EFFECTS OF CONDITIONAL CONSERVATISM DUE TO ECONOMIC CRISIS ON THE INVESTIMENT OF BRAZILIAN PUBLIC FIRMS

JAILSON MANOEL SILVA DUARTE
*Universidade Federal da Paraíba. **Address:** Campus I | Loteamento Cidade Universitária | João Pessoa/PB | Brazil.*
http://orcid.org/0000-0002-3443-3248
jailsonduarte@hotmail.com

LAURO VINICIO DE ALMEIDA LIMA
*Universidade Federal da Paraíba. **Address:** Campus I | Loteamento Cidade Universitária | João Pessoa/PB | Brazil.*
http://orcid.org/0000-0001-5474-5655
lvinicio2@gmail.com

EDILSON PAULO
*Universidade Federal do Rio Grande do Sul. **Address:** Avenida Paulo Gama, n.110 | Farroupilha | Porto Alegre/RS | Brazil.*
http://orcid.org/0000-0003-4856-9039
e.paulo@uol.com.br

RENATO HENRIQUE GURGEL MOTA
*Universidade Federal Rural do Semi-Árido. **Address:** Avenida Francisco Mota, n. 572 | Bairro Costa e Silva | Mossoró/RN | Brazil.*
http://orcid.org/0000-0001-8439-7540
renatohenriq@gmail.com

ABSTRACT

This research aimed to identify the influence of accounting conservatism on the level of investments by traded companies due to the Brazilian economic crisis of 2014-2017. The research was based on an empirical analysis through the collection of information on non-financial public firms, listed in Brazil, Bolsa, Balcão (B^3), during the period of 2010 to 2018. Basu model was adjusted to measure the effect of the Brazilian economic crisis on the conditional conservatism of firms. Then, using that model, the influence of the companies' accounting conservatism level on investments in Property, Plant, and Equipment (PP&E) was verified. The results indicate that in periods of local economic crisis, companies anticipate future losses by increasing the level of conservatism. This behavior, however, was not able to mitigate the effects of the crisis that negatively influenced the level of investments in PP&E made by Brazilian companies. In addition, it has been observed that more conservative companies significantly reduce their investments in crisis times. These findings become relevant to investors as they may consider more conservative behavior in firms' future investments. It is also worth mentioning that the results of the research can help government policies in the sense that public managers seek actions that enable companies to invest, minimizing the negative effects of the crisis and allowing faster economic growth.

Keywords: Brazilian Economic Crisis. Accounting Conservatism. Investments.

Jailson Manoel Silva Duarte, Lauro Vinicio de Almeida Lima, Edilson Paulo, Renato Henrique Gurgel Mota

1 INTRODUCTION

The US financial system crisis in 2008 has triggered a series of studies attempting to understand its impact on the level of investment by companies. This period represented an unexpected negative shock in the external financing supply, significantly reducing companies' ability to make new investments (Duchin, Ozbas & Sensoy, 2010). This fact can also be explained by companies with financial restrictions that, faced with access to credit difficulties, reduced capital expenditures more intensely in this period (Campello, Graham & Harvey, 2010).

According to Duchin *et al*. (2010), financial or economic crises directly affect companies' levels of investment. The authors have shown that corporate investment significantly declines after the onset of crises; also, decline is most observed in companies that have the following characteristics: (a) low cash reserve; (b) high net short-term debt and (c) companies with financial restrictions or operating in sectors dependent on external financing. Also according to Duchin *et al*. (2010), this investment reduction is strongly explained by the change in investment opportunities in this period.

Previous research such as that by Biddle, Hilary and Verdi (2009) has demonstrated that the quality of accounting information is related to investments efficiency – that is, companies with higher quality financial reporting are less likely to deviate from their expected level of investment. The authors have found a significant relationship between the quality of accounting information and the level of investments since the reduction of informational asymmetry can mitigate problems of adverse selection and moral hazard that make it difficult to make investments efficiently.

One of the measures of the accounting information quality is accounting conservatism, described by Basu (1997) as accounting major tendency to recognize "bad news" in companies' results faster than "good news" – for example, unrealized losses are usually recognized earlier than unrealized gains. Also according to the author, this asymmetric recognition between good and bad news causes systematic differences in the persistence of profits, damaging future profits predictability.

This relationship between the level of accounting conservatism and investments has also been studied by Lara, Osma and Penalva (2016) who have found a negative association in it – that is, the more conservative companies were more prudent in developing projects and obtaining debts when inserted in a more unfavorable economic environment to investment, such as a period of economic crisis.

Under the assumption that the financial crisis of 2007–2008 was a favorable external factor for companies to reduce the level of investment of their projects, Balakrishnan, Watts and Zuo (2016) have verified the effect of accounting conservatism on the level of companies' investments in this period. The authors have found evidence that companies considered more conservative have undergone smaller reductions in their activities investment levels when compared to those with lower conservative behaviors. In addition, the effect of conservatism on investment was stronger for companies that had financial difficulties or greater external financing needs. Balakrishnan *et al*. (2016) went on from the assumption that the classification of companies by their level of conservatism *ex ante* the period of financial crisis in which the company is inserted helps to explain the magnitude of the investment decline *ex post*.

Considering that information on companies' financial statements is relevant to capital market and credit market agents, it can be expected that in adverse situations such as periods of economic crisis companies tend to be more cautious and not have convenient scenarios to invest more intensely in their projects.

Thus, it is believed that effects of negative macroeconomic indicators signaling a period of economic crisis are incorporated by corporate accounting in an attempt to dilute negative results that would be absorbed in future periods by anticipating the recognition of future losses. Under this perception, it is believed that the impact of economic crises on the level of corporate investments is less pronounced in those with more conservative accounting figures.

In this context, the Brazilian economy has gone through a period of strong downturn (2014-2017) for since 2014 the country has been presenting several indicators of a period of economic crisis. And Brazilian government Institute of Applied Economic Research (IPEA, in the Portuguese abbreviation) (2016) has estimated a reduction in Brazil's economic activity in the coming years and consequent reduction of investments by economic agents in view of reductions in the country's gross domestic product (GDP) and rising inflation rates.

From these considerations, it is believed that findings by Balakrishnan *et al.* (2016) are observable not only when economic crises of global dimensions arise as in 2008 but also in times of crisis of a local nature, specific in a single country, as is the case in Brazil. In view of the above, the following research problem is presented: *What is the effect of accounting conservatism on the level of capital goods investments in Brazilian publicly held corporations during the economic crisis in Brazil between 2014 and 2017?*

This paper aims to analyze the effect of accounting conservatism on the level of investment by companies listed in the Brazilian Stock Exchange B3 [(in full, B3 – Brasil Bolsa Balcão S.A. (B^3) Brazil, Stock Exchange and Over-the-Counter Market), formerly BM&FBOVESPA] due to the Brazilian economic crisis between 2014 and 2017. Thus, it was assessed whether the degree of capital investment has been impacted as companies anticipated the recognition of these events in their financial statements – that is, if companies with higher levels of conservatism have carried out smaller reductions in investments than those considered less conservative.

Carrying out this study broadens discussions raised by Balakrishnan *et al.* (2016) on the relationship between macroeconomic factors and accounting information disclosed by companies, particularly regarding their level of conservatism. It also seeks to reveal accounting conservatism effects on corporate investments in times of economic crises.

Therefore, the research contributes to verify, by means of an empirical study, what the behavior of the relationship between accounting conservatism and companies' level of investment in a period of economic crisis is, considering, especially in this study, analysis in a market with considerably different characteristics from those observed in previous studies (Balakrishnan *et al.*, 2016; Lara *et al.*, 2016).

2 THEORETICAL FRAMEWORK

2.1 Accounting conservatism

Basu (1997) has characterized accounting conservatism as the tendency for accountants to require a high level of verification to recognize "good news" in financial statements more than "bad news" – that is, accountants prefer to recognize more "bad news" than "good news". Consequently, profit is more sensitive in publicly reflecting, in a timely fashion, available "bad news" than "good news".

Ball and Shivakumar (2005) segregate conservatism on conditional and unconditional. According to the authors, in an environment of hiring, the latter seems, at best, to be neutral (without bias) and possibly inefficient (if bias is unknown). On the other hand, conditional conservatism involves timely recognition of losses. Coelho (2007) complements this differentiation by justifying that unconditional conservatism recognizes, among equally valid alternatives, that which results in lower value of assets and this is valid for income/gains and expenses/losses. Conditional conservatism favors the recognition of bad news that reduces assets rather than good news.

Regarding the relationship between accounting conservatism and companies' level of investment, Ahmed and Duellman (2011) have analyzed the role of accounting conservatism in relation to monitoring managers' investment decisions in the United States' stock market,

Jailson Manoel Silva Duarte, Lauro Vinicio de Almeida Lima, Edilson Paulo, Renato Henrique Gurgel Mota

assuming that conservatism *ex ante* reduces managers' incentives for taking on negative net present value (NPV) projects and still improves *a posteriori* investments control. Thus, companies with more conservative accounting results should have greater future profitability and less susceptibility to changes in the "special items" heading. Results from this study indicate that more conservative companies have higher gross margins and higher future cash flows and have confirmed the lower probability that special items shall change in less conservative companies in the future.

Bushman, Piotroski and Smith (2011) have directly related corporate investments behavior and timely recognition of economic losses in different accounting bases. The authors have sought to identify the extent to which losses recognition can influence managers' investment decisions from the perspective that investments behavior is influenced by deterioration of their environment. In the research, the authors assume that losses recognition shall have an asymmetric impact on investments behavior so that investment decisions are influenced by opportunity decline of the latter. Results indicate that conservative companies invest more and emit more debt in environments prone to lack of investments and that these effects are more observed in companies characterized by higher levels of information asymmetry. The authors also confirm that conservatism is associated with reduced investment even for those in research and development.

Lara *et al.* (2016) argue that conservatism improves investment efficiency. Thus, they believe that conservatism solves the debt-own capital conflict by facilitating companies' access to debt financing and limiting underinvestment, i.e., projects with negative NPV, allowing the financing of prudent investments that could not be pursued in any other way.

Biddle and Hilary (2006) have examined how accounting information quality is related to companies' capital investment efficiency level. The authors have considered several accounting quality measures derived from previous research and two different methods to estimate the sensitivity of investment cash flows under the assumption that accounting numbers quality strengthens investment efficiency and reduces informational asymmetry between managers and investors. The study assumes that there is a strong relationship between accounting information and capital investment efficiency in countries with a predominance of own capital financing. Results confirm the argument that accounting is an institutional feature available for policy decisions that increase investment efficiency, mitigating investment flow sensitivity and that this effect is most pronounced in situations where capital is provided by means of independent transactions.

2.2 The Brazilian economy

According to Giambiagi (2011), since the 1990s the Brazilian economy has undergone important changes such as an increase in the degree of commercial and financial openness, greater companies' competitiveness, increased number of public sector privatizations and increased attention to inflation rates as well as the adoption of severe fiscal adjustment measures. According to the author, such measures constitute steps in the process of transforming an economy towards a situation of greater competition with other countries' companies and involve the objective of having solid fiscal indicators, low inflation rates and relatively stable economic policy rules.

Already in the first decades of the 2000s significant controversies have been registered about the Brazilian economic performance (Lopes, 2018). On the one hand, arguments that point to high growth rates in this period (Novy, 2009) and for the consolidation of the process of economic stabilization and social progress stand out (Giambiagi, 2011). On the other hand, it is also seen as a period of reduction of the average real growth rate of central government investments and of real GDP growth (Paulani, 2017). It would therefore be premature to state that the country has undergone a process of resuming development and a new economic phase despite visible signs of resuming growth and good macroeconomic fundamentals (Fonseca, Cunha, & Bichara, 2013).

According to the Brazilian Institute of Geography and Statistics (IBGE, in the Brazilian Portuguese abbreviation) (2016), the country's GDP has shown some positive change in the last

quarter of 2013 and has ended the year with an increase of 2.3% over 2012. This positive result was also influenced by the investment rate, which was slightly above that observed in the previous year, reaching the mark of 18.4% of the GDP.

In this period, inflation indicators, although not within the targets established by the government, have presented tolerable results. The Brazilian National Index of Broad Consumer Prices (IPCA, in the Brazilian Portuguese abbreviation) has ended in 2013 at 5.91%, slightly higher than the previous year, due to the monthly variation of 0.92% in December compared to November of that year. Thus, in terms of inflation rates, the Brazilian economy would already be showing signs of negative variation in the following periods.

When looking at the IPCA in the following quarter, it is clear that these signs were already beginning to become more pronounced. Thus, at the end of the first quarter of 2014, the IPCA increased by 2.18%, above the 1.94% rate of the same period in 2013. Considering the last twelve months, the index was 6.15%, above the 5.68% relative to the previous twelve months. The accumulated IPCA in 2014 ended up at 6.41%, up from 5.91% in the previous year.

Following this downward trend in the country's economic indicators, the GDP of 2014 has presented a negative variation of 0.2% in the last quarter of the year. As a result, GDP at the end of 2014 was practically stable compared to 2013 (+ 0.1%). However, to confirm the idea that 2015 was marked by a period of economic crisis in the country, the value of GDP in the last quarter, in comparison with the same period of 2014, had a decrease of 5.9%, ending the year with a decline of 3.8% in relation to 2014 (IBGE, 2016).

In view of these indicators, it can be seen that there were changes in the country's economic activity level, leading the local scenario to a period of recession that lasted until 2017, when the Brazilian GDP grew by about 1% after the retraction but without recovering the losses due to the economic crisis and returning to the level found in 2011 (Barbosa Filho, 2017).

In view of the economic crisis in Brazil during 2014 and 2017, it is possible that companies have retracted their investments due to insecurity regarding economic returns on invested capital. Likewise, accounting conservatism, tending to anticipate bad news, could soften crises effects on corporate capital goods investments. Thus, based on the study by Balakrishnan *et al*. (2016), in this context of economic deceleration, it is believed that companies that anticipated in their financial statements this tendency of retraction by adopting a more conservative stance have intensely felt the impacts on the level of their operations investments.

3 METHODOLOGICAL PROCEDURES

3.1 Methodology and sample

This research is an empirical study of a descriptive nature with companies participating in the Brazilian capital market. To make up the sample, nonfinancial companies that traded shares at B[3] from 2010 to 2018 were chosen. Data were collected at Economatica® (2008) database. The study has not analyzed financial companies since they have a very specific capital structure and, when compared with others, could bias the results. Thus, initially 276 companies have been used. However, those whose share price information was not available, either because it was not included in the database or because they had not negotiated on the date of data collection, were excluded. Table 1 shows the sample distribution by sector.

Table 1
Sample distribution by sector

Sector	Quantity	Sector	Quantity
Industrial Goods	40	Health	13
Cyclical Consumption	65	Information Technology	5

Jailson Manoel Silva Duarte, Lauro Vinicio de Almeida Lima, Edilson Paulo, Renato Henrique Gurgel Mota

Non-cyclical Consumption	18	Telecommunications	4
Basic Materials	24	Public Utility	39
Oil, Gas and Biofuels	9		
TOTAL		**217**	

Source: Prepared by the authors (2019).

This research sample consisted of nine sectors, according to B^3 classification. Of particular note are the cyclical consumption sectors, with 65 companies, and industrial goods, with 40. In all, 217 companies listed at B^3 were part of the study.

3.2 Effect of economic crises on conservatism

Companies' conditional conservatism measurement was carried out based on the original model proposed by Basu (1997). Afterwards, the model was adjusted to verify the effect of the Brazilian economic crisis between 2014 and 2017, using the results verified to test the research hypothesis.

Basu's (1997) original model equation is described as follows:

$$\frac{X_{it}}{P_{it-1}} = \alpha_0 + \alpha_1 D_{it} + \alpha_2 R_{it} + \alpha_3 R_{it} D_{it} + \varepsilon \quad \text{Equation (1)}$$

where:
X_{it} is the earnings per share of companies i in the year t;
P_{it-1} is the price per share at the beginning of the year;
R_{it} is company's return i in the year t by the logarithm of P_{it}/P_{it-1};
D_{it} is a *dummy* variable which takes on value 1 where $R_{it} < 0$ and 0 for other situations.

From the Equation (1), the econometric model used in this research was developed to verify the relationship between conditional conservatism of companies listed at B^3 and the Brazilian economic crisis of 2014-2017. Therefore, the model used can be described as follows:

$$\frac{X_{it}}{P_{it-1}} = \alpha_0 + \alpha_1 D_{it} + \alpha_2 R_{it} + \alpha_3 R_{it} D_{it} + \alpha_4 CRISE_{it} + \alpha_5 CRISE_{it} R_{it} D_{it} + \varepsilon \quad \text{Equation (2)}$$

where:
X_{it} is the earnings per share of companies i in the year t;
P_{it-1} It is the average price per share in April since in Brazil accounting information for the previous year is presented until March 31 of the following year, having an effect on the real estate market in April;
R_{it} is the company's return i in the year t calculated by the logarithm of P_{it}/P_{it-1};
D_{it} is a *dummy* variable that takes on value 1 where $R_{it} < 0$ and $R_{it} < 0$, and 0 for the other situations;
CRISIS is a *dummy* variable to which has been assigned value 1 for the years between 2014 and 2017, the time of the economic crisis that the model proposes to capture, and 0 for the other years.

Taking into consideration that economic losses asymmetric recognition indicates that profit reflects bad news in advance of good news, the proposed model underlying theory is that stock price is more important than accounting profit because it reflects information received from other sources beyond current earnings (Basu, 1997; Kothari & Sloan, 1992). Therefore it becomes evident that conservatism in accounting earnings shall be more timely and sensitive to bad news than good news. As a result, negative returns are expected to be more significant than unexpected

positive ones as conservatism increases opportunities for profit recognition in dissemination of bad news (Ball & Shivakumar, 2005; Basu, 1997).

In the proposed model, the coefficient captures the effect of good and bad news on accounting profitsα_2 . However, economic loss asymmetric recognition in relation to gains shall represent conditional conservatism, which is evidenced in the coefficients α_1 and α_3 it is expected that these are statistically significant and that the relation of the former is negative and that of the second one, positive. Likewise, it is expected that the coefficient shows a positive and statistically significant relationship, evidencing the effect of the Brazilian economic crisis between 2014 and 2017 on Brazilian companies' unconditional conservatism in case of an increase in their level due to the crisisα_5.

3.3 Effect of conservatism on the level of investments

In order to investigate the effect of accounting conservatism on the level of companies' investment in periods of economic crises, the methodology developed by Balakrishnan *et al* has been adapted (2016). Thus, a regression model has been adopted using a comparative structure of the investment level before and during the crisis period. Thus he examines whether a pre-crisis conservatism rating makes the company more robust in its business development so as to suffer less from effects of crises on its level of investments.

The econometric model used follows the following specification:

$$INVEST_{it} = \alpha_i + \beta_1 CRISE_{it} + \beta_2 CONSV_{it-1} + \beta_3 CRISE_{it} \times CONSV_{it-1} + \beta_4 X_{it} + \varepsilon_{it}$$
Equation (3)

where:
$INVEST_{it}$ are the investment and capital expenditure incurred by an enterprise *i* in the year *t* (with data from 2010 to 2018) divided by total assets;
$CRISE_{it}$ is a *dummy* variable to which has been assigned value 1 for the years between 2014 and 2017 and 0 for the other years;
$CONSV_i$ is the accounting conservatism captured by the *a₃* coefficient of Basu's (1997) model Equation (1), estimated by company between 2010 and 2018;
X_{it} is a control variable – in this case, Tobin's q was used.

According to an understanding by Balakrishnan *et al*. (2016), β_1 captures the crisis impact on the level of investments; a negative and significant coefficient is expected, indicating the existence of difficulties for implementing investments. β_2 captures the effect of accounting conservatism on capital goods investment and β_3 is the coefficient of interest that captures the moderating effect of conservatism on economic crises – for this one, a significantly positive value is expected, suggesting that conservatism would soften the negative impact of crises on the level of investments. With this, this hypothesis is established:

H1: Accounting conservatism softens negative effects of economic crises on Brazilian companies' capital goods investments.

The data used in the research have been processed on a panel data set presented in two dimensions: *cross-section* and time series for the years 2010 to 2018. At this point, the panel data has allowed to study influences of explanatory variables on the dependent variable in a set of observations and over time (Greene, 2003).

For analysis of panel data, tests by Chow, Hausman and Breusch-Pagan have been carried out for definition of which is the best estimation model for the sample data – *pooled*, fixed effects or random effects (Gujarati, 2006). In addition, Wooldridge e Wald tests have been carried out, modified for panel data in order to observe autocorrelation and heteroscedasticity, respectively.

Jailson Manoel Silva Duarte, Lauro Vinicio de Almeida Lima, Edilson Paulo, Renato Henrique Gurgel Mota

4 PRESENTATION AND ANALYSIS OF RESULTS

4.1 Descriptive Statistics

Table 2 shows the descriptive statistics of the variables of interest and control used in the research and relate to the sample containing 217 companies and totaling 1,734 observations.

Table 2
Descriptive statistics of the variables used in the model from 2010 to 2018

Variables	Average	Standard deviation	Minimum	Maximum
X/P	− 0.6162	2.8979	− 21.2862	1.3852
R	− 0.0045	0.1368	− 3.0374	6.3452
INVEST	0.0459	0.0994	− 0.8438	2.7899
Q OF TOBIN	1.3634	3.8709	− 0.4038	71.0238

Note. X/P is the earnings per share divided by the average price of the share in the previous period; R is the company's return i in the year t calculated with the logarithm of P_{it}/P_{it-1}; $INVEST_{i,t}$ is the company's capital investment i in the year t divided by total assets, $DR_{it} < 0$.
Source: Prepared by the authors (2019).

The result of the division index between earnings per share and average share price in the sample was, on average, − 0.6162 while the return variable (R) had a negative mean of 0.45%; that is, the companies used in the sample, on average, did not present a positive market performance. This average indicates possible influences from a context unfavorable to the capital market performance, that is, it shows signs of a crisis moment that has settled in the country. Investment in capital goods (INVEST) represented, on average, 4.59% of total corporate assets for the period studied.

4.2 Conservatism and economic crisis

For analysis of conservatism in the context of the economic crisis of 2014 to 2017, financial statements for financial years 2010 to 2018 were used. The average stock price related to the last day of April of the respective year and its return in the subsequent year were also used.

Thus, after testing for assumptions for regression estimation and relaxation of the data normality assumption based on the central limit theorem, its explanatory power and the significance of the variables were observed, according to Table 3.

Table 3
Regression estimation to capture the effect of crisis on conservatism

Invest	Equation (1) – Basu (1997)			Equation (2) – Basu (1997) modified		
	Coefficient	*p-value*	VIF (Variance Inflation Factor)	Coefficient	*p-value*	VIF (Variance Inflation Factor)
D	− 0.7531	0	1.03	− 0.5328	0	1.07
R	0.1236	0.056	2.09	0.0307	0.575	2.1
RD	5.8241	0.001	2.08	4.1637	0.004	2.23
CRISE	–	–	–	− 0.5774	0	1.06
CRISERD	–	–	–	18.0263	0.032	1.16
Intercepto	− 0.1979	0.001	–	0.0323	0.514	–
R² Adjusted	0.0647			0.1189		
Notes: 1734				**Companies: 217**		

Note. $\frac{X_{it}}{P_{it-1}} = \alpha_0 + \alpha_1 D_{it} + \alpha_2 R_{it} + \alpha_3 R_{it} D_{it} + \alpha_4 CRISE_{it} + \alpha_5 CRISE_{it} R_{it} D_{it} + \varepsilon$, where X/P is earnings per share divided by the average share price; R is the company's return i in the year t, calculated with the logarithm of P_{it}/P_{it-1}, $P_{it} - P_{it-1}$; D is a *dummy* variable that takes on value 1 where $R_{it} < 0$ and 0 for the other situations; CRISIS is a *dummy* variable for the fiscal years, being 1 for years 2014 to 2017, the moment of the economic crisis that the model proposes to capture and 0 for the other years; CRISERD is the variable CRISIS multiplied by the variable R and by the *dummy* D and CI (95%) is the confidence interval at 95%.
Source: Prepared by the authors (2019).

Analyzing Table 3, in Equations 1 and 2 results are found to be in line with the underlying theory according to Basu (1997) and the coefficients of variables D and RD are negative and positive, respectively, and statistically significant, suggesting that bad news was disclosed more timely by accounting than good news. In Equation 2, regarding variable CRISERD (interaction of the crisis with the return), it was significant at the confidence level of 5%. These results indicate that the Brazilian economic crisis of 2014-2017 ($\alpha_5 = 18.0263$) has influenced the conditional accounting conservatism of the sample companies, increasing its level when compared to periods without crises ($\alpha_4 = 4.1637$).

Results found in the Brazilian market are in line with the international literature (Al-Hroot, Al-Qudah, & Alkharabsha, 2017; Balakrishnan *et al.*, 2016), confirming the hypothesis of the influence of the crisis on the level of conservatism of companies listed at B[3]. Thus, the effect of this crisis period on the level of companies' investment is analyzed, considering the most conservative ones.

Thus, regressions of Equations (1) and (2) per company were estimated to obtain the coefficients, something represented by α_3 in Equation 1 for accounting conservatism and α_5 in Equation 2 for accounting conservatism as a result of the crisis. Estimated coefficients were used in Equation 3.

4.3 Conservatism and capital investment

For analysis of the effect of accounting conservatism on investment in capital goods by Brazilian companies, the most suitable model for the study was sought; the following alternatives were observed: *pooled* (restricted) model, fixed effects model (unrestricted) and random effects model. After applying the tests by Chow, Hausman and Breusch-Pagan, it was verified that the random effects model is the most adequate for the data analysis.

Regarding the analysis of the correlations among the variables in the panel data, the Wooldridge test was applied, rejecting the null hypothesis of nonexistence of autocorrelation ($Prob > F = 0.0005$). As for the data homoscedasticity analysis, the modified Wald test was applied, rejecting H_o of constant variation ($Prob > chi^2 = 0$) and therefore detecting a heteroscedastic behavior. Given this, it was necessary to estimate the regression in a robust fashion to correct the problem.

After the regression model assumptions tests, when estimating the regression described in Equation 3, regressions were established using the balanced and unbalanced panel data and it was verified that, in both cases, results were not altered and there was no decrease in the estimator efficiency. Thus, Table 4 shows regression results based on the model adopted by Balakrishnan *et al*. (2016), in an unbalanced panel to allow the increase of the number of observations of the study.

Table 4
Regression model between investment and accounting conservatism

Variables	Equation conservatism (1)			Equation conservatism (2)			
Invest	**Coefficients**	*p-value*	**VIF (Variance Inflation Factor)**	**Coefficients**	*p-value*	**VIF (Variance Inflation Factor)**	
CRISE	− 0.0181	0	1.01	− 0.0101	0	2.22	
CONSV	− 0.0081	0.1	1.72	0.0004	0.706	1.94	
CRISE_CONSV	− 0.0128	0.075	1.72	− 0.0024	0.079	3.19	
X	− 0.0005	0.105	1	− 0.0004	0.131	1	
Intercepto	0.0551	0	–	0.0533	0		
	Within	Between	Overall	Within	Between	Overall	Groups
							217

Jailson Manoel Silva Duarte, Lauro Vinicio de Almeida Lima, Edilson Paulo, Renato Henrique Gurgel Mota

R^2	0.0246	0	0.0173	0.0281	0.0004	0.0206	
	\multicolumn{3}{c}{Wald chip 2(4) = 72.79}		\multicolumn{3}{c}{Wald chip 2 (4) = 65.24}	
	\multicolumn{3}{c}{Prob > F = 0}		\multicolumn{3}{c}{Prob > F = 0}	
Tests	*Chow (F)*		*Breusch-Pagan*	*Chow (F)*		*Breusch-Pagan*	Note
	0		0	0		0	1734
	Hausman		*Wooldridge*	*Hausman*		*Wooldridge*	
	0.6537		0.0005	0.6306		0.0005	
		Wald			*Wald*		
		0			*0*		

Test result: random effects model

Note. $INVEST_{i,t} = \alpha_i + \beta_1 CRISE_{i,t} + \beta_2 CRISE_{i,t} \times CONSV_i + \beta_3 X_{i,t} + \varepsilon_{i,t} INVEST_{i,t}$ is the company's capital investment *i* in the year *t*, divided by total assets; $CRISE_{i,t}$ is a *dummy* variable for the years, being 1 for years 2014 to 2017, the moment of the economic crisis that the model proposes to capture, and 0 for the other years; $CONSV_i$ is the measure of conservatism according to the model by Basu (1997); $X_{i,t}$ is a Tobin's q control variable.
Source: Prepared by the authors (2019).

As can be seen in Table 4, the assumption that the crisis coefficient signal would be negative was confirmed by the data. Thus, following the propositions defined by Balakrishnan *et al*. (2016), the CRISIS variable with negative coefficient implies a reduction in the capacity to obtain financing in order to restrict companies' level of investments at the time of crisis. In the Brazilian market, the CRISIS variable negatively influenced investments in capital goods by 1.81%, on average, in the sample period.

The conservative accounting (CONSV) captured by Equation (1), in turn, presented a negative relation (– 0.0081) and a significant at the level of 10%. This result indicates that, on average, more conservative companies reduce their capital goods investments, corroborating the findings by Lara *et al*. (2016), who have come to the conclusion that more conservative companies are more prudent in developing projects in times of economic crises.

Still using the accounting conservatism captured by Equation (1), the interaction between conservatism and economic crisis had a negative coefficient (– 0.0128), that is, accounting conservatism moderated by economic crisis has exerted greater negative influence than accounting conservatism in other periods. This result is in dissonance with the hypothesis formulated in the research and the results found by Balakrishnan *et al*. (2016). Thus, contrary to expectations, there is an indication that, during the crisis period in Brazil, accounting conservatism has not mitigated its negative impact on investments. Therefore, results indicate that even the companies participating in the Brazilian capital market that presented greater conservatism in accounting have not managed to maintain their investments in capital goods at a time when the country was facing an economic crisis.

Moreover, using conservatism adjusted for the moment of crisis, captured by Equation (2), it is verified that the interaction between conservatism and the economic crisis presented statistical significance, at the level of 10%, negative in investment (– 0.0024). The CONSV captured by Equation (2) at the moment of crisis, only considered, has not presented a relation with statistical significance, being this the only parameter significantly divergent in relation to the first model estimates.

It should also be noted that the control variable used, Tobin's q, in both models considered, has not presented statistical and economic significance in the regression results. It should be noted that there is a controversy about the relevance of this metric in Brazil in the decision-making process in capital investments (Santos, Costa, Alberto, Gonçalves & de Faria, 2011) so that it is often necessary to estimate it by using adaptations (Kammler & Wickstrom, 2009).

In view of the results, it can be verified that also in periods of local economic crisis, the proportions of which are not of a global nature, managers' conservative behaviors have exerted an influence on the crisis effect on Brazilian companies' level of investment. However, in a sense that

is contrary to that found in the North American market. That is, in Brazil, companies with more conservative behaviors, which have greater accounting conservatism, have reduced their investments in view of the economic crisis in the 2014-2017 period.

5 FINAL CONSIDERATIONS

As presented in the research problem, analyzing the effect of accounting conservatism on the level of assets investment of companies listed at B^3 during the Brazilian economic crisis from 2014 to 2017 has been sought. The goal was to assess whether the degree of capital investment has been impacted as companies anticipated the recognition of these events in their financial statements. Consequently, verifying the effect of the level of companies' accounting conservatism in the capital goods investments has been sought.

From an empirical approach developed in two stages, the research has initially revealed statistical significance for conservatism in view of the economic crisis that lasted from 2014 to 2017. Thus, results indicate that a conservative accounting tends to include in its demonstrations the possible negative results that would arise in the near future. Therefore, it has been verified that, in fact, Brazilian companies show a tendency of greater anticipated recognition of bad news during crises.

Another finding of the work was that the 2014-2017 crisis has significantly affected the level of Brazilian companies' capital investments. This result was already expected because in times of crisis there is a reduction in the supply of resources to the financial market, negatively affecting the funding of companies to perform new investments.

Finally, as the main purpose of this research, we have tried to verify if conservative companies are less susceptible to reduction in investments in moments of crisis. Results have not confirmed this hypothesis. Therefore, there was a significant negative relation between conservatism and investments in times of crisis. Thus, evidence suggests that companies, even when anticipating future losses in their financial statements, have suffered the impacts of economic crises in Brazil on their investments.

For all of the above, the research contributes to the discussion about accounting conservatism, showing signs that, in periods of crises, companies tend to be more conservative and already include in their statements future losses diluted over the periods. However, in Brazil, companies have persisted in the impact of the crisis on capital goods investments, even though accounting conservatism has had, in advance, assimilated the losses.

These findings become relevant to investors as they may consider more conservative behaviors in companies' future investments. It should also be noted that the research results could support government policies so that public managers seek actions that enable companies' investments, minimizing crises negative effects and allowing faster economic growth.

Regarding the results achieved, we recognize the limitations imposed on this study in view of the use of only one model of conservatism. It is known that other models could be used to make the results more robust and other control variables could be used to better verify the impact on investments. Therefore, it is recommended that new research be carried out in this area, broadening the scope of this research.

REFERENCES

Al-Hroot, Y. A., Al-Qudah, L. A. M., & Alkharabsha, F. I. A. (2017). The effect of the global financial crisis on the level of accounting conservatism in commercial banks: Evidence from Jordan. *International Journal of Business and Management*, *12*(2), 151-159.

Ahmed, A. S., & Duellman, S. (2011). Evidence on the role of accounting conservatism in monitoring managers' investment decisions. *Accounting & Finance*, *51*(3), 609-633.

Jailson Manoel Silva Duarte, Lauro Vinicio de Almeida Lima, Edilson Paulo, Renato Henrique Gurgel Mota

Balakrishnan, K., Watts, R., & Zuo, L. (2016). The effect of accounting conservatism on corporate investment during the global financial crisis. *Journal of Business Finance & Accounting*, *43*(5), 513-542.

Ball, R., & Shivakumar, L. (2005). Earnings quality in UK private firms: Comparative loss recognition timeliness. *Journal of Accounting and Economics*, *39*(1), 83-128.

Barbosa Filho, F. D. H. (2017). A crise econômica de 2014/2017. *Estudos Avançados*, *31*(89), 51-60.

Basu, S. (1997). The conservatism principle and the asymmetric timeliness of earnings. *Journal of Accounting and Economics*, *24*(1), 3-37.

Biddle, G. C., & Hilary, G. (2006). Accounting quality and firm-level capital investment. *The Accounting Review*, *81*(5), 963-982.

Biddle, G. C., Hilary, G., & Verdi, R. S. (2009). How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics*, *48*(2), 112-131.

Bushman, R. M., Piotroski, J. D., & Smith, A. J. (2011). Capital allocation and timely accounting recognition of economic losses. *Journal of Business Finance & Accounting*, *38*(1-2), 1-33.

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics*, *97*(3), 470-487.

Coelho, A. C. D. (2007). *Qualidade informacional e conservadorismo nos resultados contábeis publicados no Brasil*. Tese de doutorado não publicada. Universidade de São Paulo, São Paulo, Brasil.

Duchin, R., Ozbas, O., & Sensoy, B. A. (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. *Journal of Financial Economics*, *97*(3), 418-435.

Economatica. (2008). *Manual*. S. l.: Autor. Recuperado em 27 maio, 2019, de http://economatica.com/support/manual/portugues/whnjs.htm

Fonseca, P. C. D., Cunha, A. M., & Bichara, J. D. S. (2013). O Brasil na Era Lula: Retorno ao desenvolvimentismo? *Nova Economia*, *23*(2), 403-428.

Giambiagi, F. (2011). Estabilização, reformas e desequilíbrios macroeconômicos: Os anos FHC. In F. Giambiagi (Org.), *Economia brasileira contemporânea: 1945-2010* (2a ed.). Rio de Janeiro, RJ: Elsevier.

Greene, W. (2003). *Econometric analysis* (5th ed.). New Jersey, United States: Prentice Hall.

Gujarati, D. (2006). *Econometria básica*. Rio de Janeiro, RJ: Campus-Elsevier.

Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro. (2016). *Contas nacionais trimestrais*. Recuperado em 11 dezembro, 2016, de https://servicodados.ibge.gov.br/Download/Download.ashx?http=1&u=biblioteca.ibge.gov.br/visualizacao/periodicos/2121/cnt_2013_4tri.pdf

Instituto de Pesquisa Econômica Aplicada, Brasília, DF. (2016). *Carta de conjuntura*. Recuperado em 22 novembro, 2016, de http://www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=27921&Itemid=3

Kammler, E. L., & Alves, T. W. (2009). Análise da capacidade explicativa do investimento pelo "q" de Tobin em empresas brasileiras de capital aberto. *RAE Eletrônica*, *8*(2), 12.

Kothari, S. P., & Sloan, R. G. (1992). Information in prices about future earnings: Implications for earnings response coefficients. *Journal of Accounting and Economics*, *15*(2), 143-171.

Lara, J. M. G., Osma, B. G., & Penalva, F. (2016). Accounting conservatism and firm investment efficiency. *Journal of Accounting and Economics*, *61*(1), 221-238.

Lopes, H. C. (2018). O Brasil no novo milênio: Regulação, progresso técnico e novo desenvolvimentismo. *Economia e Sociedade*, *27*(3), 1029-1052.

Novy, A. (2009). O retorno do Estado desenvolvimentista no Brasil. *Indicadores Econômicos FEE*, *36*(4), 121-128.

Paulani, L. (2017). A experiência brasileira entre 2003 e 2014: Neodesenvolvimentismo? *Cadernos do Desenvolvimento*, *12*(20), 135-155.

Santos, L. M., Costa, D. F., Alberto, J. G. C., Gonçalves, M. A., & de Faria, E. R. (2011). Análise do Q de Tobin como determinante do investimento das empresas brasileiras. *FACES Journal*, *10*(3), 65-82.