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Earnings management and investment efficiency

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Abstract

Purpose – To verify the relationship between the quality of the accounting information, measured by earnings management, and the efficiency of investments made by Brazilian companies listed on the BM&FBovespa.

Design/methodology/approach – Firstly, the investment efficiency benchmark was established, analyzing the level of investment and the growth in sales as shown in equation (1). After this classification, the results of the extreme quartiles, which were classified as over/under investment, were used as dependent variables to analyze the relationship between income and investment management above or below predictable levels. Finally, to test this relationship, a multinomial logistic regression was used to evaluate the probability of over and under investments in companies that practice earnings management, compared to the benchmark.

The sample that served as the basis for this study is composed of all the publicly-held companies that had or still have shares listed on the BM&FBOVESPA, covering the period from 1996 to 2012.

Findings – The data analysis revealed empirical evidence that earnings management is positively related to levels investment and this can interfere in the probability of a company being classified as under or over investing. Therefore, based on the results found, it is confirmed that "the higher the level of earnings management, the greater the probability of the company deviating from the ideal level of investment."

Originality/value – The results were consistent with the idea that the quality of accounting information plays a relevant role for managers in order to analyze the efficiency of investments.

Keywords – Investments, Efficiency, Earnings quality, Earnings management.

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1 Introduction

In this paper we study the relationship between investment efficiency and the quality of accounting information, measured by earnings management practices (discretionary accruals). Previous studies (Healy & Palepu, 2001; Bushman & Smith, 2001; Lambert, Leuz, & Verrechia, 2000) report that raising quality in financial reporting leads to relevant economic implications for firms, including in the efficiency of investments made.

In order to verify the relationship between the level of investment and earnings management in the Brazilian market, this paper analyzes the probability of companies that practice earnings management deviating from the predicted level of investment, classified as a benchmark.

Biddle, Hilary, and Verdi (2009) point out that higher quality financial reporting improves the efficiency of investments, as it reduces information asymmetry, this reducing the cost of fundraising and the cost of monitoring managers. Biddle et al. (2015) show that the adoption of international financial reporting standards (IFRS) improves the efficiency of capital investment in companies, especially in countries with weaker investor protections, as in the case of Brazil.

Previous studies carried out in Brazil have focused on the determinants of accounting information quality (Lopes & Martins, 2005; Paulo & Martins, 2007; Martinez, 2001; Lopes, 2002; Paulo 2007). Thus, there is a gap in assessing the consequences of higher or lower quality information. In line with what has already been investigated in the North American market (Biddle, Hilary, & Verdi, 2009), it is expected that this paper will contribute to understanding the relationship between levels of earnings management and investments in the Brazilian market.

Biddle, Hilary, and Verdi (2009) emphasize that financial reports with better quality information could reduce adverse selection in the issuance of shares by companies, since they tend to demonstrate companies' projects in a clearer and more efficient way for the investor. They also emphasize that investment efficiency means projects with a positive net present value in a scenario of conflict of interest in the market, such as adverse selection and agency costs. In the literature, when a company rejects an investment opportunity that would have a positive net present value, it is defined as underinvestment. Conversely, overinvestment consists of investing in projects with a negative net present value (Biddle, Hilary, & Verdi, 2009).

According to Martinez (2001), the users of accounting information are the economic agents who seek to perfect their decision-making models. According to the author, as soon as it generates useful information, it also has economic implications for the various agents.

Beaver (1981) states that it is possible to identify some relevant economic consequences of accounting information, including how this information can affect the way in which investments are allocated by companies. In the same sense, Biddle, Hilary, and Verdi (2009) report that the association between financial reporting and investment efficiency reduces information asymmetry and that reports with higher quality levels can lead to greater capital attraction and, consequently, to a greater volume of resources to be invested. Firstly, to measure the quality of the accounting information, a quality management measure was used as a proxy for quality, according to the modified Jones model (Dechow, Sloan, & Sweeney, 1995). Then, the ideal level of investment was evaluated via the relationship between sales growth and investments in order to measure the efficiency of these investments, according to the model proposed by Biddle, Hilary, and Verdi (2009).

The residuals of this relationship were used in order to classify the levels of investments. The residuals were classified into quartiles and served as the basis for the classification of investments; that is, investments below the ideal level were identified as underinvestment, investments above the optimal level were identified as overinvestment. The classifications in the middle

of the quartiles were defined as references classified as the benchmark.

The results indicate that companies with higher quality financial reports are less likely to deviate from the optimal degree of investment. The study also showed that control variables, such as auditing, levels of corporate governance, total assets, and earnings, are related to the efficiency of investments.

The results showed that companies that manage their earnings are more likely to deviate from the expected level of investment. Thus, this study is expected to contribute to both earnings management literature and information users, since they are usually the providers of resources.

2 Literature review

2.1 Accounting Information Quality

Biddle, Hilary, and Verdi (2009) define the quality of accounting information as the ability of financial reports to convey information about a firm's operations, especially regarding its expected cash flow.

2.1.1 *Earnings Management*

Dechow et al. (2012) point out that earnings management is an important issue for academics and practitioners in the field of accounting, which makes research that involves examining the causes and consequences of earnings management routine.

In the context of information quality and investment efficiency, there is evidence that the quality of accounting information is associated with both low investment and excess investment (BIDDLE et al., 2009). Thus, companies with higher quality accounting reports are less likely to invest resources in amounts significantly above or below the level considered optimal. Therefore, the results presented by the aforementioned authors are consistent with the idea that the quality of accounting information is important in investment decision-making processes.

According to Martinez (2001), earnings management is qualified as discretionary choices by the company manager. Therefore, the manager makes choices because of some specific objective that leads him to report a result that is different from the one derived from the reality of operations.

There are several definitions of earnings management. For Schipper (1989), earnings management is a purposeful action in financial statements, with the aim of obtaining some particular benefit; that is, it refers to an action that is primarily based on the intention of executives and not on transparency of information. For Healy and Wahlen (1999), earnings management occurs when managers use their own goals to prepare financial reports with the intention of changing them without drawing the attention of stakeholders to the company's economic and financial performance.

Cosenza and Grateron (2003) define earnings management as a way of modeling the economic and equity reality of a company, using information manipulation practices in order to demonstrate a reality that meets managers' goals.

Martinez (2001) points out that, in relation to the motivations involved, there may be several earnings management modalities, which are described as:

a) Target Earnings: is earnings management to change profit by increasing or decreasing it. The goal is to achieve benchmarks that may be above or below the period.
b) Income Smoothing: aims to reduce variability and maintain results at a certain level, without oscillations.
c) Big Bath Accounting: aims to reduce current profits in favor of future profits. According to Martinez (2001), companies manage their current profits to reflect this act in future results.

For Kraemer (2005), the practice of earnings management is a way for managers to use accounting standards in order to meet specific objectives, without breaking the accounting principles.

2.2 Accounting Information Quality and Investment Efficiency

Biddle, Hilary, and Verdi (2009) point out that firms invest until the benefit is equal to the marginal cost in order to spend excess cash, which is the excess positive net present value for investors.

The authors also mention that there are a priori literatures that recognize the possibility of companies moving away from this expected level and investing above or below predictable levels. These authors also cite as an example the previous research that identifies two reasons, that is, moral hazard and adverse selection, caused by the asymmetry of information between managers and investors, and that can therefore affect the efficiency of investments.

Merely for their own interests managers often make investments that are not in the investor's interest, that is, they invest in projects with negative net present value (BERLE & MEANS, 1932; JENSEN & MECKLING, 1976).

Jensen (1986) predicts that managers driven by private incentives and bonuses tend to push their firms beyond their ideal size. On the other hand, investors recognizing this problem can restrict capital, which can lead to fewer investments than necessary.

Adverse selection models suggest that executives have more privileged information than investors about the prospects of companies. They will try to issue more expensive bonds and if they are successful, they will be able to invest these excess resources (BAKER, et al, 2003).

On the other hand, studies show that when managers act in favor of shareholders and the company needs to raise funds for a project with a positive net present value (NPV), managers can refuse to withdraw funds at a discounted price, even though this implies not investing in projects that would have a positive NPV (MYERS & MAJLUF, 1984).

According to Biddle, Hilary, and Verdi (2009), the discussions mentioned above suggest that information asymmetry between managers and investors can reduce the efficiency of investments, resulting in friction such as moral hazard and adverse selection, and leading to over or under investment.

Prior studies report that the quality of financial reporting can improve the efficiency of investments as financial information is used by shareholders to monitor managers and is also an important source of information for investors (Healy & Palepu, 2001; Bushman & Smith, 2001; Lambert, Leuz, & Verrechia, 2000). A study by McNichols and Stubben (2008) indicates significant results in which profit-making firms carry out more investments than would be expected based on investment fundamentals. The authors argue that conservative firms invest more and issue more debt in environments prone to a lack of investment, with greater effects for firms characterized by greater information asymmetries. Lara, Osma, and Penalva (2016) argue that conservatism improves investment efficiency.

Therefore, the aforementioned literature suggests a relationship between the quality of accounting information and the efficiency of investments. Biddle et al. (2015) found that the adoption of IFRS is significantly associated with higher capital investment efficiency, measured by the sensitivity and flow of cash investments and higher value risk taking.

But other control mechanisms can also be associated with the efficiency of investments, as demonstrated in the following section.

2.3 Accounting Information Quality and Control Mechanism

One of the ways for Brazilian companies to raise funds is through the international market (ADR - American Depositary Receipts).

Leuz and Wysocki (2008) point out that US securities legislation protects foreign investors more than their own. Archambault and Archambault (2003) also point out that companies tend to be influenced by the disclosure policies in the market in which securities are traded, and are subject to compliance with the laws of the country and their enforcement.

In Brazil, Murcia and Santos (2009) found evidence in their work on determinants of the levels of disclosure that Brazilian companies audited by the "Big Four" demonstrated a higher level of disclosure of accounting information.

Analyzing institutional controls, Jensen (1986) states that corporate control can serve as a more rigid and rigorous follow-up mechanism, thus reducing investments beyond those foreseeable. Cohen et al. (2004) state that one of the primary functions of corporate governance is to guarantee quality in the preparation of financial statements, through interaction between agents inside and outside the firm. Hope, Thomas, and Vyas (2016) stress that the cost of providing quality information can outweigh the benefit of this information to stakeholders in the case of some privately held companies.

Ahmed and Courtis (1999) highlight the positive relationship between disclosure level and firm size. Corroborating the idea, several papers identified a positive relationship between company size and disclosure level. The results suggested that the largest companies presented a higher level of disclosure (Singhvi & Desai, 1971; Cooke, 1989).

3 Methodology

To evaluate the level of earnings management, the Modified Jones model was used (Dechow, Sloan, & Sweeney, 1995). Section 3.3 describes the methodology used to classify under or over investment. After this classification, the test was carried out to evaluate if earnings management is directly associated with the (greater\lower) probability of a company investing below or above the market norm (benchmarking).

3.1 Research Question Development

The development of the research question arose from the work of Biddle, Hilary, and Verdi (2009). In this paper, a regression model was estimated to evaluate the relationship between investment and quality of information, evaluated through the quality of accruals, derived from the work of Dechow and Dichev (2002) and McNichols (2002). The authors also evaluated the quality of the information using the model proposed by Wysochi (2008).

In light of the studies presented by Biddle, Hilary, and Verdi (2009) and the international literature that points to a relationship between the quality of accounting information and investment efficiency, the following research question was defined: **Do companies that manage their earnings tend to deviate from the ideal investment level?** The question is also based on studies by Martinez (2001), in which the author argues that earnings management can cause serious inefficiencies in resource allocation between firms.

To answer the research question, the study followed the following steps: firstly, the investment efficiency benchmark was established, analyzing the level of investment and the growth in sales, as shown in equation (1). After this classification, the results of the extreme quartiles, which were classified as over/under investment, were used as dependent variables to analyze the relationship between income and investment management above or below predictable levels. Finally, to test this relationship, a multinomial logistic regression was used to evaluate the probability of over and under investments in companies that practice earnings management, compared to the benchmark.

The study sample is composed of all the publicly-held companies that owned or still own shares listed on the BM&FBOVESPA, covering the period from 1996 to 2012. The data for the 2008 and 2009 periods were excluded from the analysis since they refer to the period in which the Brazilian accounting model was in transition towards the international one (IFRS). All the variables were collected from the Economática database.

3.2 Accounting Information Quality Metrics Development

The original model proposed by Biddle, Hilary, and Verdi (2009) is based on the Dechow and Dichev (2002) proposal, where quality level

is measured by the standard deviation for the years. This approach is not feasible for research in Brazil because companies adhered to IFRS as of 2010 and the last period analyzed in this survey was 2012. Since there is a variable in the model to evaluate possible changes after the adoption of IFRS, we used the level of earnings management as a proxy for quality due to the reduced time period after 2010.

Therefore, the earnings management measure used in the research consists of the discretionary accruals estimation, according to the Modified Jones model (Dechow, Sloan, & Sweeney, 1995) and used in Brazilian literature by several researchers. Equation 1 details the formation of total accruals:

$$TA_{it} = \beta_1 \frac{1}{Assets_{t-1}} + \beta_2 \frac{(\Delta Rev_{it} - \Delta Ac.Rec_{it})}{Assets_{t-1}} + \beta_3 \frac{PPE_{it}}{Assets_{t-1}} + \varepsilon_{it}$$

Equation 1

in which:

$\boldsymbol{AT_{it}}$**:** total accruals of firm i in period t; For the accruals calculation, for the years prior to 2007, the data used were extracted from the Balance Sheet. For this calculation, the following econometric variables were used: Current Assets, Current Liabilities, fincp, debcp. For the calculation as of 2010, the difference between profit and operating cash flow was used, which used the following variables: profit and fcxoper. $\boldsymbol{\Delta Rev_{it}}$: change in net revenue of company i between periods t - 1 and t; $\boldsymbol{\Delta Ac.Rec_{it}}$ change in accounts receivable for company i between periods t-1 and t; $\boldsymbol{PPE_{it}}$ **:** corresponds to property, plant, and equipment of company i in period t; $\boldsymbol{Assets_{t-1}}$**:** corresponds to the total assets of the company i in period t-1 ; $\boldsymbol{\varepsilon_{it}}$: error term of company i in period t.

According to Dechow, Sloan, and Sweeney (1995), the modified Jones model is formulated to eliminate expected trends from the Jones model to measure discretionary accruals with an error when discretionary revenue is exercised. According to the modified model, non-discretionary accruals are estimated as:

$$NDA_{it} = \beta_1 \frac{1}{Assets_{t-1}} + \beta_2 \frac{(\Delta Rev_{it} - \Delta Ac.Rec_{it})}{Assets_{t-1}} + \beta_3 \frac{PPE_{it}}{Assets_{t-1}}$$

Equation 2

In which:

$\boldsymbol{NDA_t}$ **:** are the non-discretionary accruals of company i in period t; $\boldsymbol{\Delta Rev_{it}}$ change in net revenue of company i between periods t - 1 and t; $\boldsymbol{\Delta Ac.Rec_{it}}$ change in accounts receivable for company i between periods t-1 and t; $\boldsymbol{Assets_{t-1}}$ **:** corresponds to property, plant, and equipment of company i in period t; $\boldsymbol{PPE_{it}}$**:** corresponds to the total assets of company i in period t-1; $\boldsymbol{\varepsilon_{it}}$: error term of company i in period t.

It should be noted that some adaptations were made due to Brazilian accounting peculiarities. The REV variable represents net operating income and the PA variable consists of the book value of fixed assets (Lopes & Tukamoto, 2007).

The last step is to calculate discretionary accruals, based on the reasoning that these are the results of the difference between total accruals and non-discretionary accruals, as shown in equation 3.

$$DA_{it} = TA_{it} - NDA_{it}$$

Equation 3

In which:

DA_{it} : discretionary accruals of firm i in period t;

TA_{it} : total accruals of firm i in period t;

NDA_t : non-discretionary accruals of company i in period t.

3.3 Earnings Management and Investment Efficiency

In this paper, investment efficiency means that a firm has chosen projects with a positive net present value (NPV). As such, underinvestment occurs when a firm loses the opportunity to implement a project with a positive NPV. Conversely, overinvestment occurs when a firm implements projects with a negative NPV (Biddle, Hilary, & Verdi, 2009).

In this section we describe the methodology to identify the probability of over- or underinvestment and its relationship with earnings management. The first step is to estimate the optimal level of investment based on Equation 4 (below). We use the residuals of this regression as a proxy for deviations from the optimal level (Biddle, Hilary, and Verdi, 2009):

$$Investment_{i,t+1} = \beta_0 + \beta_1 * SalesGrowth_{i,t} + \varepsilon_{i,t+1}$$

Equation 4

We calculate *Investment* based on capex scaled by total assets and *SalesGrowth* as the percentage change in net operating revenues between years *t* and *t-1*. Following Biddle, Hilary, and Verdi (2009), we estimate the residuals in Equation (4) and then rank them into quartiles (yearly). Companies from the bottom quartile are classified as underinvesting firms. Companies from the top quartile are classified as overinvesting firms. Companies from the intermediary quartiles are classified as achieving the optimal level of investment (*benchmark firms*).

We then create two indicator variables. The first indicator variable (*overinvest*) takes the value of 1 if the firm is classified as an overinvesting firm, and 0 if it is classified as a benchmark firm. The second indicator variable (*underinvest*) takes the value of 1 if the firm is classified as an underinvesting firm, and 0 if it is classified as a benchmark firm. Due to the characteristic of our dependent variables, we use logistic regressions to evaluate the probability of a firm being classified in the top (bottom) quartile compared to the benchmark firms. In order to consider all three classifications (overinvest, underinvest, benchmark), we also use a multinomial logistic regression.

3.3.1 *Control Variables*

Prior literature (for example, Dechow et al., 2010) shows that earnings quality is related to the size of the audit firm. Accordingly, we use an indicator variable *BigFour*, which takes the value of 1 if the firm is audited by any of the four largest audit firms (EY, KPMG, PWC, or Deloitte), and 0 otherwise.

Prior literature (Chiang and Chia, 2005) demonstrates that a higher level of transparency is related to better future predictions. And it also shows that better corporate governance

mechanisms are positively related to earnings quality (Dechow et al., 2010). We use two proxies to capture these dimensions: *Corporate Governance* and *ADR*.

Corporate Governance is an indicator variable that takes the value of 1 if the firm is listed in any of the three different Corporate Governance Levels (Novo Mercado, Nível 1, or Nível 2) as B3. This type of indicator variable is commonly used in Brazilian academic literature (Alencar, 2005; Terra & Lima, 2006; Antunes & Mendonça, 2008; Sarlo Neto, 2009; Dalmácio et al., 2013). *ADR* is an indicator variable that takes the value of 1 if the firm has American Depositary Receipts traded on the New York Stock Exchange, and 0 otherwise. This variable has been used as a proxy for higher levels of institutional investors and higher levels of enforcement, since the American institutional environment is deemed to have a stronger level of protection for investments (Mendonça et al., 2010).

We also include an indicator variable for losses (*Losses*) and control for *Size*, based on the logarithm of total assets. These controls are commonly used in international papers that evaluate their relationship with either earnings quality or disclosure (Ahmed & Courtis, 1999; Singhvi & Desai, 1971; Cooke, 1989; Wallace & Naser, 1995).

Finally, because there was a change in accounting standards in Brazil due to the adoption of IFRS, we use a dummy variable to control for the pre- and post-IFRS periods.

4 RESULTS

4.1 Earnings Management

Our first step is to estimate earnings management using the Modified Jones Model (Dechow, Sloan, & Sweeney, 1995). We present the results in Table 1 (below).

Table 1
Estimating discretionary accruals

Earnings Management –Modified Jones Model (Dechow, Sloan, & Sweeney, 1995)	
$TAcc_{it} = \beta_0 + \beta_1 \frac{1}{TA_{t-1}} + \beta_2 \frac{(\Delta Rev_{it} - \Delta Ac.Rec_{it})}{TA_{t-1}} + \beta_3 \frac{PPE_{it}}{TA_{t-1}} + \varepsilon_{it}$	
Dependent Variable: Total Accruals	
Variables	**Coefficients**
β_1	-2934.142*** (-8.34)
β_2	0.0311 (1.09)
β_3	-0.1996*** (-7.13)
_cons	0.523
Obs.	3.469
Prob>F	0.0000
	0.0312

Table 1 presents the outputs of the regression based on the Modified Jones Model (Dechow, Sloan, & Sweeney, 1995). We use the residuals of this regression as our proxy for earnings management. The variables are defined as follows: $\boldsymbol{TAcc_{it}}$: total accruals of firm *i* in year *t*; $\boldsymbol{\Delta Rev_{it}}$: change in revenues of firm *i* between years *t* and *t-1*; $\boldsymbol{\Delta Ac.Rec_{it}}$ change in receivables of firm *i* between years *t* and *t-1*; $\boldsymbol{PPE_{it}}$: Property, Plant, and Equipment of firm *i* in year *t* ; $\boldsymbol{TA_{t-1}}$: total assets of firm *i* in year *t-1*; $\boldsymbol{\varepsilon_{it}}$: error term – our proxy for discretionary accruals. The t statistics are presented in parenthesis and the significance levels are 1%, 5%, and 10% and represented by ***, **, *, respectively.

The results presented in Table 1 are consistent with prior research in Brazil (Paulo, 2007; Rey, 2011). We use the residuals as our proxy for discretionary accruals.

4.2 Earnings Management and Investment Efficiency

After estimating the discretionary accruals, we then estimate the expected level of investment and create our two indicator variables (underinvest and overinvest) based on the residuals of Equation (4). We present the results in Table 2, below:

Table 2
Estimating the expected level of investment

Results based on Equation (4) (Biddle, Hilary, and Verdi, 2009)	
$Investment_{i,t+1} = \beta_0 + \beta_1 * SalesGrowth_{i,t} + \varepsilon_{i,t+1}$	
Dependent Variable: Investiment	
Variables	**Coefficients**
SalesGrowth	0.029*** (8.25)
_cons	0.073*** (39.41)
Obs.: 4498	
Prob>F: 0.0000	
R^2: 0.0147	

Table 2 presents the results from regressing *Investment* and *SalesGrowth*. We define the variables as follows: $\boldsymbol{Investment}_{i,t+1}$ = total capital expenditures (capex) minus sales of fixed assets scaled by lagged total assets, of firm *i* in year *t*; $\boldsymbol{SalesGrowth}_{i,t}$ = percentage change in revenues, of firm *i* between years *t* and *t-2*. The t statistics are presented in parenthesis and the significance levels are 1%, 5%, and 10% and represented by ***, **, *, respectively.

We rank the residuals of the regression presented in Table 2 into quartiles and create two indicator variables that take the value of 1 for the top (bottom) quartile to identify overinvesting (underinvesting) firms, and 0 if the residuals fall into the middle quartiles (benchmark firms). We present the descriptive statistics in Table 3.

Tabela 3
Descriptive statistics

	Descriptive Statistics – main variables				
	Variables	**Obs.**	**Mean**	**Min.**	**Max.**
Group 1 - Underinvest	Discretionary accruals	701	.2421	.0000685	3.9903
	Discretionary accruals x IFRS	701	.0304	0	3.9094
	IFRS	991	.2219	0	1
	BigFour	920	.5293	0	1
	ADR	984	.2032	0	1
	Corporate Governance	700	.2971	0	1
	LogTotalAssets	991	12.9639	7.5989	19.7127
	Loss	991	.4661	0	1
	SalesGrowth	991	.4771	-.9773	50.029
	Capex	987	.04915	-.7326	13.1009
	Variables	**Obs.**	**Mean**	**Min.**	**Max.**
Group 2 - Benchmark	Discretionary accruals	1408	.1818	.0001861	4.0373
	Discretionary accruals x IFRS	1408	.0173	0	1.01217
	IFRS	1981	.2195	0	1
	BigFour	1781	.7097	0	1
	ADR	1967	.0889	0	1
	Corporate Governance	1344	.4315	0	1
	LogTotalAssets	1981	13.8315	7.6685	18.9641
	Loss	1981	.2948	0	1
	SalesGrowth	1981	5.0670	-.9998	9736.656
	Capex	1917	.0748	-.7706	3.2969
	Variables	**Obs.**	**Mean**	**Min.**	**Max.**
Group 3 - Overinvest	Discretionary accruals	686	.1956	.0000325	3.9241
	Discretionary accruals x IFRS	686	.0191	0	2.2519
	IFRS	975	.2184	0	1
	BigFour	871	.7990	0	1
	ADR	958	.1450	0	1
	Corporate Governance	690	.5217	0	1
	LogTotalAssets	975	14.0950	7.4960	20.3342
	Loss	975	.1887	0	1
	SalesGrowth	975	.2959	-.9857	22.1515
	Capex	947	.1682	-.4423	4.6454
	Variables	**Obs.**	**Mean**	**Min.**	**Max.**
	Discretionary accruals	2795	.2003	.0000325	4.0373
	Discretionary accruals x IFRS	2795	.0210	0	3.9094

Group 1 represents firms classified as underinvesting firms (bottom quartile); **Group 2**: represents firms classified as benchmark firms (middle quartiles); **Group 3** represents firms classified as overinvesting firms (top quartile). The variables are defined as follows: **Discretionary accruals:** residuals of the regression based on Equation 3 - Modified Jones (Dechow, Sloan, & Sweeney, 1995); **Discretionary accruals x IFRS** = interaction between discretionary accruals and the indicator variable for the pre- and post-IFRS periods; **IFRS =** indicator variable that takes the value of 1 for periods beginning in 2010, and 0 for periods until 2007. **BigFour =** indicator variable that takes the value of 1 for firms audited by BigFour firms (KPMG, EY, PWC, or Deloitte), and 0 otherwise. **ADR =** indicator variable that takes the value of 1 for firms with American Depositary Receipts traded on the New York Stock Exchange, and 0 otherwise. **Corporate Governance**

= indicator variable that takes the value of 1 if the firm is listed in any of the three different levels (Novo Mercado, Nível 1, or Nível 2) as B3, and 0 otherwise. **LogTotalAssets** = logarithm of total assets. **Loss** = indicator variable that takes the value of 1 for loss-making firms, and 0 otherwise. **SalesGrowth** = percentage change in revenues between years *t* and *t-1*.

In order to evaluate if earnings management practices are related to the probability of a firm under or overinvesting, we run a multinomial logistic regression comparing Group 1 (underinvest) and Group 3 (overinvest) with Group 2 (benchmark firms). The results are presented in Table 4, below.

Table 4
Earnings management and investment efficiency

	Underinvest *versus* Benchmark Firms	**Overinvest *versus* Benchmark Firms**
Dependent Variable	***Underinvest***	***Overinvest***
Discretionary accruals	1.5710***	0.9974**
	(4.21)	(2.34)
	[4.81]	[2.71]
Discretionary Accruals x IFRS	-0.1281	0.9235
	-0.13	(0.91)
	[1.13]	[2.51]
IFRS	0.2770*	-0.3257**
	(1.70)	(-2.02)
	[1.31]	[1.38]
BigFour	-0.2073	**0.4445*****
	(-1.47)	**(2.75)**
	[1.23]	**[1.55]**
ADR	-1.0519***	0.3632*
	(-2.81)	(1.76)
	[2.86]	[1.43]
Corporate Governance	-0.1915	**0.2651***
	(-1.32)	**(1.95)**
	[1.21]	**[1.30]**
LogTotalAssets	-0.0958**	-0.0182
	(-2.34)	(-0.44)
	[1.10]	[1.01]
Loss	0.4002***	-0.6115***
	(3.21)	(-4.08)
	[1.49]	[1.84]
_Cons	0.4399	-0.8312
	(0.85)	(-1.55)
Obs.	1855	1855
LR Chi2	215.42	215.42
Prob>chi2	0.000	0.0000
Pseudo R2	0.0556	0.0556

Table 4 presents the results for our multinomial logistic regression. Two categories are considered against the benchmark firms: overinvest and underinvest. **Underinvest =** firms from the bottom quartile, based on the residuals of estimating Equation 4. **Overinvest =** firms from the top quartile, based on the residuals of estimating Equation 4. **Discretionary accruals:** residuals of the regression based on Equation 3 - Modified Jones (Dechow, Sloan, & Sweeney, 1995); **Discretionary accruals x IFRS** = interaction between discretionary accruals and the indicator variable for the pre- and post-IFRS periods; **IFRS =** indicator variable that takes the value of 1 for periods beginning in 2010, and 0 for periods until 2007. **BigFour =** indicator variable that takes the value of 1 for firms audited by BigFour firms (KPMG, EY, PWC, or Deloitte), and 0 otherwise. **ADR =** indicator variable that takes the value of 1 for firms with American Depositary Receipts traded on the New York Stock Exchange, and 0 otherwise. **Corporate Governance =** indicator variable that takes the value of 1 if the firm is listed in any of the three different levels (Novo Mercado, Nível 1, or Nível 2) as B3, and 0 otherwise. **LogTotalAssets =** logarithm of total assets. **Loss =** indicator variable that takes the value of 1 for loss-making firms, and 0 otherwise. **SalesGrowth =** percentage change in revenues between years *t* and *t-1*. Z-statistics are presented in parenthesis; the odds ratio is presented in brackets and significance levels of 1%, 5%, and 10% are represented by ***, **, *, respectively.

The results presented in Table 4 indicate a positive relationship between earnings management and investment efficiency, both for underinvesting or overinvesting firms (coefficients are positive and significant at the one percent level). These results are in line with those presented by Biddle, Hilary, and Verdy (2009). Companies with lower levels of earnings quality are more likely to deviate from the expected level of investment.

We highlight some of the results related to our control variables. IFRS adoption seems to alter the probability of underinvestment or overinvestment in opposite directions. Firms audited by Big-Four audit firms (*BigFour*) are more likely to overinvest, but there is no difference between the benchmark and underinvesting firms. This result may be related to a higher level of conservatism by Big-Four firms that could lead to overinvestment decisions (for an analytical description of auditor conservatism and investments, see Lu and Sapra, 2009).

We find that cross-listed firms (*ADR*) are less likely to underinvest (negative coefficient and significant at the one percent level). Conversely, we find weak evidence that these firms are more likely to overinvest (positive coefficient and significant at the ten percent level). We fail to find any difference between a listing in one of the three different levels of corporate governance as B3 (*Corporate Governance*) for underinvesting firms. We find only weak evidence of a higher probability of overinvesting (positive coefficient and significant at the ten percent level).

We show that larger firms (*Size*) are less likely to underinvest (negative coefficient and significant at the five percent level) and there is no difference between benchmark and overinvesting firms. The results also indicate that controlling for losses (*Loss*) is relevant: as expected, loss-making firms are more likely to underinvest and less likely to overinvest, compared to benchmark firms (positive and negative coefficients and significant at the one percent level, respectively).

Taken together, the results based on Brazilian listed firms are consistent with those presented by Biddle, Hilary, and Verdi (2009) in the U.S. environment: there is a relationship between earnings quality and investment efficiency. Thus, they add to prior literature that shows that increasing the quality of financial statements may have positive economic implications for firms, such as investment efficiency (Healy & Palepu, 2001; Bushman & Smith, 2001; Lambert, Leuz, & Verrechia, 2000).

5 Conclusion

We extend the prior literature by presenting empirical evidence that higher levels of earnings management in Brazilian listed firms lead to a higher probability that firms will deviate from the expected level of investment. We therefore show that earnings quality and investment efficiency are also linked in a different institutional environment, like the one in Brazil.

We demonstrate that earnings quality has implications for investment decisions,

after controlling for IFRS-adoption, corporate governance mechanisms, cross-listing, loss, size, and Big-Four audit firm. Our results are in line with those linking, in a broader sense, the quality of reported accounting information and corporate decisions (Biddle, Hilary, & Verdi, 2009; Healy & Palepu, 2001; Bushman & Smith, 2001; Lambert, Leuz, & Verrechia, 2000).

We hope that the findings will encourage new research related to the theme, especially testing different earnings quality dimensions, such as conservatism, mapping of accruals, and persistence. We also believe that the results may be important for investors and firms by considering how actions toward better financial reporting can lead to better economic outcomes in future periods.

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3. Development of theoretical propositions (theoretical Work)	√		
4. Theoretical foundation/ Literature review	√	√	
5. Definition of methodological procedures	√		√
6. Data collection	√	√	
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8. Analysis and interpretation of data	√	√	
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