the news published in Folha de São Paulo, one of the leading newspapers in Brazil, as will be better detailed in the Methodology.

2.3. Hypothesis Development

The general equilibrium model developed by Pastor and Veronese (2013) predicts a strong relationship between political uncertainty and systemic risk, especially in adverse economic conditions, and found empirical confirmations in the US stock market. Considering that the Brazil capital market and the Brazilian democracy are less mature than the United States, political uncertainty is expected to have the capacity to affect stock systematic risk in the Brazilian market, therefore increasing its volatility significantly (Martins and Paulo, 2014). Given that, the first hypothesis of this study predicts that:

Hypotheses 1: Political uncertainty shows a positive relationship with volatility and the correlation of stock returns in the Brazilian stock market.

Besides, according to the literature, the increase in systemic risk has a direct relationship with assets risk premium since the latter incorporates all the relevant information related to the firm's future performance (Pastor & Veronesi, 2013). Based on this:

Hypotheses 2: Political uncertainty has a positive relationship with the risk premium in the Brazilian stock market.

Conventionally the risk premium is calculated by the difference between the market return and the risk-free rate. Damodaran (2009) presents two other approaches to this calculation in non-mature economies. In the first one, the basic interest rate of the economy minus the country risk is considered the risk-free rate. In the second approach, the risk premium is calculated by adding the country risk to the risk premium of a mature economy. In emerging countries, both country risk and the basic interest rate of the economy are strongly related to political uncertainty (Cuadra & Sapriza, 2008). Given that political uncertainty also affects the stock market making it riskier (Pastor & Veronese, 2013), it is possible to occur a double counting of political risk. Therefore, this study establishes the following hypothesis:

Hypotheses 3: The political uncertainty has a positive relationship with the country risk and the Brazilian basic interest rate.

According to Pastor and Veronese (2013), the relationships expected in the three previous hypotheses should show a more intense relationship in adverse economic conditions. This is because, under such circumstances, governments are more likely to adopt changes in existing policies to protect themselves from the unfavorable scenario and there is uncertainty as to the effectiveness of such changes to achieve the initial goals. Especially in periods of dismissal of government officials, such as in the face of presidential impeachment, the risk tends to increase and market agents tend to seek greater protection (Oliveira & Rocco, 2018), as well as more information (Batista, Maia, & Romero, 2018). Based on this:

Hypotheses 4: The association between political uncertainty and risk premium in recession scenarios is different in the periods' pre- and post-impeachment.

3. METHOD

To cover a big number of stocks of the Brazilian stock exchange (Brasil, Bolsa, Balcão – B^3), we used the stocks listed in the IBRX100 index at the end of each year. IBRX100 consists of the 100 most liquid stocks on the stock exchange. This index began in 1995, the same year in which the Real currency was launched. Because of that, our sample is composed of data from January 1996 to December 2019, except for the regressions that use the implied volatility, which begins in August 2011. The data of diary returns of the stocks are collected from Economatica database, and the implied volatility (VolIMP) from the NEFIN database (NEFIN, 2020) and published by Astorino, Chague, Giovannetti & Silva (2017).

Considering that the stock prices incorporate relevant news in your risk premium, we chose to use the Baker, Bloom & Davis (2016) index as a measure of political uncertainty. This index is based on frequency counts of key terms for the newspaper Folha de São Paulo, rescaled the resulting series to a mean of 100. Monthly is counted the number of articles in the newspaper that contains the key terms: "uncertain" or "certain", "economic" or "economy", in conjunction with one or more of the following terms: "regulation", "deficit", "budget", "tax", "central bank", "planalto" (equivalent to government), "congress", "senate", "legislation" and "rate".

To identify the periods of economic adverse conditions we selected the recession dummy elaborated by the OECD to indicate the periods of recessions in Brazil. Series available

on the website of Federal Reserve (2020). To compute the risk premiums' calculations, we used the monthly series of the interest rate of Brazilian bonds (Selic), available on the IPEADATA database, and the monthly series of the American market risk premium, as obtained from Ken French's website (French, 2020). And to the proxies of default spread we use EMBI+Br, an index produced by JP Morgan indicating the country risk of Brasil, available on the IPEADATA database, and the Moody's Rating to the Credit Risk Premium (CRP), that is changed to the percentage of country's weighted credit risk premium, like the Damodaran (2019a) database.

3.1. Empirical Models and Variables

The econometric models used in this study are based on Pastor and Veronesi (2013), which initially verify the relationship between political uncertainty and systemic risk, like Hypothesis 1 of this study. Therefore, the volatility or correlation are regressed on political uncertainty in Equation 1, where VC_t is a measure of volatility or correlation within the month *t*, PU_t is the political uncertainty index of Baker, Bloom, and Davis (2016), and ε_t is the random error term.

$$VC_t = a + bPU_t + \varepsilon_t \quad (1)$$

As in Pastor and Veronesi (2013), to conduct the analysis we considered two measures of volatility (implied and observed) and two measures of correlation (equally weighted mean and value-weighted mean). The implied volatility is obtained from the series developed by Astorino *et al.* (2017), and the observed volatility is the standard deviation of the diary returns of IBRX100 within the month *t*, like in Equation 2, where Rm_d is the return of the market index *m* on day *d*, and $\bar{R}_{m,d}$ is the expected return of the market index *m* on day *d*.

$$DP_t = \sqrt{\frac{\sum_{d=1}^{d}(Rm_d - \overline{Rm}_d)^2}{(d-1)}} \quad (2)$$

For the other two measures related to systemic risk, we initially estimate every month the correlation of the daily returns of the IBRX100 index with the daily return of each stock of the sample, like in Equation 3. Next, we estimate the equally weighted monthly average and the monthly average weighted by the market value of the correlations in the month of each stock with the index. The means are obtained by $\sum w_i \rho_{im,t}$, being considered for the equally-weighted average $w_i = 1/n$, and for the value-weighted average w_i equal to the market value of stock *i* in the month *t* divided by the sum of the market values of the shares of the month *t*. In Equation 3, $R_{i,d}$ is the return of the stock *i* on day *d*, $R_{m,d}$ is the return of the market index on day *d*, and $\bar{R}_{i,d}$ and $\bar{R}_{m,d}$ are the expected return of the stock *i* and the index *m* on day *d*.

$$\rho_{im,t} = \frac{\sum_{d=1}^{d}(R_{i,d} - \bar{R}_{i,d})(R_{m,d} - \bar{R}_{m,d})}{\sqrt{\sum_{d=1}^{d}(R_{i,d} - \bar{R}_{i,d})^2 (R_{m,d} - \bar{R}_{m,d})^2}} \quad (3)$$

To analyses Hypothesis 2 and 3, we realize 110 regressions estimations in time series (ten return measures times eleven h's), having as dependent variable the cumulative return from month $t+1$ to $t+h$ base on the equity risk premium or the measures related to it. The returns are accumulated with a h horizon from 2 to 12 months. As an independent variable, the measure of political uncertainty is used, resulting in Equation 4, where $R_{t+1,t+h}$ is the cumulative return

from month $t+1$ to $t+h$, PU_t is the political uncertainty index of Baker, Bloom e Davis (2016), and ε_t is the random error term.

$$R_{t+1,t+h} = a + bPU_t + \varepsilon_t \quad (4)$$

For the calculation of the risk premium, we use the estimated return of the IBRX100 for the market portfolio, the Selic monthly series, the US risk premium, and as proxies for the default spread, we use EMBI+Br (DS_{EMBI}) and the credit ratings of Moody's (DS_{Rating}). It is worth mentioning that in addition to the conventionally calculated risk premium obtained by the market return minus the risk-free rate, the approaches proposed by Damodaran (2019a, 2019b) for non-mature economies are used, this being one of the relevant innovations to this study. The three approaches have their calculation methods summarized in Table 1.

Table 1
Approaches to compute the Equity Risk Premium

Approach		Equity Risk Premium (ERP)
Conventional	1	$ERP_{BR1} = R_m - R_{SELIC}$
As Damodaran (2019b)	2	$ERP_{BR2} = R_m - (R_{SELIC} - DS_{Rating})$
		$ERP_{BR3} = R_m - (R_{SELIC} - DS_{EMBI})$
	3	$ERP_{BR4} = ERP_{US} + DS_{Rating}$
		$ERP_{BR5} = ERP_{US} + DS_{EMBI}$

Source: Damodaran (2019b).

To test Hypothesis 4, the measure of political uncertainty is regressed, as a dependent variable, like a function of the dummy recession, provided by the OECD. We use the cumulative monthly return from $t+1$ to $t+h$ as our dependent variable, and the risk premium and the dummy recession in Equation 5. This is the basis for testing Hypothesis 4, it is assumed that the interaction variable has a positive relationship with the dependent variable, but these coefficients are different in periods pre- and post-impeachment. In Equation 5, $R_{t+1,t+h}$ is the cumulative return from month $t+1$ to $t+h$, PU_tE_t is the interaction term of PU_t and E_t, PU_t is the political uncertainty index of Baker, Bloom, and Davis (2016), E_t is the recession dummy elaborated by the OECD, and ε_t is the random error term. This Equation is estimated for two subsamples: all samples (including the post-impeachment period) and pre-impeachment sample.

$$R_{t+1,t+h} = a + bPU_tE_t + cPU_t + dE_t + \varepsilon_t \quad (5)$$

In all models, we use essentially the Ordinary Least Squares (OLS) estimates, which is expected according to the research hypothesis a positive relationship. In all regressions, we use the robust error of Newey and West (1987) with three lags, except for the regressions where the dependent variable is the accumulated return, in which the errors are estimated with h lags. Also, as a precaution to avoid serial autocorrelation, in the models (1), (2) and (3) we realize regressions with a lag of the dependent variable as a control variable.

4. RESULTS

The correlation matrix of the studied variables, presented in Table 2, evidence that the political uncertainty index has a positive association with the systematic risk measures. However, it only has a significant correlation with the implied volatility (0,22) and value-weighted correlation (0,15). These findings suggest that political uncertainty has the potential to significantly increase the future volatility of the local market and has a more significant

impact on larger companies. Moreover, the systematic risk measures show a positive and significant association between them, and the equally weighted correlation and the value-weighted correlation report a strong association at 0,81.

The return of the market portfolio (R_m) and the American risk premium (RP_US) show a slightly negative and non-significant correlation with PU (-0,05 and -0,06, respectively), indicating that, at least contemporaneously, these variables do not seem to be related to political uncertainty in Brazil. However, these two variables have a negative and significant relationship with the volatility and correlation of Brazilian stock markets (-0,25 and -0,21, respectively). On the other hand, the measures related to bond rates (Selic, Rating or EMBI) reported a negative and significant correlation with the political uncertainty proxy -0,30, -0,36 and -0,50, respectively), contrary to the expected, as, by the literature, an increase in political uncertainty imply an expansion in the basic interest rate and the default spread (Damodaran, 2019b).

Table 2
Contemporary correlation matrix between variables. 1996-2019.

	PU	VolDP	VolIMP	CorEW	CorVW	Rm	Selic	Rating	EMBI
VolDP	0,09	1							
VolIMP	**0,22****	0,63***	1						
CorEW	0,10	0,68***	0,48***	1					
CorVW	**0,15*****	0,67***	0,46***	**0,81*****	1				
Rm	-0,05	-0,25***	-0,22**	-0,3***	-0,25***	1			
Selic	**-0,30*****	0,33***	0,33***	0,19***	0,00	0,11*	1		
Rating	**-0,36*****	0,19***	0,13	0,22***	-0,10*	0,12**	0,75***	1	
EMBI	**-0,50*****	0,23***	0,25**	0,16***	0,01	0,04	0,70***	0,69***	1
RP_US	-0,06	-0,21***	-0,26***	-0,28***	-0,20***	0,59***	0,05	-0,01	-0,07

Source: *PU* is the measure of the political uncertainty of Baker, Bloom, and Davis (2016) for Brazil. *VolSD* is the observed volatility obtained by the standard deviation in the month of the daily returns of the *IBRX100*. *VolIMP* is the implied volatility obtained from the series developed by Astorino *et al.* (2017). *CorEW* is the equally-weighted average of the correlations (of each month) between the daily returns of the IBRX100 with each stock of the index. *CorVW* is the average of the correlations of each month weighted by the market value. *Rm* is the return of the IBRX100 index used as a proxy for the return of the market portfolio. *Selic* is the interest rate series provided by the Central Bank of Brazil. *Rating* is the Moody's rating notes converted to weighted percentages according to the database provided by Damodaran (2019a). *EMBI+Br* refers to the Brazilian Bond Index, elaborated by JP Morgan and made available on IPEADATA. *RP_US* is the monthly series of American risk premiums obtained on French (2020) website. Level of significance: * 10%, ** 5%, *** 1%.

Figure 1 shows that the relation can be attributed to long-term trends in the series since bond rates have declined over the studied period, while the uncertainty measure shows an upward trend. This finding suggests that other driving factors may have determined a tendency of the interest rates, especially after the presidential impeachment. According to Oliveira and Rocco (2018), the impeachment of ex-president Dilma Rousseff was the political fact that fostered a series of turbulences over the Brazilian economy, having significantly altered the level of risk exposure of companies, with an anticipated effect of the increased risk, with its subsequent reduction after each stage of the impeachment process. For this reason, the trends of the series for the regression analysis are removed.

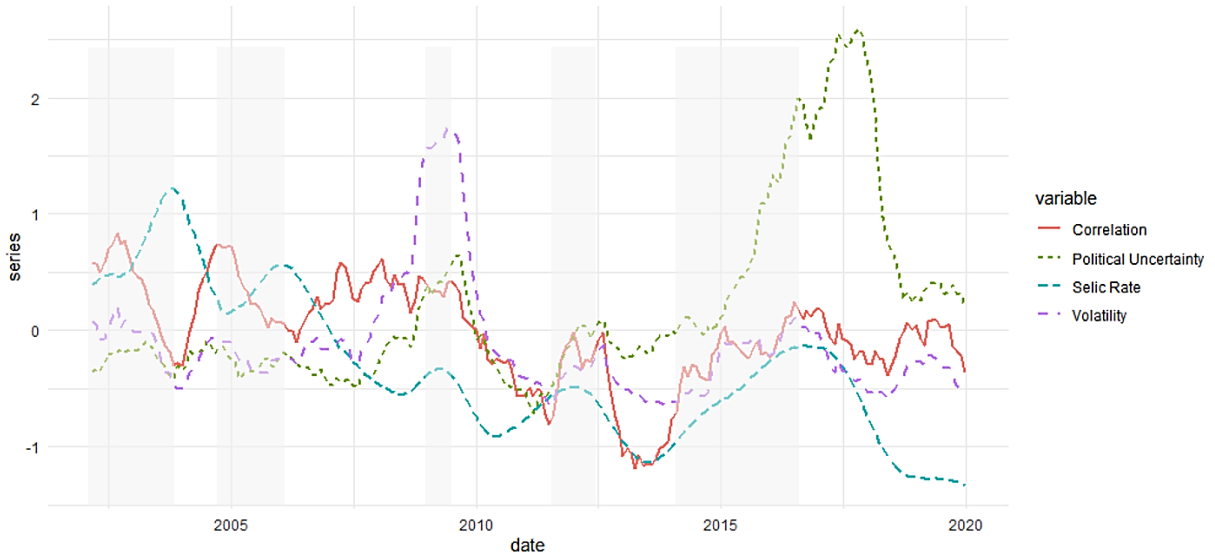

Figure 1. **Political uncertainty, volatility, correlation, interest rate and recessions (shaded areas).**
Source: Elaborated by the authors.

Another aspect worth mentioning is the fact that, until 2015, all the periods marked by recession dummies (gray areas) also can be verified a growth of political uncertainty, suggesting that this variable becomes more intense in adverse economic conditions (Pastor & Veronese, 2013). Alternatively, it is only in the most recent recession period that, after a hike in political uncertainty especially associated with the presidential impeachment, we can observe a significant reduction, pattern not identified in the previous periods. This converges with Oliveira and Rocco (2018), who found that the 2016 impeachment contributed significantly to the increase in the risk premium of the stocks, due to the reduction of the risk exposure of companies, especially for firms with lower volumes of Value at Risk.

Considering that political uncertainty is positively associated with volatility and correlation of stock returns (Copeland et al., 2005; Damodaran, 2009), Figure 2 shows the impulse response coefficients for political uncertainty, volatility (realized and implied) and correlation (Equally Weighted and Value Weighted) by the Bootstrap method. The impulse response coefficient demonstrates how the shock in political uncertainty spreads over the months, taking as a reference the mentioned proxies of volatility and correlation. In Figure 2, we can see that PU shocks persist with a greater amplitude about volatility (VolSD and VilIMP) over 12 periods while concerning the correlation of returns (CorEW and CorVW) the effects are decreasing, especially from the 6th period.

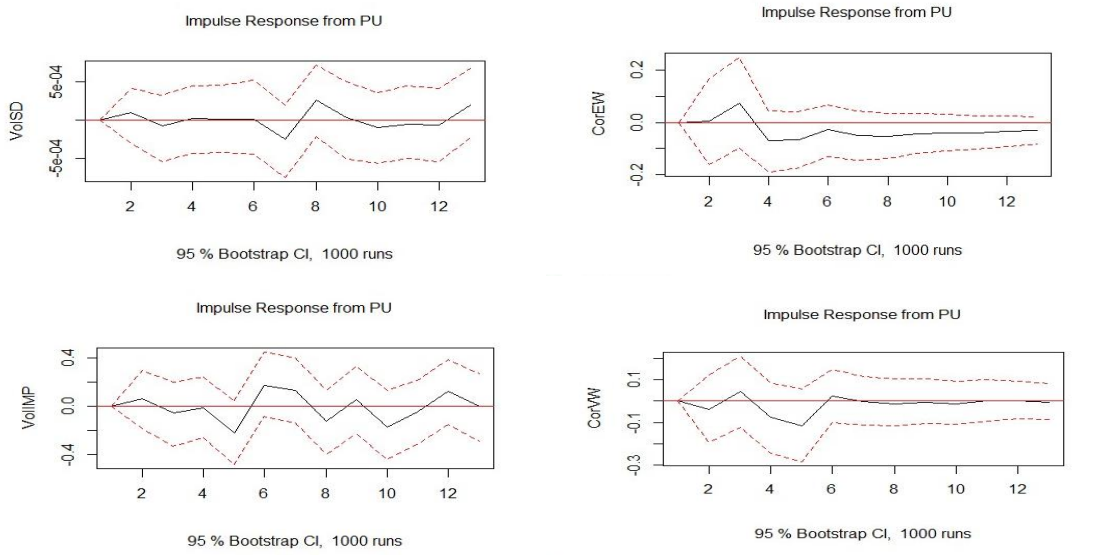

Figure 2. **Political uncertainty, volatility, and correlation.**
Source: Elaborated by the authors.

Given the changes in the interest variables, because the presidential impeachment, for the analysis of the relationship between political uncertainty and the volatility or correlation of stock returns in the Brazilian stock market, we have considered two samples: 1) the sample as a whole (All Sample); and 2) the sample until the presidential impeachment (Pre-impeachment Sample), that is, data until April 2016. The results in Table 3 evidence that, when all sample data is considered, political uncertainty proxy only has a positive and significant relationship with the value-weighted correlation (in the specifications 1 and 2). Nonetheless, in the pre-impeachment sample, both volatility and correlation of stock returns measures have a positive and significant relationship with political uncertainty, as expected in the literature (Damodaran, 2009; Chau et al., 2014; Ferreira & Martins, 2017).

This means that, until April 2016, an increase in the political uncertainty turned the local market more volatile and correlated, confirming its relevance to understanding these variations in the Brazilian stock market, thus confirm Hypotheses 1 for this subsample. However, these findings do not hold when the sample is considered as a whole, indicating that some political uncertainty events took place in the period post-impeachment that actually can be associated with a reduction of the volatility and correlation in the markets, as noted by Oliveira and Rocco (2018). Given the high level of political uncertainty reached in the period of impeachment and the following accelerated fall in political uncertainty and interest rate (Selic in Figure 1), it appears that this has led to an improvement in expectations of economic recovery, changing the historical trend of these variables. Therefore, this variable loses its importance to explain the variations of the market from 2016 on. Therefore, our analyzes consider subsamples 1 and 2.

Table 3
Political uncertainty, volatility, and correlation. 1996-2019.

Political Uncertainty	All Sample				Pre-Impeachment Sample			
	Volatility		Correlation		Volatility		Correlation	
	Realized	Implied	Equally Weighted	Value Weighted	Realized	Implied	Equally Weighted	Value Weighted
Specification 1	0,001	0,770	0,012	0,018**	0,003**	2,569***	0,027**	0,037***
	(1,033)	(1,205)	(1,545)	(2,170)	(1,988)	(5,583)	(2,492)	(3,169)
Specification 2	0,001	0,456	0,010	0,013**	0,002*	1,905***	0,018**	0,023***
	(1,318)	(1,097)	(1,621)	(2,286)	(1,810)	(3,601)	(2,026)	(2,658)

Source: The table reports the estimated slope of the coefficient β and the t-statistic of the following regressions: Specification 1: $VC_t = a + bPU_t + \varepsilon_t$; Specification 2: $VC_t = a + bPU_t + cVC_{t-1} + \varepsilon_t$. Standard errors adjusted for serial correlation, using Newey-West 3-lags standard error. PU_t is the measure of political uncertainty of Baker, Bloom, and Davis (2016) for Brazil, divided by 100. VC_t refers to volatility or correlation. We use two measures of volatility (realized and implied) and two measures of correlation (equally-weighted average and value-weighted) to conduct the analysis. The realized volatility is the standard deviation of the daily returns of the IBRX100 in the month, and the implied volatility is obtained from the series developed by Astorino *et al.* (2017). Correlations are obtained from the equally weighted monthly average and the value-weighted monthly average of the daily returns of the index IBRX100 with each stock. Level of significance: * 10%, ** 5%, *** 1%.

We can note that, in the pre-impeachment sample, volatility has a statistically stronger relationship when considered implicitly (2,569 and 1,905, for Specifications 1 and 2), which may be related to the characteristic of this measure in reflecting the future perspective of volatility. The value-weighted correlation reports a stronger positive relationship (0,037 and 0,023), bigger than that found in equally weighted (0,027 and 0,018), suggesting that this phenomenon affects a greater proportion of the larger companies. However, all the market is impacted somehow. These findings are similar to those found by Pastor and Veronese (2013) in the US market, and Nunes and Medeiros (2016) who analyze the relationship of uncertainty with the volatility of returns in nine countries (United States, Canada, United Kingdom, Germany, Italy, France, India, and China).

Considering that the political uncertainty index has a relationship with the volatility and the correlation of the returns, it would be reasonable to expect that it also presents a positive and significant relationship with the stock's risk premium. Table 4 summarizes the coefficients found in the relationships between the political uncertainty and the different equity risk premium measures utilized in this study and its components, considering all the sample. In these analyzes, we consider the effects accumulated over up to 7-time horizons (h = 7, in months). We observe that none of the five risk premium proxies has a significant slope coefficient, differently than expected. Not even the two measures formed with the American risk premium have significant coefficients. However, this finding can be explained by the level of information that the market may have on the progress of the stages of the impeachment process, because, according to Batista, Maia, and Romero (2018), the Brazilian market is efficient in the semi-strong form, with no evidence of abnormal return nor of accumulated abnormal return in event windows surrounding the stages of the 2016 impeachment.

On the other hand, we can identify a positive and significant association in all-time horizons between political uncertainty and the interest rate (Selic), as well as between PU and the credit rating (Cuadra & Sapriza, 2008). This shows that the increase in political uncertainty in Brazil was accompanied by an increase in the government's basic interest rate (Selic), which was expected, since in an environment of greater uncertainty investors tend to demand greater returns, including for government bonds. Regarding the credit rating (DS_{rating}), we also can verify a positive association between PU and the deterioration of the credit rating (higher percentages of credit risk premium), converging with Cuadra and Sapriza (2008) and Bloomberg (2016). When uncertainty increases, credit risk analysis agencies tend to downgrade country ratings, which leads countries to increase the premium offered for their bonds.

Table 4
Slope coefficients between political uncertainty and risk premium, for All Sample. 1996-2019.

Political uncertainty	h = 2	h = 3	h = 4	h = 5	h = 6	h = 7
$Rm - Rf$	0,001	0,005	0,012	0,018	0,020	0,024
	(0,109)	(0,518)	(0,889)	(1,082)	(1,114)	(1,223)
$Rm - (Rf - DS_{Rating})$	-0, 001	0,004	0,010	0,015	0,017	0,021
	(-0,019)	(0,371)	(0,742)	(0,929)	(0,948)	(1,043)
$Rm - (Rf - DS_{EMBI})$	-0,001	0,003	0,009	0,013	0,015	0,018
	(-0,096)	(0,280)	(0,648)	(0,830)	(0,840)	(0,924)
$RP_{US} + DS_{Rating}$	-0,009	-0,009	-0,006	-0,009	-0,012	-0,013
	(-1,104)	(-0,820)	(-0,558)	(-0,675)	(-0,863)	(-0,971)
$RP_{US} + DS_{EMBI}$	-0,009	-0,009	-0,007	-0,009	-0,012	-0,014
	(-1,130)	(-0,848)	(-0,592)	(-0,714)	(-0,908)	(-1,015)
Rm	0,004	0,009	0,013	0,014	0,016	0,021
	(0,620)	(0,905)	(1,007)	(0,908)	(0,928)	(1,072)
$Selic\ (detrended)$	0,002***	0,003***	0,004***	0,004***	0,005***	0,006***
	(4,651)	(4,704)	(4,159)	(3,686)	(3,244)	(2,916)
$DS_{Rating}\ (detrended)$	0,001**	0,001**	0,001**	0,001**	0,001*	0,001*
	(2,201)	(2,214)	(2,103)	(2,011)	(1,940)	(1,980)
$DS_{EMBI}\ (detrended)$	0,001	-0,001	-0,001	-0,001	-0,001	-0,001
	(0,058)	(-0,034)	(-0,089)	(-0,138)	(-0,167)	(-0,207)
RP_{US}	-0,005	-0,003	-0,002	-0,002	-0,004	-0,003
	(-0,928)	(-0,495)	(-0,230)	(-0,292)	(-0,483)	(-0,335)

Source: The estimated slope of the coefficient β and the t-statistic of the regression $R_{t+1,t+h} = a + bPU_t + \varepsilon_t$ are reported in this table. Standard errors adjusted for serial correlation, using Newey-West h-lags standard error. $R_{t+1,t+h}$ is the cumulative return from month t+1 to t+h of five approaches to compute equity risk premium and their components (portfolio market return, Selic rate, default spread measured by credit rating and EMBI+Br). RP_{US} is the American risk premium. PU_t is the measure of political uncertainty of Baker, Bloom, and Davis (2016) for Brazil, divided by 100. Level of significance: * 10%, ** 5%, *** 1%.

Although most of the tests presented a positive signal, as expected in the literature, none of them is significant, so it is not possible to confirm Hypotheses 2. When testing a similar model in a sample of 26 years older than the present study, Pastor and Veronese (2013) also did not find a significant relationship between political uncertainty and risk premium. The authors argued that in addition to the possibility of no relationship between variables, it is also possible that the number of observations is not enough to obtain a strong relation in the model tested.

Additionally, Pastor and Veronese (2013) suggest that political uncertainty may contain opposing forces since the government may be acting to protect or improve the market condition, thereby reducing the risk premium. The latter argument gains strength when we observe that the components of the risk premium, both the Selic rate and the Credit Rating (detrended) reported positive and significant relationships over the six analyzed horizons. Therefore, it can be considered that these components are directly affected by political uncertainty, as predicted by Cuadra and Sapriza (2008), and possibly generate a double-counting of political risk, in line with Damodaran's (2019b) arguments. These results enable us to confirm Hypotheses 3.

In Table 5 we consider only the data before the presidential impeachment in April 2016. The political uncertainty proxy also reports no significant relationships with the different equity risk premium measures. Therefore, even considering the subsample until April 2016, it is not possible to confirm Hypotheses 2. Moreover, there are positive and significant relationships between the risk premium and the Selic rate in this subsample, as well as between the PU and the default spread measured by the EMBI+Br, again, converging to Cuadra and Sapriza (2008) and confirming Hypotheses 3. However, the Credit Rating is not significant in all the horizons, probably because our measure of political uncertainty reduces after the impeachment, just as the EMBI+Br also decrease with the change of government; however, Brazil's credit rating has not changed. This makes EMBI+Br significant, and DS_{rating} not significant.

Table 5
Slope coefficients between political uncertainty and risk premium, for Pre-impeach. Sample. 1996-2016.

Political uncertainty	h = 2	h = 3	h = 4	h = 5	h = 6	h = 7
$Rm - Rf$	-0,005	0,001	0,009	0,014	0,016	0,021
	(-0,404)	(0,068)	(0,443)	(0,572)	(0,569)	(0,680)
$Rm - (Rf - DS_{Rating})$	-0, 007	-0,001	0,007	0,011	0,012	0,017
	(-0,496)	(-0,049)	(0,321)	(0,446)	(0,437)	(0,539)
$Rm - (Rf - DS_{EMBI})$	-0,007	-0,001	0,007	0,011	0,013	0,017
	(-0,484)	(-0,033)	(0,336)	(0,460)	(0,449)	(0,551)
$ERP_{US} + DS_{Rating}$	-0,012	-0,010	-0,008	-0,011	-0,014	-0,014
	(-1,285)	(-0,875)	(-0,610)	(-0,746)	(-1,000)	(-1,042)
$ERP_{US} + DS_{EMBI}$	-0,012	-0,010	-0,008	-0,011	-0,014	-0,014
	(-1,301)	(-0,894)	(-0,634)	(-0,776)	(-1,037)	(-1,081)
Rm	0,004	0,010	0,014	0,014	0,017	0,024
	(0,412)	(0,684)	(0,684)	(0,559)	(0,601)	(0,779)
$Selic\ (detrended)$	0,002***	0,003***	0,004***	0,004**	0,005**	0,006*
	(2,891)	(3,042)	(2,659)	(2,377)	(2,093)	(1,980)
$DS_{Rating}\ (detrended)$	0,001	0,001	0,001	0,001	0,001	0,001
	(0,127)	(0,219)	(0,273)	(0,315)	(0,367)	(0,423)
$DS_{EMBI}\ (detrended)$	0,001***	0,001***	0,001***	0,001***	0,002***	0,002***
	(5,644)	(5,584)	(5,134)	(4,771)	(4,456)	(4,185)
RP_{US}	-0,013	-0,012	-0,010	-0,013	-0,017	(-0,018)
	(-1,411)	(-1,027)	(-0,794)	(-0,950)	(-1,242)	(-1,313)

Source: The estimated slope of the coefficient β and the t-statistic of the regression $R_{t+1,t+h} = a + bPU_t + \varepsilon_t$ are reported in this table. Standard errors adjusted for serial correlation, using Newey-West h-lags standard error. $R_{t+1,t+h}$ is the cumulative return from month t+1 to t+h of five approaches to compute equity risk premium and their components (portfolio market return, Selic rate, default spread measured by credit rating and EMBI+Br). RP_{US} is the American risk premium. PU_t is the measure of political uncertainty of Baker, Bloom, and Davis (2016) for Brazil, divided by 100. Level of significance: * 10%, ** 5%, *** 1%.

Finally, we sought to verify if the relationship between political uncertainty and the risk premium is more intense under adverse economic conditions. According to the findings reported in Table 6, considering all sample, the relationships of the first three risk premium measures, that use the Selic rate in its calculation, show positive and significant relationships starting from $h = 3$. This means that the impact of political uncertainty is only effectively reflected in the risk premium in adverse economic periods from the third month onwards. A similar condition was observed by Nunes and Medeiros (2016), suggesting that the risk premium does not immediately absorb the content of the political uncertainty, but it takes a few months to incorporate the information into the pricing of the assets in the Brazilian market. That occurs perhaps due to the uncertainty involved in the information as soon as it is released.

It is worth highlighting that until horizon 4 the relation between the interaction variable and the risk premium becomes more significant, in all the three measures, and has a slight decrease in its intensity in the following months. This is similar to Pastor and Veronese (2013) in horizons of up to 12 months in the American market. Nunes and Medeiros (2016) also find similar results in the other 9 countries, where an increase of the relationship up to 6 months was followed by a reduction of significance when considered 12 months accumulated.

Moreover, the market return (R_m) and the default spread measured by the EMBI+Br (DS_{EMBI}) show a positive and significant relationship with the political uncertainty in the economic adverse periods, in all the horizons. This finding indicates that in these scenarios, the political events that cause instability have greater importance to explain the market variations and the Brazil country risk trend, similarly to Oliveira and Rocco (2018). Market return and EMBI+Br present a positive and significant relationship with PU in all time horizons.

Table 6
Slope coefficients of political uncertainty, risk premium, and economic conditions, for All Sample. 1996-2019.

Political uncertainty	h = 2	h = 3	h = 4	h = 5	h = 6	h = 7
$Rm - Rf$	0,017	0,035*	0,053**	0,062*	0,072*	0,081**
	(0,989)	(1,743)	(2,038)	(1,943)	(1,949)	(2,060)
$Rm - (Rf - DS_{Rating})$	0,016	0,035*	0,052**	0,061*	0,071*	0,080**
	(0,961)	(1,712)	(2,002)	(1,906)	(1,911)	(2,011)
$Rm - (Rf - DS_{EMBI})$	0,018	0,037*	0,054**	0,064**	0,074**	0,084**
	(1,045)	(1,823)	(2,121)	(2,02)	(2,018)	(2,126)
$ERP_{US} + DS_{Rating}$	-0,008	0,003	0,017	0,024	0,047	0,065*
	(-0,543)	(0,138)	(0,778)	(0,911)	(-1,625)	(1,836)
$ERP_{US} + DS_{EMBI}$	-0,008	0,003	0,017	0,025	0,048*	0,066*
	(-0,525)	(0,160)	(0,817)	(0,957)	(1,695)	(1,912)
Rm	0,028*	0,045**	0,054**	0,064*	0,073*	0,079*
	(1,912)	(2,148)	(1,978)	(1,890)	(1,968)	(1,920)
$Selic\ (detrended)$	-0,001	-0,001	-0,001	-0,001	-0,001	-0,001
	(-0,562)	(-0,61)	(-0,526)	(-0,372)	(-0,280)	(-0,150)
$DS_{Rating}\ (detrended)$	-0,001	-0,001	-0,001	-0,001	-0,001	-0,001
	(-1,353)	(-1,317)	(-1,229)	(-1,159)	(-1,089)	(-1,058)
$DS_{EMBI}\ (detrended)$	0,001***	0,002***	0,002***	0,003***	0,003***	0,003***
	(5,515)	(5,970)	(5,738)	(5,459)	(5,166)	(4,854)
RP_{US}	-0,007	-0,002	0,006	0,007	0,015	0,019
	(-0,685)	(-0,151)	(0,437)	(0,433)	(0,853)	(1,033)

Source: The estimated slope of the coefficient β and the t statistic of the regression $R_{t+1,t+h} = a + bPU_tE_t + cPU_t + dE_t + \varepsilon_t$ are reported in this table. Standard errors adjusted for serial correlation, using Newey-West h-lags standard error. $R_{t+1,t+h}$ is the cumulative return from month t+1 to t+h of five approaches to compute equity risk premium and their components (portfolio market return, Selic rate, default spread measured by rating and EMBI+Br). RP_{US} is the American risk premium. PU_t is the measure of political uncertainty of Baker, Bloom, and Davis (2016) for Brazil divided by 100. E_t refers to the dummy built by the OECD to indicate periods of recession in Brazil, available on the Federal Reserve website (2020). PU_tE_t is an interaction term of PU_t and E_t. Level of significance: * 10%, ** 5%, *** 1%.

In Table 7 we consider the sample pre-impeachment, the political uncertainty proxy presents only significant relationships with the first three risk premium measures from horizon 5 on. Thus, we note that the results of the association between political uncertainty and risk premium in periods of recession are less robust when considering only the pre-impeachment period. That is, when Brazil faced the stress of dismissing a president, on average, the market demanded a higher risk premium when the country faced periods of recession and increased political uncertainty. Therefore, the association between PU and risk premium is different between the pre- and post-impeachment periods, which confirms Hypothesis 4 in this study.

Still, in Table 7 our finding indicates that the impact of political news that caused uncertainty took a longer period to be relevant to the Brazilian risk premium, and after the impeachment, this horizon is reduced to three months. Moreover, the market return also reported a positive and significant relation from h = 3 on, and the components of the risk premium that reported a significant and positive relationship with the political uncertainty proxy in the period pre-impeachment the Selic rate, in all time horizons, and the US risk premium on h = 7, confirming that in this period a higher political uncertainty has a lower explanatory power related to market variations. However, the PU continue being an important driver to explain the risk premium and their components, following Oliveira and Rocco (2018).

Table 7
Slope coefficient of political uncertainty, risk premium, and economic conditions, for Pre-Impeach. Sample. 1966-2016.

Political uncertainty	h = 2	h = 3	h = 4	h = 5	h = 6	h = 7
$Rm - Rf$	0,008	0,032	0,058	0,077*	0,111**	0,137**
	(0,345)	(1,067)	(1,536)	(1,690)	(2,115)	(2,253)
$Rm - (Rf - DS_{Rating})$	0,008	0,032	0,059	0,077*	0,112**	0,138
	(0,350)	(1,075)	(1,538)	(1,684)	(2,107)	(2,233)
$Rm - (Rf - DS_{EMBI})$	0,008	0,032	0,059	0,077*	0,112**	0,137**
	(0,352)	(1,075)	(1,539)	(1,687)	(2,108)	(2,240)
$ERP_{US} + DS_{Rating}$	-0,006	0,001	0,015	0,022	0,045	0,065
	(-0,353)	(0,053)	(0,688)	(0,829)	(1,546)	(1,813)
$ERP_{US} + DS_{EMBI}$	-0,006	0,002	0,016	0,023	0,046	0,065*
	(-0,338)	(0,077)	(0,731)	(0,878)	(1,618)	(1,890)
Rm	0,032	0,060*	0,081*	0,117**	0,144**	0,153**
	(1,383)	(1,806)	(1,957)	(2,370)	(2,510)	(2,229)
$Selic\ (detrended)$	0,003***	0,004**	0,005**	0,006**	0,007**	0,008**
	(2,779)	(2,573)	(2,573)	(2,566)	(2,377)	(2,262)
$DS_{Rating}\ (detrended)$	-0,001	-0,001	-0,001	0,001	0,001	0,001
	(-0,013)	(-0,031)	(-0,021)	(0,005)	(0,051)	(0,082)
$DS_{EMBI}\ (detrended)$	-0,001	-0,001	-0,001	-0,001	-0,001	-0,001
	(-0,364)	(-0,395)	(-0,409)	(-0,416)	(-0,454)	(-0,520)
RP_{US}	-0,005	0,002	0,016	0,023	0,046	0,066*
	(-0,327)	(0,090)	(0,747)	(0,895)	(1,632)	(1,902)

Source: The estimated slope of the coefficient β and the t statistic of the regression $R_{t+1,t+h} = a + bPU_tE_t + cPU_t + dE_t + \varepsilon_t$ are reported in this table. Standard errors adjusted for serial correlation, using Newey-West h-lags standard error. $R_{t+1,t+h}$ is the cumulative return from month t+1 to t+h of five approaches to compute equity risk premium and their components (portfolio market return, Selic rate, default spread measured by rating and EMBI+Br). RP_{US} is the American risk premium. PU_t is the measure of political uncertainty of Baker, Bloom, and Davis (2016) for Brazil, divided by 100. E_t refers to the dummy built by the OECD to indicate periods of recession in Brazil, available on the Federal Reserve website (2020). PU_tE_t is an interaction term of PU_t and E_t. Level of significance: * 10%, ** 5%, *** 1%.

In the quest for adequately pricing assets in a capital market, the agents use information from a variety of sources that they consider relevant to the determination of future earnings. Among the systematic risks that affect the market, political uncertainty has gained prominence due to the great instability across the globe (Bekaert et al., 2016; Chau et al., 2014). In Brazil, our findings demonstrate that political uncertainty has effects on the risk premium, regardless of how this premium is estimated. So, the capital market performance and political instability have a strong relationship in Brazil, as observed by Lehkonen and Heimonen (2015) in emerging countries.

5. CONCLUSION

This study aimed to analyze how political uncertainty affects the risk premium in the Brazilian stock market between 1996 and 2019, a period in which Brazil was strongly marked by a series of political events that generated uncertainties and significant changes in its economic conjuncture, having years with favorable economic environments as well as years marked by recession and presidential impeachment. This diversity of circumstances in such a short space of time provides a unique and relevant horizon of analysis, but also challenging to observe meaningful relationships.

The results extracted from the sample showed positive and significant relationships between political uncertainty and systematic risk measures (volatility and correlation), confirming the relevance of the study of these variables to understand market movements in Brazil. Above all, when we sought to verify the relationship between political uncertainty and

risk premium, we note that the political uncertainty is an important determinant of the risk premium and their components. Still, the presidential impeachment improved this importance.

Pastor and Veronese (2013) also observed the lack of significance between uncertainty and the risk premium in the US market. They attributed this result to the size of their sample (26 years), which could be not enough to show the expected results, but they also stressed that there is the possibility that political uncertainty may contain opposing forces. However, in Brazil we found significant results, suggesting that the perception in the local market and the US market may be different. This difference in Brazil may be explained by the higher level of political uncertainty, an inference that is reinforced by the more robust result from the presidential impeachment.

The statistical significance found in the relationship between the index and the Selic and the rating makes it possible to state that like systematic risk measures the rates analyzed are also directly affected by political uncertainty. Verifying if deteriorations in economic conditions could amplify the effect of political uncertainty and if this would have a statistically significant influence on the systematic risk and in the risk premium in the Brazilian market, we note that the political uncertainty shows greater intensity in adverse economic conditions and that under these circumstances there is a greater impact on the risk premium.

As studies in this field do not have yet widely consolidated literature or theories, both abroad and in Brazil, the results found are a relevant basis for possible future studies. These could broaden the range of possible proxies for the determination of political uncertainty, both considering other news outlets or proposing other ways of capturing this risk. Also, with the expansion of the data series, it would be possible to explore the discussion about the double-counting of risk and the interconnection of the local and US markets observed in the results of the regressions related to the different risk premiums addressed.

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