Do Political News Affect Financial Market Returns? Evidences from Brazil

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October 2016

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1 Introduction

The recent political events in Brazil has been grabbing the media's attention. It is normal to find these vehicles associating the political events with financial markets oscillation. Nevertheless, this common sense approach to market prices runs into efficient market hypothesis as posed by Fama (1970).

Actually, the impact of political events on financial markets is a widespread issue. Smales (2015) measured the role of political uncertainty on implied volatility with macroeconomics variables in the regression model and Australian Financial Market data. Jovanovic & Zimmermann (2008) tested whether U.S. Federal Reserve (FED) reacts to market's uncertainty. They concluded that FED decreases the interest rates in periods of abnormal volatility in the stock market and raise them in the opposite case, notwithstanding with inflation rates. In South Africa's Financial Markets, Naraidoo & Raputsoane (2015) found interest rates are guided by inflation uncertainty.

In this paper, we analyzed whether fixed income and the stock market volatility movements matches political news. To do so we used a GARCH model to filter volatility and then we compared timing of political events and abnormal volatility to find out correlations between them using two different approaches: a parametric and a nonparametric method to distinguish abnormal volatilities from .

This paper is organized as follows. Section 2 is a quick introduction to Brazilian Political Institutions and to the Financial System, which has some singularities compared to countries like United States, France and England. The Section 3 is a literature review. The Section 4 has the Empirical Strategy, the subsections are: Data, Methods, Alternative 1 – Parametric and Alternative 2 – Non-parametric. Section 5 has the Results and Discussion. Section 6 has Concluding Remarks and the Section 7 is the Bibliography.

2 Brazilian Political Institutions and Financial System

Brazil is a federative republic with a presidential system, where the legislative, executive and judiciary branches of government are independents from each other. The president is elected for a four-year administration and can be reelected for only one subsequent term (Brazil, Constituição da República Federativa do Brasil: 49ª edição, 1988). The president chooses his ministers and the president of Central Bank of Brazil. The last one needs to be approved by the senate and he can be fired at any moment, in other words, the Central Bank is not independent

The Table 1 shows the composition of the Brazilian Financial System.

Table 1 – Brazilian Financial System

<table>
<tr><th>Regulating entities</th><th>Supervision Entities</th><th colspan="4">Operators</th></tr>
<tr><td rowspan="2">National Monetary Council (CMN)</td><td>Central Bank of Brazil (BCB)</td><td>Financial institutions taking demand deposits</td><td>Other financial institutions

Foreign exchange banks</td><td colspan="2" rowspan="2">Other financial intermediaries and entities administering financial assets of third parties</td></tr>
<tr><td>Securities and Exchange Commission (CVM)</td><td>Commodities and futures exchanges</td><td>Stock exchanges</td></tr>
<tr><td>National Council for Private Insurance (CNSP)</td><td>Private Insurance Superintendence (SUSEP)</td><td>Reinsurance Companies</td><td>Insurance companies</td><td>Capitalization companies</td><td>Entities operating private open pension funds</td></tr>
<tr><td>National Council for Complementary Pension (CNPC)</td><td>National Complementary Pension Superintendency (PREVIC)</td><td colspan="4">Entities operating private closed pension funds</td></tr>
</table>

Source: Central Bank of Brazil

Financial system is built upon Law 4595/1964 (1964), which establishes National Monetary Council (CMN) as the major normative institution of Brazilian Financial System. (Brazil, 1964). The institution is composed by the Minister of Finance, Minister of Planning and President of Central Bank of Brazil. The objectives of CMN are defining monetary and exchange rate policies and establishing rules for the financial system.

The Central Bank of Brazil, according to the Constitution (1988), has the monopoly of notes issuance, is the government's banker and also the banker's bank, along with this, the Central Bank is the supervisor of the financial system, the executor of monetary and exchange rate policies.

In June, 1999, Brazil adopted the inflation targeting regime, where de CMN defines the inflation target and the Central Bank pursues this target using monetary policy, although there is a tolerance level for that target. Actually, Monetary Policy Committee (Copom) is Central Bank decision making body on monetary policy responsible for setting the target of short-term interest rate (Selic). There is Copom's meetings each forty-five days and an official note is released informing the directions of the Selic rate target.

In fact, Brazil has only one stock exchange, the BM&FBovespa, which is a company that manages the organized securities, commodities and derivatives markets. According to the BM&FBovespa (2016) "The Bovespa Index (Ibovespa) is compiled as a weighted average of a theoretical portfolio of stocks pursuant to criteria set forth in this methodology". Only shares and units listed on BM&FBovespa that are within the inclusion criteria can compose the index.

The Clearing House for the Custody and Financial Settlement of Securities (CETIP) is a" depositary" of mainly private fixed income, state and city public securities and some securities representing National Treasury debts" (Central Bank of Brazil, 2016).

3 Political Uncertainty and Financial Markets Informational Efficiency

Fama (1970) defined market efficiency in terms of information organized three information subsets to efficient markets: the weak form, where the information set includes only the history of prices; the semi-strong form, where the information set is the publicly available information; and the strong form, where the information set includes all the information, including the private information. In the strong form the existence of abnormal returns is not possible, because the information is repassed so rapidly to the prices that makes impossible to achieve gains.

There is massive literature of empirical analysis of efficient markets hypothesis (EMH). This paper focused to review the literature about these markets on emerging countries. Kamal (2014) studied the Egyptian Exchange (EGX) before and after the 25th January Revolution when the stock market was closed and, for both cases, rejected the weak-form efficiency hypothesis.

Dong, Bowers, & Latham (2013) studied the relationship of the markets around the world and if they are efficient. The authors realized that, to the market be at least efficient, it can't exist any global or regional leader on the market, but they founded evidences of this existence, these conclusion violates the EMH.

Recently, in Brazil, Gabriel, Ribeiro, & de Sousa Ribeiro (2013) studied the behavior of stock prices of companies that belong to segment of "white line" household appliances, furniture, papers and cellulose during the period of the announcement by Brazilian government of reduction of Industrial Products Tax (IPI) in March of 2012. Using the event study, the results leaded to the conclusion that the market wasn't showed the behavior of EMH, especially the semi-strong form.

Baker, Bloom and Davis (2012), though, realized that, before 2008 crises, the stock market usually moved in response to economic news, however this changed after the subprime crisis, the actions of policy-makers and their statements are impacting directly the stock market. The authors created an index to measure the policy uncertainty where they combine three types of information:

> "(…) frequency of newspaper articles that reference economic uncertainty and the role of policy; the number of federal tax code provisions that are set to expire in coming years; the extent of disagreement among economic forecasters about future inflation and future government spending on goods and services" (Baker, Bloom, & Davis, 2012).

At the same time, they created another index to measure the policy uncertainty searching for news on Google News using keywords as 'uncertain' or 'uncertainty' with 'economic' or 'economy'.

According to Jovanic & Zimmermann (2008), the FED of United States reacts to uncertainty reducing the interest rates when there is high volatility in the stock market and raises in the opposite case, ignoring the inflation control of the last 15 years before the study. Laakkonen (2015) studies the fixed income of United States from investors' viewpoint and how they react to uncertainty. The author uses the volatility of Ten Years US Treasury Note futures and concluded that investors reacts stronger when news are associated with low uncertainty, raising the volatility and the trade volume of those future contracts. The paper uses three types of uncertainties: the macroeconomic, discordance between professional forecasters about the macroeconomic scenario, the financial uncertainty, which is measure through the VIX and the political uncertainty, which is measure by the policy uncertainty index by Baker etl al. (2012). The conclusion was that investor react to news significantly stronger when uncertainty is low and they are more sensitive to uncertainty in the financial market.

Smales (2015) analyzed the Australian electoral cycle and the uncertainty from the real economy and financial markets. He found the implied volatility of equity and bond options increases with the election uncertainty, that is, there exists a relationship between financial market uncertainty and political uncertainty

On the other side, in South Africa, which has a monetary policy institutional framework similar to Brazil's, Naraidoo & Raputsoane (2015) found interest rates are guided by inflation uncertainty, output gap and financial conditions. The author defined financial conditions with the financial condition index, which is made up by the average price of all houses, the real stock prices, the real effective exchange rate, the credit spread, and the future spread.

4 Empirical Strategy

4.1. Data

We collect a sample of Bovespa Index, DI and SELIC, because those prices are the most used one to evaluate conditions of capital and private and public bond markets in Brazil, respectively. The first one was collected from the Brazil's Central Bank Time Series Management System (Central Bank of Brazil, 2016) at 05/11/2016 in the CSV format. The code of Bovespa Index is 7. The series started at 01/02/2014 and ended at 04/29/2016 and was daily separated. The Figure 1 shows the series through the time.

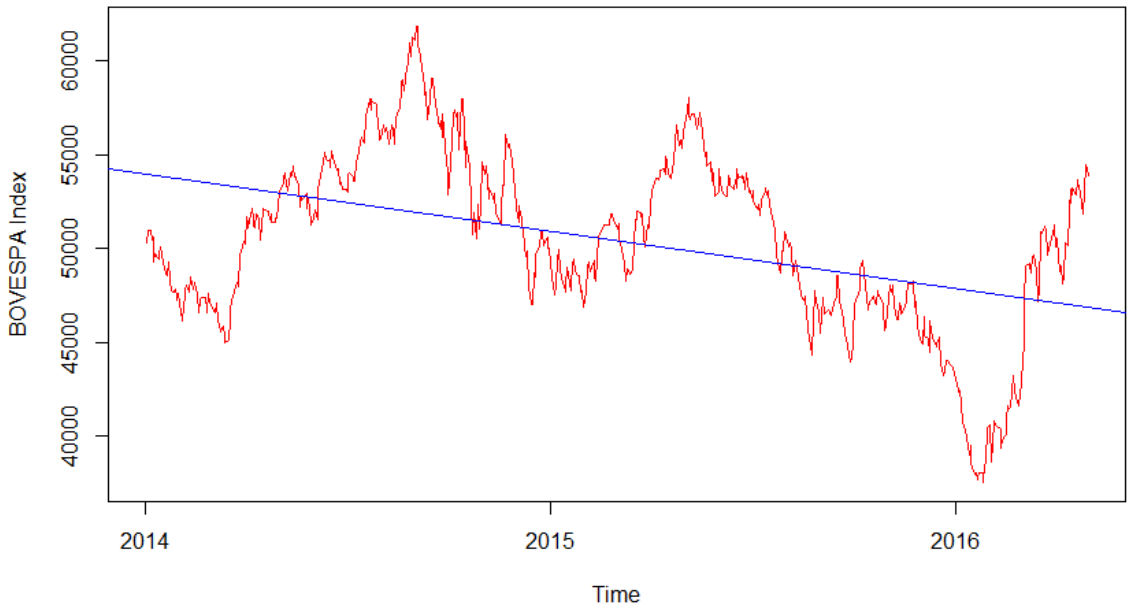

Figure 1 Bovespa Index 2014-2016

A crisis started to surround the Brazilian economy in 2014, which was the year of presidential elections where Ms. Rousseff was reelected to other 4-years mandate. The year of 2015 was marked by the explosion of the crisis, the fall of the Ms. Rousseff's popularity reflected on the popular manifestations demanding the impeachment of her, the failed attempt of government to recover credibility by nominating an orthodox economist to lead the Ministry of Finance and was also marked by the evolution of investigations of corrupt practices with the Brazilian state-controlled oil company, Petrobras. At last, in 2016 the president impeachment happened, where Mr. Temer, a center-right politician and also vice-president, assumed the presidency.

We calculated the returns of Ibovespa in the Equation (1)

$$IbovespaReturns_t = ln\left(\frac{Ibovespa_t}{Ibovespa_{t-1}}\right) \quad (1)$$

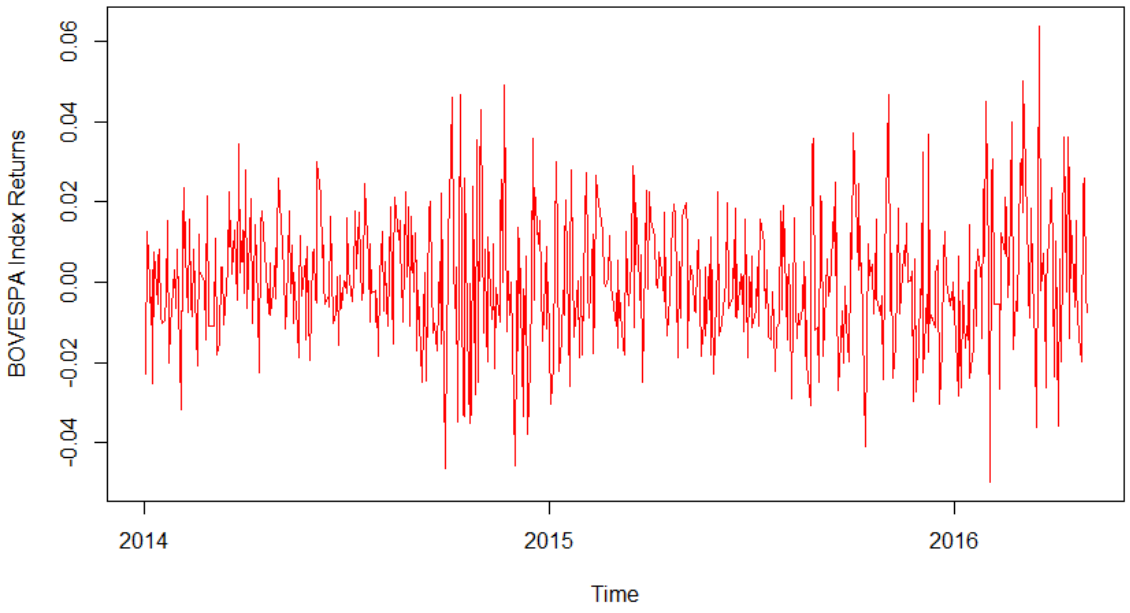

Figure 2 Bovespa Index Returns 2014-2016

We tested the Ibovespa Returns (IR) to observe if the series has unit root and if the series is stationary by using the Augmented Dickey-Fuller (ADF) test (1979) and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test (1992), respectively. Visually, the Figure 2 shows a stationarity form, to confirm this hypothesis, the Table 2 and Table 3 returns the results obtained.

Table 2 ADF Test (IR)

	Estimate	Std. Error	t value	Pr(>|t|)
z.lag.1	-0.992446	0.058360	-17.005	<2e-16 ***
z.diff.lag	0.004417	0.041436	0.107	0.915

Table 3 KPSS Test (IR)

	test-statistic	significance level 5%
KPSS	0.0919	0.463

The ADF Test rejected the Null Hypothesis of unit root's existence and the KPSS Test accepted the Null Hypothesis of stationarity.

To study the fixed income of private market, we chose the Interbank Deposit, which is calculated by CETIP. We extracted the data from the CETIP webpage (2016) at 05/11/2016 in the XLS format. The series starts at 01/02/2014 and ends at 04/29/2016. To measure the Interbank Deposit rate (DI), it's necessary to adjust the through the Equation (2). The file is only available in Portuguese, daily factor is fator diário in the XLS file.

$$X_t = Fatordiário - 1 \qquad (2)$$

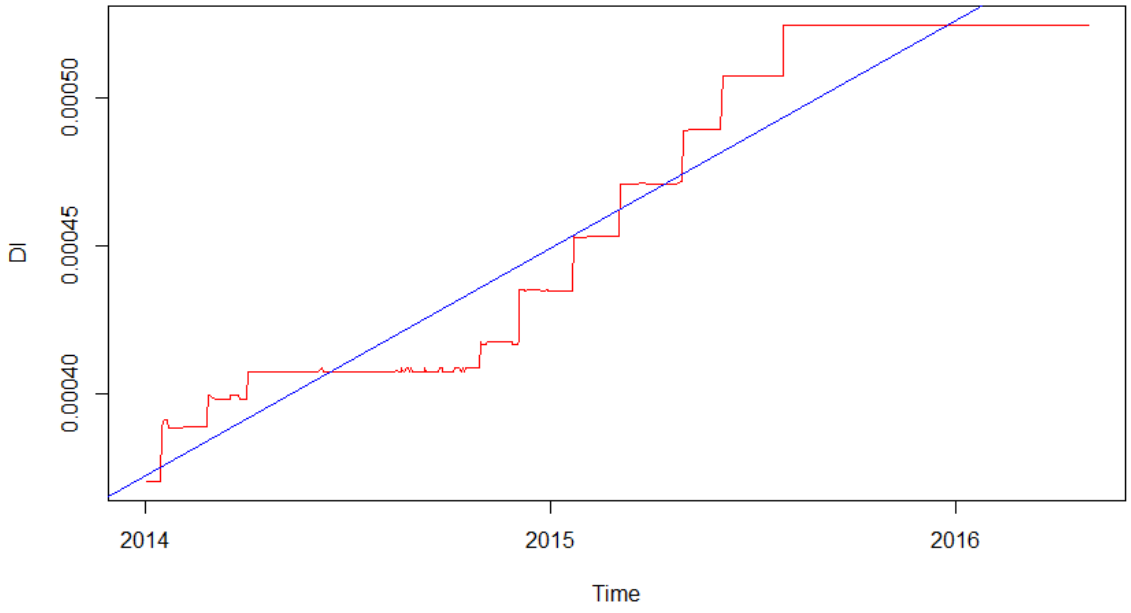

Figure 3 DI

The Figure 3 shows a deterministic trend. The Hypothesis of unit root of ADF Test was accepted and the Null Hypothesis of stationarity of KPSS Test was rejected, implying in non-stationarity. The

Table 4 and Table 5 returns the results obtained from the tests.

Table 4 ADF Test (DI)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	3.013e-06	2.154e-06	1.399	0.162
z.lag.1	-6.997e-03	5.779e-03	-1.211	0.226
Tt	1.643e-09	1.849e-09	0.888	0.375
z.diff.lag	9.374e-03	4.170e-02	0.225	0.822

Table 5 KPSS Test (DI)

	test-statistic	significance level 5%
KPSS	0.3567	0.146

We solved the unit root problem, as showed at Table 6 and Table 7, using the daily variation of the DI. The Figure 4 shows the behavior of the data.

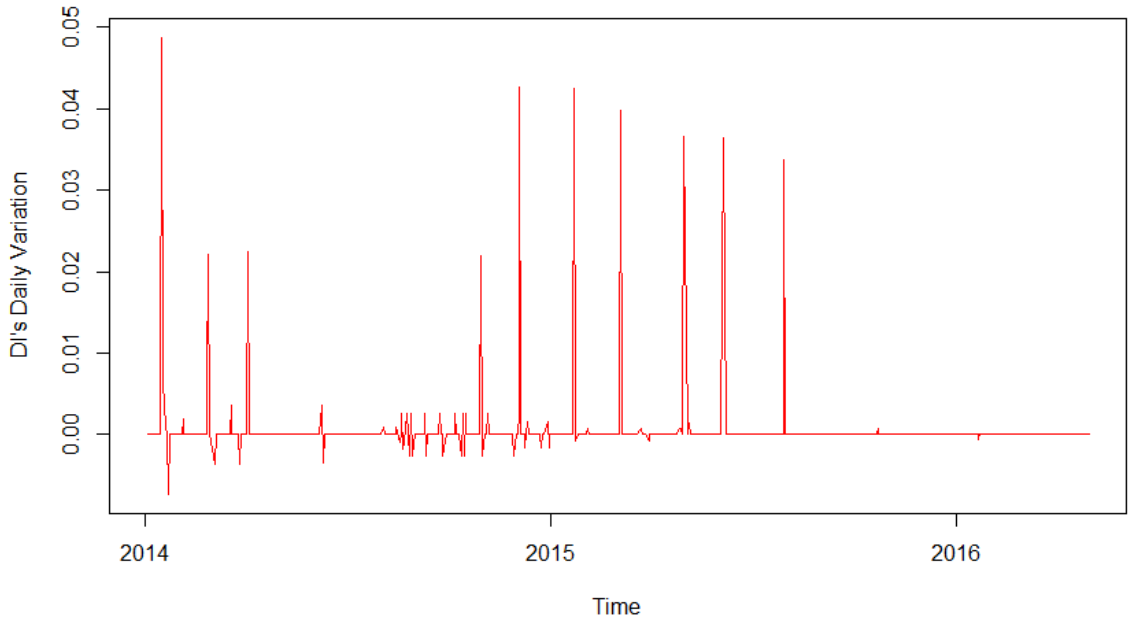

Figure 4 DI's Daily Variation

Table 6 ADF Test (DI's daily variation)

	Estimate	Std. Error	t value	Pr(>|t|)
z.lag.1	-0.967452	0.057871	-16.718	<2e-16 ***
z.diff.lag	-0.002153	0.041558	-0.052	0.959

Table 7 KPSS Test (DI's daily variation)

	test-statistic	significance level 5%
KPSS	0.3063	0.463

It's important distinct the Selic Target from the Selic Over, the real interest rate. In this paper the Selic Over is the object of study.

We collected the Selic Over sample from Brazil's Central Bank webpage (2016) at 06/30/2016 in the xls format. The series started at 01/02/2014 and ended at 04/29/2016 and was daily separated.

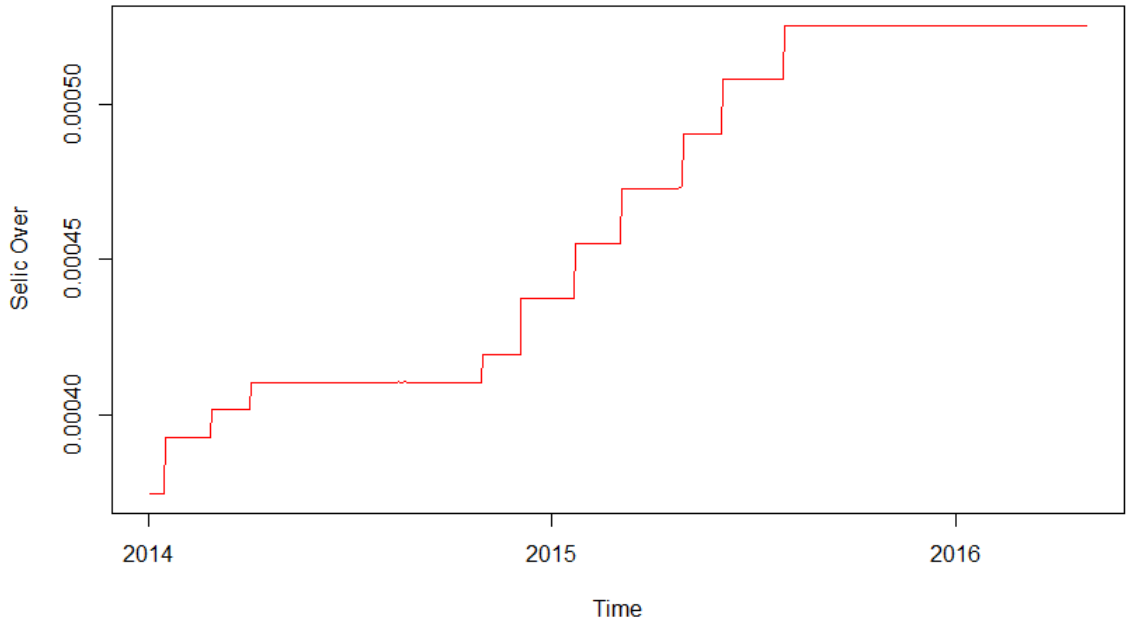

Figure 5 Selic Over

As expected, the Figure 5 shows that Selic Over is similar with DI, ahead the analysis, this similarity is explored.

The ADF Test accepted the null hypothesis, implying in existence of unit root. The evidence of non-stationarity was found at KPSS Test. The Table 8 and

Table 9 shows the results of both tests.

Table 8 ADF Test (Selic Over)

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	2.954e-06	2.177e-06	1.357	0.175
z.lag.1	-6.780e-03	5.779e-03	-1.173	0.241
Tt	1.543e-09	1.806e-09	0.854	0.393
z.diff.lag	-1.379e-02	4.170e-02	-0.331	0.741

Table 9 KPSS Test (Selic Over)

	test-statistic	significance level 5%
KPSS	0.3559	0.146

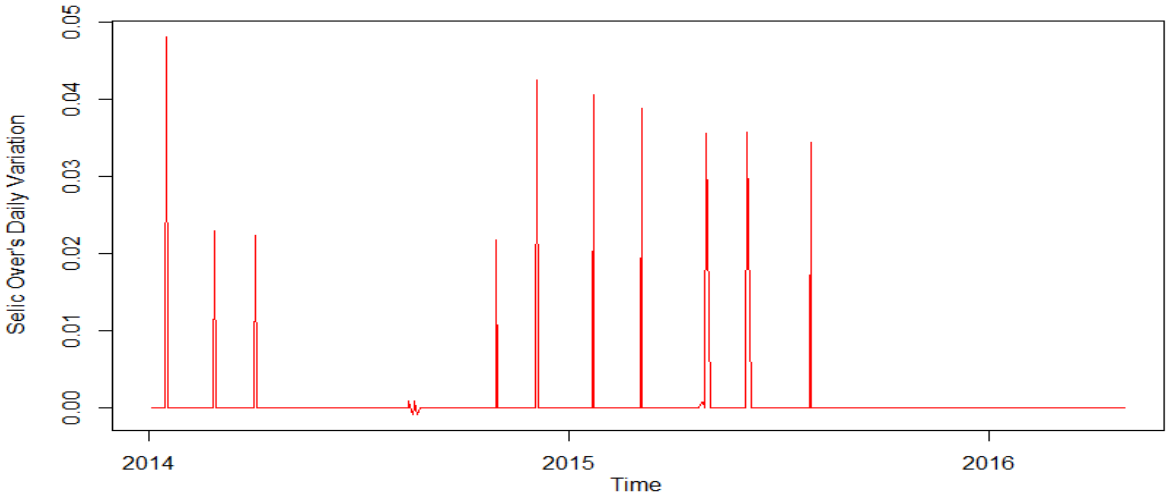

Figure 6 Selic's Daily Variation

The Figure 6 shows the behavior of the data and the Table 10 and Table 11 shows, respectively, the rejection of unit root existence and non-stationarity.

Table 10 ADF Test (Daily Variation of Selic Over)

	Estimate	Std. Error	t value	Pr(>|t|)
z.lag.1	-0.997968	0.058773	-16.980	<2e-16
z.diff.lag	-0.002048	0.041558	-0.049	0.961

Table 11 KPSS Test (Daily Variation of Selic Over)

	test-statistic	significance level 5%
KPSS	0.2963	0.463

The Table 12 contains the descriptive statistics of the five series.

Table 12 Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Max
Ibovespa	584	50,441	4,681.578	37,497	61,895

IR	584	0.000078	0.016094	-0.04988	0.063867
DI	584	0.000462	0.000054	0.00037	0.000525
Daily var. DI	583	0.000610	0.004724	-0.007368	0.048759
Selic Over	584	0.000464	0.000053	0.000375	0.000525
Daily var. Selic	583	0.000590	0.004594	-0.000876	0.048094

4.2. Methods

The study is mainly divided in two parts: Filtering the normal and abnormal volatility with GARCH (Bollerslev, 1986) considering everything above (under) the mean plus (minus) two standard deviations of the Conditional Standard Deviation (CSD) series obtained to each series as abnormal volatility. The second part is to look for political events on the days where abnormal volatility was found.

We used a parametric analysis where we defined abnormal volatility in the equations (3) and (4).

$$AbnormalVolatility > mean + 2(standarddeviation) \quad (3)$$

$$AbnormalVolatility < mean - 2(standarddeviation) \quad (4)$$

Also, we considered a non-parametric alternative where we used every point between the 5th and 95th percentile was considered normal volatility instead of equations (3) and (4).

1.1 Alternative 1 – Parametric

We applied GARCH on the returns of Ibovespa, the daily variation of DI and the daily variation of Selic. The filter procedure occurs by analyzing the Conditional Standard Deviation series extracted from GARCH.

To examine if the model is suitable, it's necessary to analyze if the residuals behave like white noise. The Ljung-Box test (Box & Pierce, 1970) and (Ljung & Box, 1978), where the Null Hypothesis is that the data are independently distributed, was used. The results of the three series are the acceptance of the Null Hypothesis, evidencing the characteristics of white noise as showed at Table 13.

Table 13 Ljung-Box Test

Data	P-value

IR Residuals from Garch	0.8099
DI's Daily Variation Residuals from Garch	0.7304
Selic Over Residuals from Garch	0.6884

We used the Shapiro-Wilk test (Shapiro & Wilk, 1965) to test normality of residuals obtained from GARCH.

Table 14 shows we rejected the null hypothesis of normality in all series.

Table 14 Shapiro-Wilk Test

Data	P-value
IR Residuals from Garc	0.0009223
DI's Daily Variation Residuals from Garch	< 2.2e-16
Selic Over Residuals from Garch	< 2.2e-16

As showed in Table 15, there is 27 periods of abnormal volatility in the returns of Ibovespa series, on contrary, there isn't periods of abnormal volatility in the daily variation of DI and daily variation of Selic.

Table 15 Conditional Standard Deviation

Data	CSD's Mean	CSD's Standard Deviation	Lower Limit	Upper Limit	Nº of Periods of abnormal volatility
CSD of IR	0.01585	0.00321	0.00944	0.022 26	27
CSD of DI's Daily Variation	0.004177	0.00030	0.00358	0.00478	0
CSD of Selic Over	0.004085	0.00028	0.00352	0.00465	0

The blue lines in Figure 7 CSD of IR (upper and lower limit) represents the upper and lower limit, the black represents the mean. There is only abnormal volatility on the upper limit, implying that there isn't abnormal stability on the Ibovespa Returns, suggesting that if political news impacted on the IR, they only produced abnormal instability.

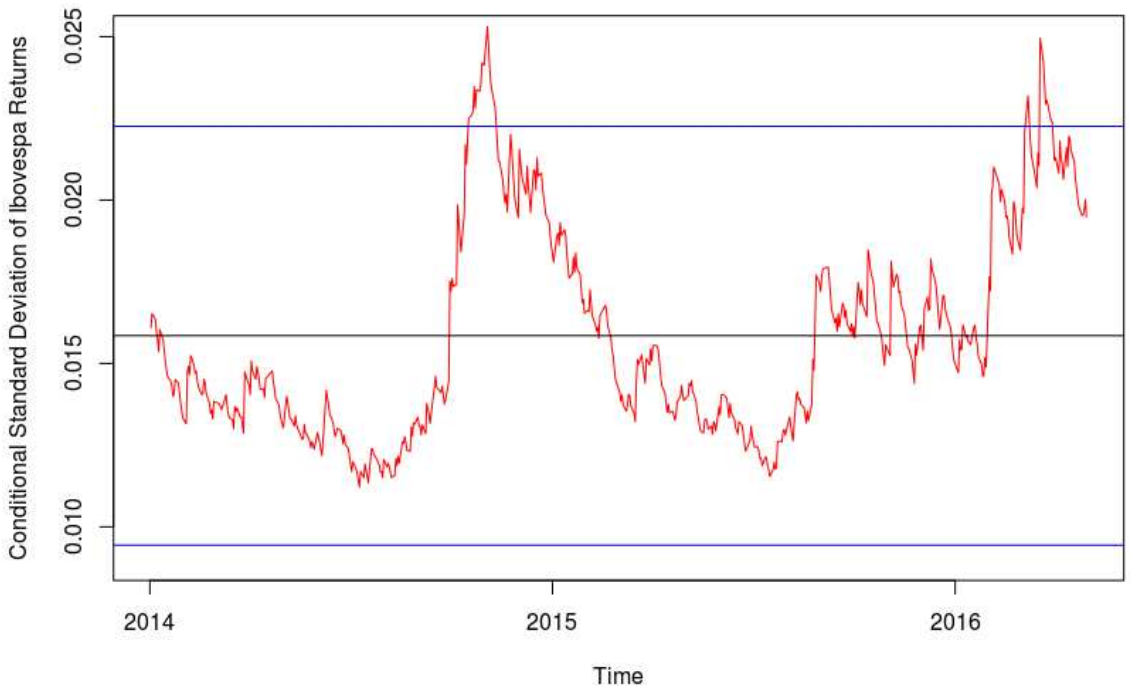

Figure 7 CSD of IR (upper and lower limit)

The lines colors in the Figure 8 follows the same scheme of the Figure 7 CSD of IR (upper and lower limit). Differently of the CSD of IR series, the CSD of DI's daily variation series doesn't shows abnormal volatility. If there isn't abnormal volatility, we can't affirm that political news impacted on the Brazilian's fixed income.

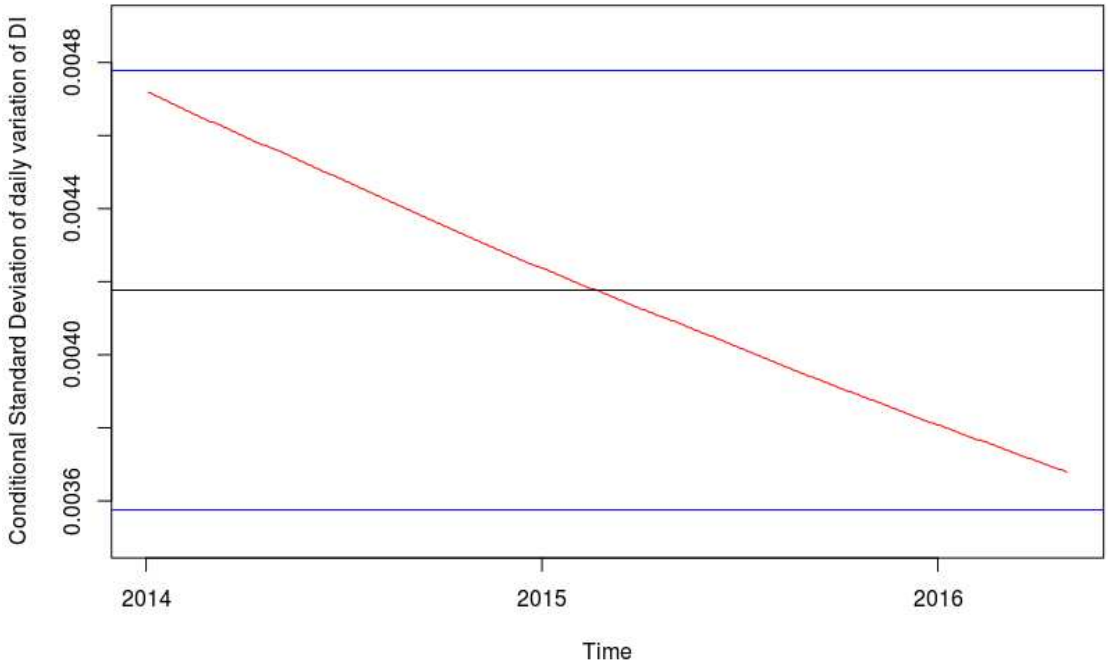

Figure 8 CSD of DI's daily variation (upper and lower limit)

The CSD of Selic Over has a notable similarity with the CSD of DI as showed at Figure 9. There isn't abnormal volatility, thus, political news doesn't impact the Selic Over and, consequently, also doesn't impact the DI. To corroborate this argument, the correlation between the series and the Engle-Granger two-step method (Engle & Granger, 1987) was applied to test if they are cointegrated.

The correlation was extremely high once the result was 0.99. The residuals series of the linear regressions of DI as dependent variable and Selic Over as explanatory variable doesn't have unit root implying through the Engle-Granger two-step method that the series are cointegrated. The Table 16 and Table 17 show the results of ADF and KPSS test, respectively.

Table 16 – ADF Test (Residuals of Regression)

	Estimate	Std. Error	t value	Pr(>|t|)
z.lag.1	-0.20155	0.02762	-7.298	9.68e-13 ***
z.diff.lag	-0.10902	0.04121	-2.645	0.00838 **

Table 17 – KPSS Teste (Residuals of Regressions)

	test-statistic	significance level 5%
KPSS	0.2633	0.463

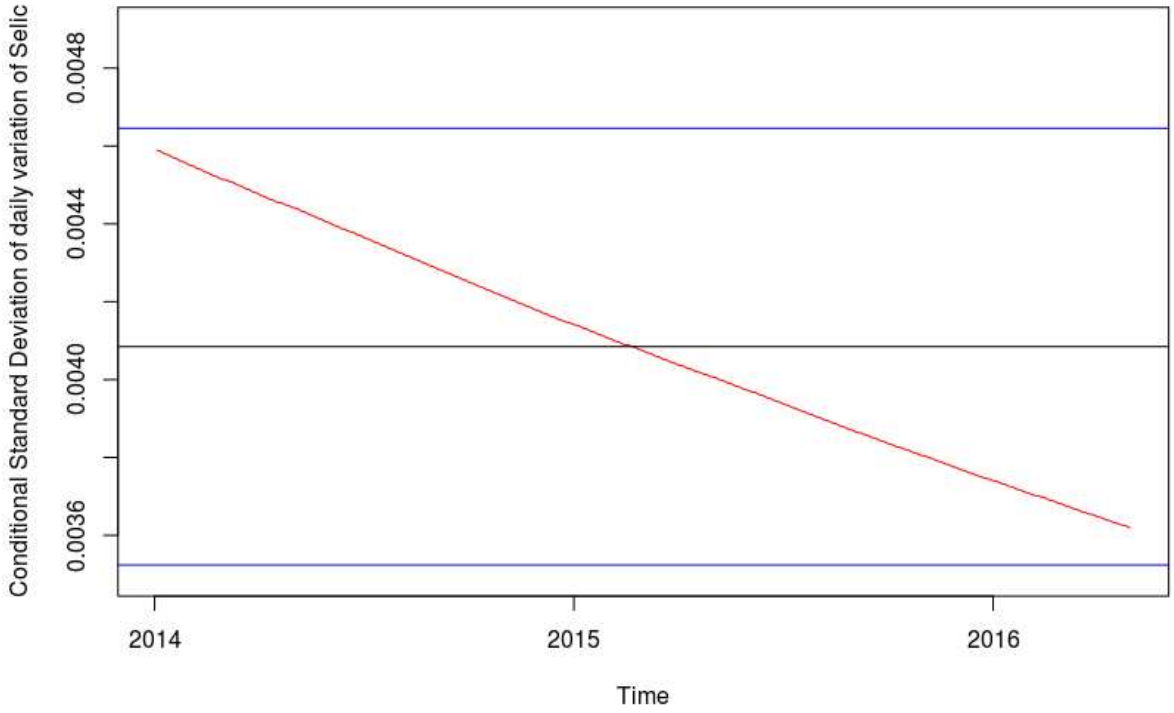

Figure 9 CSD of Selic's daily variation (upper and lower limit)

1.2 Alternative 2 – Non-parametric

A non-parametric technique is to work with de critical points of the conditional standard deviation of the series. Examining the percentiles of the series, it is possible to points with normal and abnormal volatility. In this study, was decided to use the 5th and the 95th percentiles of the three series to consider everything bellow the 5th percentile and everything above the 95th percentile an abnormal volatility. The Table 18 shows the values of the percentiles mentioned on this paragraph. The abnormal volatility of DI and Selic happened on the same days, the Ibovespa returns has a different behavior.

Table 18 – Percentiles of Conditional Standard Deviation

Data	5%	95%	Nº of periods with abnormal volatility
garch_ret_csd	0.01194074	0.02194739	60
garch_di_csd	0.003724591	0.004659724	60
garch_seli_csd	0.003662363	0.004659724	60

Differently of the Alternative 1, in this case abnormal volatility was found on the upper and lower limits, indicating that, even though instability found previously, exists abnormal stability on IR too. The Figure 10 shows the CSD of IR and their limits. The black line represents the mean of the series and the blue lines represents the upper (95th percentile) and lower (5th percentile) limits.

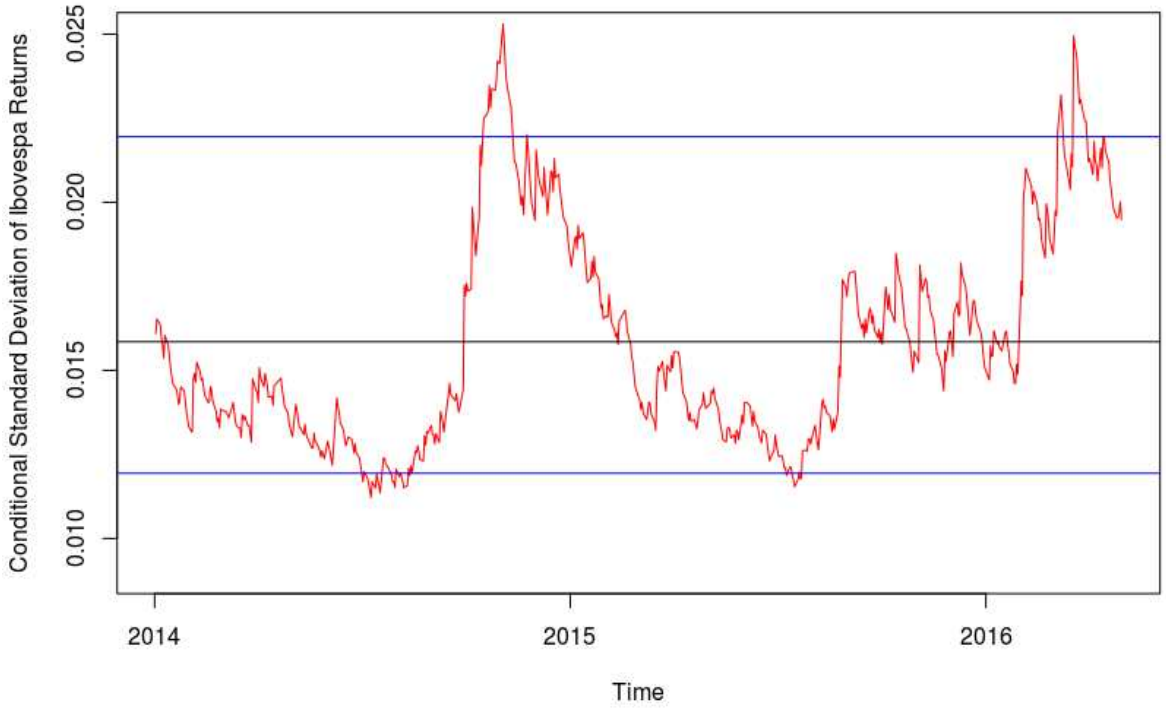

Figure 10 CSD of IR (5th and 9th percentile limit)

The CSD of DI's Daily Variation, using the percentile method, returns periods of high and low volatility. The Figure 11 shows this behavior.

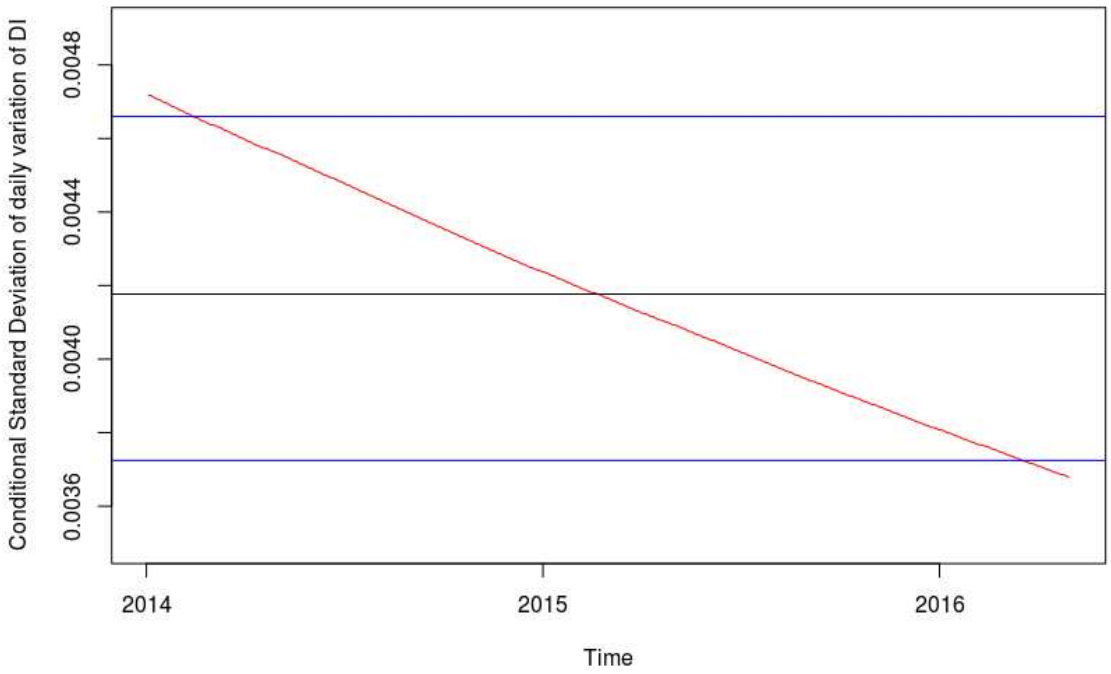

Figure 11 CSD of DI's Daily Variation (5th and 9th percentile limit)

The periods of abnormal volatility of the Selic series using the percentile method are the same of the DI. The Figure 12 evidences this similarity.

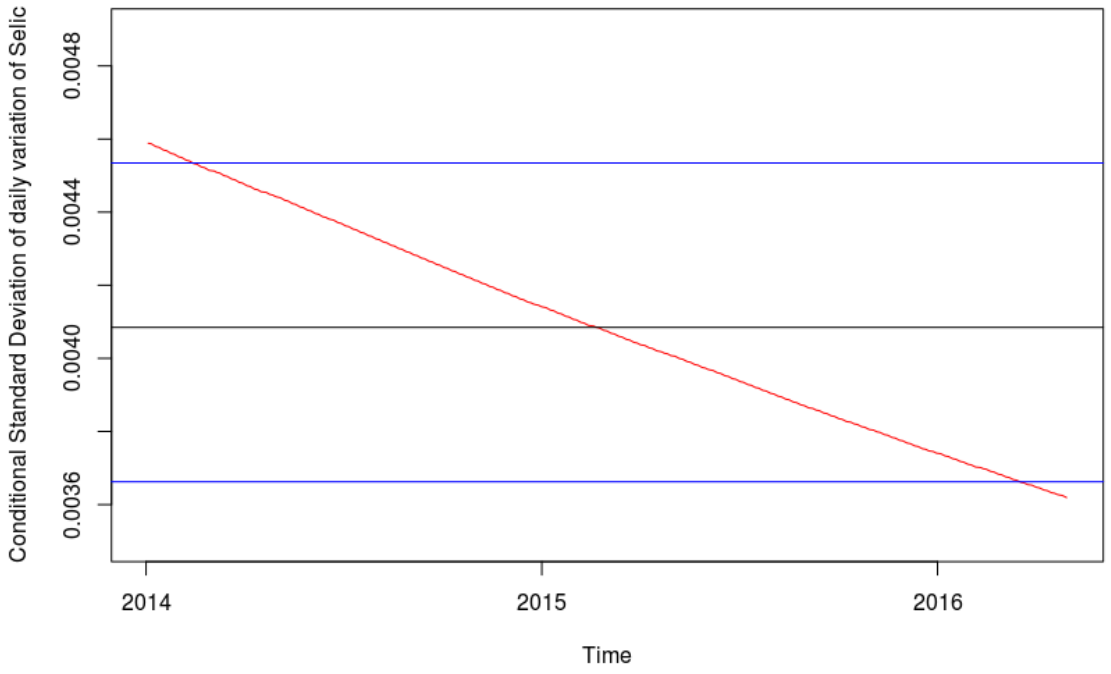

Figure 12 CSD of Selic's Daily Variation (5th and 9th percentile limit)

The Figure 13 shows the histogram of CSD of IR

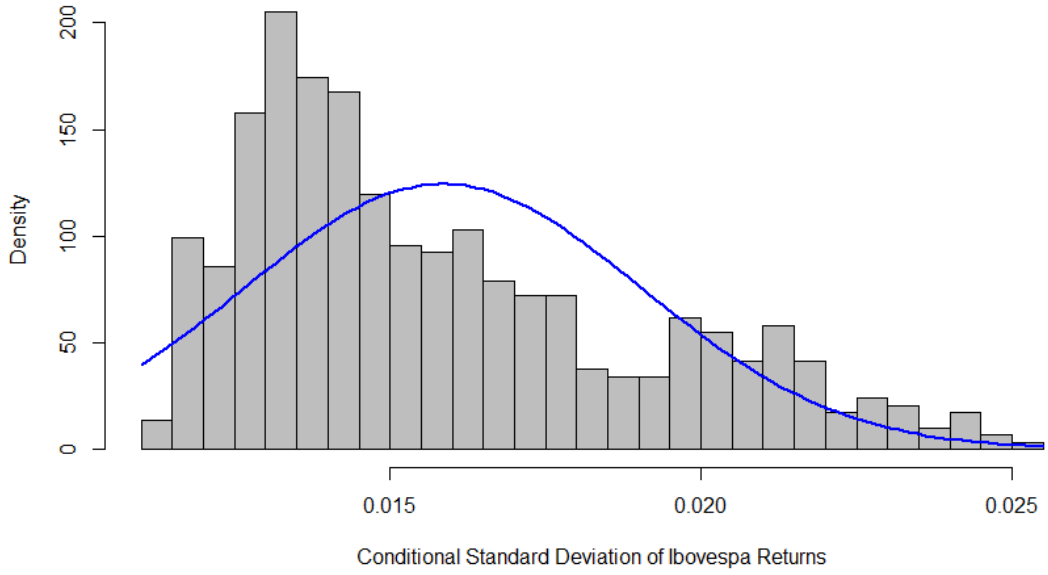

Figure 13 Histogram of CSD of IR

The Figure 14 shows the histogram of CSD of DI's Daily Variation

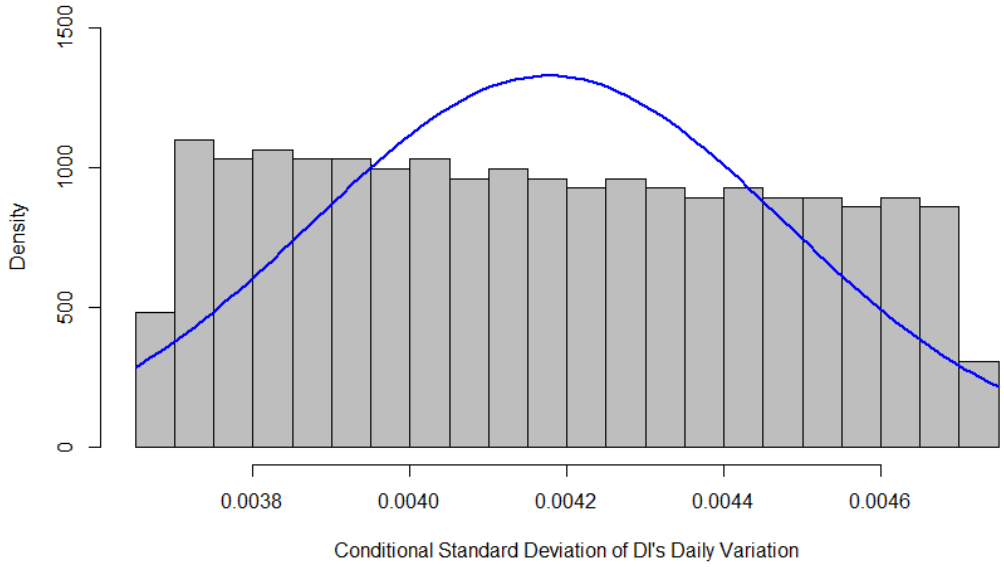

Figure 14 Histogram of CSD of DI's Daily Variation

The Figure 15 shows the histogram of CSD of Selic's daily variation.

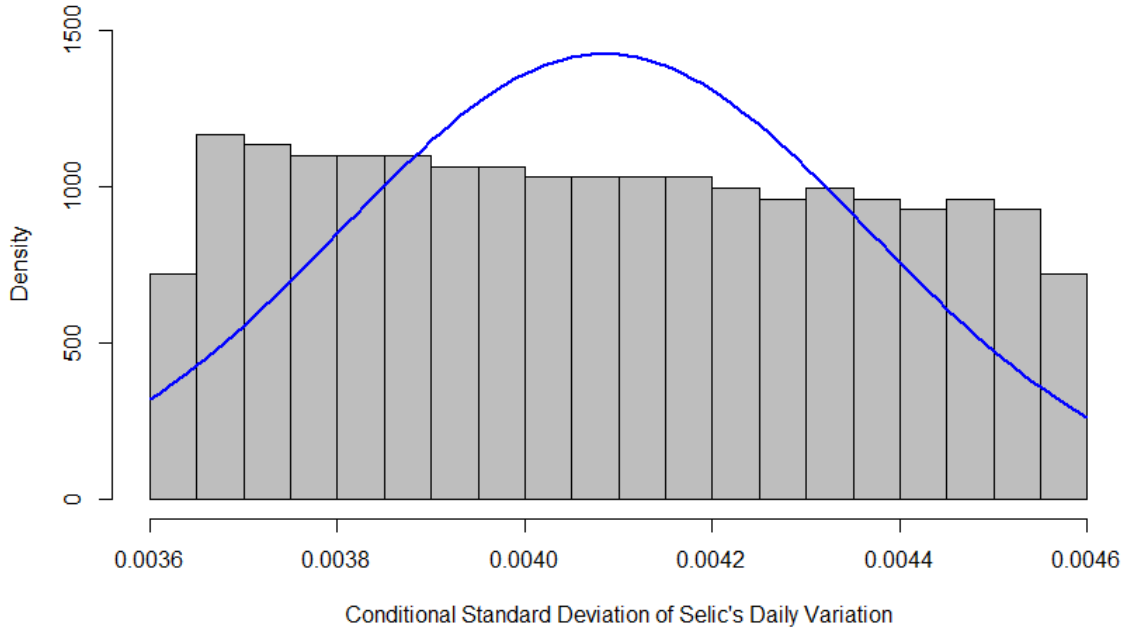

Figure 15 Histogram of CSD of Selic's Daily Variation

5. Results and Discussion

The results obtained using the parametric approach leaded to similar conclusions of Smales (2015), that is, when agents don't know who is going to win the elections, the market volatility increases. The political events we founded were crossed with the 27 periods of abnormal volatility. As we can see in Table 19, results showed evidences the uncertainty of the presidential elections occurred simultaneously with the abnormal volatility observed on the Ibovespa Returns.

Table 19 – IR's abnormal returns associated with political events – Parametric Approach

Period	Week Day	Event
10/17/2014 – 10/24/2014	-	Week before the elections
10/26/2014	Monday	Ms. Rousseff's Reelection
10/27/2014 – 10/31/2014	Tuesday	Week after the elections

The conclusions of Baker, Bloom and Davis (2012) are also aligned with the results of this study. The actions of policy-makers took and their statements are impacting directly on the stock market. Accordingly, it seems Ms. Rousseff's statements during campaign have caused the uncertainty we saw at the end of her first term.

Different from United States, where the Federal Reserve reacts to abnormal volatility on the stock market reducing the interest rates and ignoring the inflation (Jovanovic & Zimmermann, 2008), in Brazil inflation targeting system focus only on inflation rate and, therefore, doesn't allow to react to financial market events.

There is no evidence of abnormal volatility on the Selic Over series. That is extremely reasonable because government uses short-term federal bond markets to aim Selic target as a result of inflation targeting monetary policy adopted. Consequently, the possibility of reacting to political events should not be observed.

The DI series had the same results of the Selic Over, that is also expected because they cointegrate. Political events also cannot impact on this series for the same reasons that they cannot on the Selic Over series.

The non-parametric approach also leaded to similar results. The number of abnormal periods obtained to IR is 60 and the presidential election matched with the abnormal volatility periods. Now, one more political event was noticed, that is the death of Mr. Campos, a presidential candidate, one of the three candidates with more voting intentions. The results are showed at Table 20.

Table 20 – IR's abnormal returns associated with political events – Non-parametric Approach

Period	Week Day	Event
8/13/2014	Wednesday	Brazil presidential candidate Campos dies in air crash
10/17/2014 - 10/24/2014	-	Week before presidential election
10/26/2014	Sunday	Ms. Rousseff's Reelection
10/27/2014 - 10/31/2014	-	Week after the presidential election

Since as we had already noticed Selic wasn't managed taking into account political events, it is expected to see the abnormal points obtained from the non-parametric approach on the extremes of our sample doesn't mean anything at all.

As showed at Table 19 and Table 20, the parametric and non-parametric methods, respectively, returned periods which only can be associated with the presidential elections, bringing conclusions that only an event with this proportion can cause abnormal stress on the market. Events like politicians being arrested, corruptions scandals and things like that, although it might seem important, don't actually impact on the returns.

Therefore, our results point to the acceptance of the semi-strong efficient market hypothesis.

6. Concluding Remarks

This paper has the objective of associate the political events to the financial market through the Ibovespa Returns, the DI rate and the Selic Over Rate. Two methods are used: the parametric, which uses Garch to extract the volatility of the series, identifying the abnormal periods using the Equation (3) and the Equation (4). After this, the abnormal volatility was associated with political events that happened at the same days of stress. The non-parametric approach also used Garch to extract the volatility of the series, but used the 5^{th} and 95^{th} percentile to determine what is abnormal. Everything below the 5^{th} and everything above the 95^{th} was considered abnormal. After this selection, the political events were associated with the same rational of the parametric approach.

Both approaches concluded that only the events related with the presidential elections were relevant and could cause stress to the Ibovespa Returns. The Selic Over and DI were not impacted with political events, that could be explained with the caution of the Central Bank of Brazil in preserving the control of inflation.

Anyway, to be more confident about the result we presented we intend to make further studies collecting an wider sample of political news using web scraping technique and measuring the impact of the political news associated with abnormal volatilities through the Event Studies approach.

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