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EFFECT OF REGULATION ON ANALYSTS' FORECAST ERROR IN THE BRAZILIAN CAPITAL MARKET

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ABSTRACT

This article aimed to understand whether regulation affects the analyst's task of predicting information from companies operating in the capital market in Brazil, listed and active with the Brazilian Securities and Exchange Commission (CVM), in the period from 2010 to 2020. The Panel Analysis approach was used, which emerges as a statistical instrument in the evaluation and understanding of temporal dynamics and individual variations in financial contexts and which allows a statistical approach that examines data over time and between different units of observation. This way it can handle longitudinal data, allowing the identification of patterns over time. The sample obtained was related to 176 companies listed on B3, in the period from 2010 to 2020, with 4,031 initial observations. The model also has its analysis segregated by 10 sectors which inform the companies that operate with the Securities and Exchange Commission, namely: (1) Industrial Goods; (2) Communication; (3) Cyclical Consumption; (4) Non-cyclical consumption; (5) Financial; (6) Basic materials; (7) Oil & Gas; (8) Health; (9) Information technology and (10) Public utility. The information was obtained from the Economática database. The results do not allow us to refute the proposed hypothesis that regulation influences analysts' error in forecasting absolute error and positive error. Thus, it points out that analysts' forecasts may have a magnitude of error far from what was realized and that they may present a confirmation bias, which implies overestimating the most regulated companies.

Keywords: Analysts' Forecast Error. Disclosure. Regulation.

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INTRODUCTION

Nowadays, disclosure, that is, the disclosure of important information about a company, translates as a fundamental practice to ensure transparency to future and potential investors. This data sharing aims to provide clarity and confidence to the decision-making process in the financial market. For this reason, several professionals have migrated to the role of financial analysts, exerting influence on the orientation of investors and assisting in the management of their investments (Jensen & Meckling, 1976). Broedel *et al*. (2007) demonstrated the relevance of accounting information in generating prediction for information users.

The aspects of transparency, governance and compliance are not sustainable without adequate informational disclosure, in this sense, Kaplan and Norton (2004) point out that the ability to communicate the company's strategy to the market is fundamental In addition, they play an essential role as information providers in times of data scarcity (Charitou et al., 2019).

Analysts' projections, according to Locatelli *et al* (2020), stand out as crucial tools in reducing informational asymmetry and in the decision-making process of investors and other users. These projections, in addition to serving as guides for investors, play a significant role in the context of signaling theory, in which analysts take responsibility for interpreting and communicating the signals emitted by organizations to investors (Healy & Palepu, 2001; Salotti & Yamamoto, 2005). Oliveira & Girão (2018) also highlight the relevance of analysts' projections, highlighting their role in reducing informational asymmetry and in guiding investors regarding the available investment options. This interaction between analysts and investors contributes to a better understanding of the available investment options and to the formation of more informed decisions in the financial market.

There is theoretical evidence that the extent of voluntary disclosure is related to the regulation of financial statements. Research conducted by a number of scholars, such as the studies of Lang & Lundholm (1993), Clarkson et al. (2008), Deumes & Knechel (2008), and Skinner (1994), suggests that voluntary disclosure tends to be more comprehensive when principled, in contrast to mandatory rules. The research on regulatory policies carried out by scholars such as Lang & Lundholm (1993) is largely based on the analysis of financial statements and the recommendations of market analysts, which emphasizes disclosure for the transparency and efficiency of financial markets.

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The relationship between voluntary and mandatory disclosure has significant implications for the quality and breadth of information disclosed by companies. Studies such as those by Clarkson et al. (2008) suggest that the increase in the quantity of dissemination does not necessarily result in a direct improvement in quality, but rather in an increase in the presence and detail of informational content. Also according to Lang & Lundholm, 1993; Clarkson et al., 2008; Deumes & Knechel, 2008; Skinner, 1994, voluntary disclosures can fill *gaps* promoted by mandatory standards and thus promote the mitigation of informational asymmetry for the market.

In the capital markets environment, financial analysts, regardless of whether they are self-employed or belong to intermediary institutions, must thoroughly analyze the financial reports and mandatory and voluntary disclosures of companies. In addition, it is essential that they are aware of the relevant macroeconomic and sectoral indicators, aiming to solidly support their investment recommendations through the consolidation and careful interpretation of the available information. This practice, essential for determining the fair price of shares, is supported by the theory proposed by Ross (1977), which, based on the approach of incentives and signaling, offers a solid conceptual framework to understand the determination of the financial structure of companies.

In addition, the most recent contributions by Ross, Westerfield, and Jordan (2019) explore the relationship between macroeconomic factors and the pricing of financial assets, enriching the analytical repertoire of financial market professionals and facilitating the prediction of stock prices. These studies provide *valuable insights* that complement Ross' previously proposed theory, deepening analysts' understanding of the fundamentals that influence companies' investment and financing decisions. Thus, the joint analysis of micro and macroeconomic aspects is essential to rigorously support investment decisions in the capital market.

Fama (1970) elaborated the efficient market theory. It posits that asset prices reflect all available information, and therefore it is difficult for investors to consistently earn returns that are consistently higher than the market. Malkiel (1973) expands on this idea, arguing that financial analysts, despite playing an important role in the interpretation and dissemination of information, face challenges in overcoming the efficient market due to the randomness of asset prices. Finally, Shiller (2000) complements this view by highlighting that financial markets can be influenced by behavioral and irrational factors, resulting in price movements that do not fully reflect the economic fundamentals of firms (Shiller, 2000).

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The efficient market theory advocated by Malkiel (2019) argues that the prices of financial assets follow a random pattern. In parallel, Myring & Wrege (2009) note that financial analysts provide more timely and revised forecasts more frequently than in the past, indicating an improvement in valuation performance. This improvement can positively impact capital market efficiency, as argued by Zortea et al. (2017), allowing investors to act with greater confidence and accuracy in their investment decisions.

Market analysts' projections play an essential role in investors' choice of capital allocation, which is crucial in the valuation of traded stocks. His work, in evaluating the history of companies and projecting future profits, is extremely relevant in this context. Understanding the regulatory aspects and their impacts on these analyses is, therefore, an important tool. These projections, by providing significant signals for the economy, influence both management's intention to disclose and the assertiveness of analysts' forecasts (Lang & Lundholm, 1993; Dechow & Schrand, 2004; Santos et al., 2018).

In this sense, this work aims to answer the following research problem: Does regulation have an impact on analysts' forecasting error? Thus, the general objective of this research is to understand whether the effect of regulation affects the analyst's error in predicting information from companies listed and active with the Brazilian Securities and Exchange Commission (CVM), in the period from 2010 to 2020.

In order to expand the sources of research and debate on the subject, this work reflects on the phenomena and factors that affect the information zeroed by Brazilian capital market analysts. They, in turn, are used by investors.

To this end, this research was structured in five sections, the first being this introduction, which presents a review of the scientific literature on the proposed theme. Next, the econometric modeling methodology, panel analysis, adopted for the research is presented. In the fourth section, the analysis of the data, whose results corroborate previous findings in the literature. They allow us to infer that, in the presence of greater regulation, the analysts' forecast error is lower. Finally, in the fifth section, the final considerations and suggestions for future research are recorded.

LITERATURE REVIEW

Studies by Patricia O'Brien in "Disclosure Regulation in the European Union" (2004) offer insights into the regulation of disclosure in the European Union and its effects on voluntary disclosure. The central premise is that voluntary disclosure only occurs when

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there are more benefits than costs for managers and/or companies (Dye, 2001). Christian Leuz, in his work "Disclosure and the Cost of Capital: Evidence from Firms' Responses to the Enron Shock" (2006), highlights the relationship between voluntary disclosure and the cost of capital of companies. In turn, Verrechia (2001) provides the conceptual framework of the Theory of Voluntary Disclosure, examining the incentives that managers and/or companies have to disclose information voluntarily.

The researchers Carrigan & Conglianese (2015) inform through their studies that regulatory practices have a variety of instruments at their disposal to develop regulatory programs, but they have great flexibility in the design of their application strategies. Developing a comprehensive regulatory enforcement program requires decisions along a number of dimensions, each of which allows the regulator choices in how it interacts with its regulated entities. The level of rigor that regulated companies face is determined not only by the regulatory requirements themselves, but also by how they are implemented in practice. Once the limiting enforcement resources are provided, regulators can use segmentation, focusing their enforcement efforts on companies with poor compliance records. All regulators seek to achieve deterrence by deterring violations through the threat of punishment, but the types of deterrence emphasized by the regulator will have implications for how it designs its enforcement programs.

Carrigan & Conglianese (2015) describe the variety of regulatory instruments available: different regulatory mechanisms provide regulatory targets with different levels of flexibility, which correspond to requirements for large or small amounts of information about regulated entities, as well as about the broader regulatory environment. While market-based or other alternative mechanisms may be considered more cost-effective than traditional policies, the conditions for their appropriateness may not always apply, and so other traditional mechanisms are more frequently implemented in practice (Keohane et al. 1998, Stavins 1998).

Table 1 Description of the Variety of Regulatory Instruments

Type of regulation	Description	Primary Benefit	Primary Cost
Meaning-Based (Technology, *Design* or Specification)	Features specific technology that can be used to meet the requirements	Provides predictability and clarity for regulators and regulators	It can "freeze" regulatory technology and inhibit companies' incentives to innovate.
Performance-based	Specifies the end goal without identifying how the company should achieve it	Encourages companies to find cheaper ways to meet regulatory goals	When applied uniformly, companies have no incentive to exceed regulatory targets

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Market-Based (Taxes, Charges, Licenses, or Marketable Securities)	Uses market signals (not commands), including prices and quantities, to change behavior	It concentrates its efforts on the companies that can do This is more cost-effective	Political resistance and potential for increased complexity of rules and enforcement
Management-Based	Requires firm planning to identify, minimize, and respond to hazards	Allows businesses flexibility to design plans around their specific operations	It is difficult for the regulator to know whether companies are involved in the planning process responsibly
Obligatory Information Disclosure	Requires companies to publicly disclose information about operations	It can be implemented at a low cost for businesses and can facilitate competition	It depends on the consumers to read and be able to understand and respond to the information
Voluntary and Self-Regulation	Rewards behavior socially desirable, but does not oblige the companies to comply with the expected social behavior	Reduces costs of regulator application and Provides flexibility Regulatory to companies	It can intensify residual risk by falsely conveying the impression that companies have controlled the risks

Source: Carrigan & Conglianese (2015)

The breadth of regulatory instruments and enforcement strategies does not lend itself easily to broad generalisations. However, the vast literature examining these regulatory choices produces two general ideas which highlight the advantages of regulators with working knowledge of the various possibilities in the design and implementation of their regulatory programmes. Possible criteria on which a regulator can base its approach include its ability to reduce risk, cost-effectiveness, relative efficiency, flexibility, administrative feasibility, propensity to promote fairness, and ability to mitigate regulatory capture potential. Regulatory approaches can be used speculatively together to encourage better regulatory performance among regulated entities. This view can be found, for example, in responsive regulation, which combines legalistic and accommodative enforcement approaches to try to realize the advantages of interacting favorably with regulated firms, while maintaining the ability to sanction those who try to take advantage of the regulator's willingness to collaborate (Carrigan & Conglianese 2015).

In recent years, according to Neto (2021), a point that is attractive to investors is the reduction of the cost of capital, as it reduces business risks and is essential to leverage a company's investments. However, to achieve this reduction, investments in corporate governance are necessary, through the institution of high management standards, given that the higher the corporate governance indexes, the more solid an

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organization tends to be and the more reliable and accurate the information made available. (Siqueira, 2023)

However, the quality of the information can be questioned due to the possibility of errors by the analysts and, in fact, raise factors that may interfere with the analysis made by them. Research points to evidence of the relationship between competition and the absence of transparency, using the informativeness of the properties of errors and dispersions related to analysts' forecasting and employing a non-structural measure of competition (Fosu et al., 2018 and Iqbal et al., 2021). That way we would have quality distortion. Thinking about the informational quality and accuracy of forecasts, it is inferred that analysts make more accurate earnings forecasts in economies with more economic freedom, suggesting that an increase in economic freedom would lead financial statements to be more transparent, reducing analysts' forecast bias.

Considering this aspect, it is considered that the environment of informational uncertainty impacts analysts' forecasts and encourages their coverage and, in this sense, Dhaliwal et al., (2012), mention that there is evidence that forecasting error is reduced in companies located in countries with a higher informational environment, since there is a greater amount of information to anticipate market movements.

In this scenario, considering that analysts' forecasts are sensitive to several operational and strategic factors of the company, to the quality of the information disclosed and other factors, as well as risk factors related to the company, it is mentioned in the study by Ananzeh, Husam et al. (2022), that predictability on the part of analysts is susceptible to errors, but that these can be mitigated by the quality of the dissemination of the statements. According to the authors, this would avoid postponing the disclosure of information, since monitoring tools can inhibit discretionary practices of the manager. This is how the research hypothesis arises:

H1: More regulated economic environments reduce analysts' forecast error.

With the construction of the hypothesis, this topic of review of the economic and theoretical literature on the subject ends. Below, we present the methodological aspects of the research.

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METHODOLOGY

ECONOMETRIC APPROACH

The panel analysis methodology emerges as a statistical instrument in the evaluation and understanding of temporal dynamics and individual variations in financial contexts. It was adopted because it allows a statistical approach that examines data over time and between different units of observation. This ability to deal with longitudinal data allows the identification of patterns over time, such as the research carried out by Engle (1982) and Granger (1988).

Still in the financial context, the technique is useful for analyzing asset performance, market behaviors, and factors that influence investment decisions. Authors such as Roll (1978), Barber & Odean (2001), Antoch, J., Hanousek, J., Horváth, L., Hušková, M., & Wang, S. (2019), and Peel, D. A., Peel, M. J., & Venetis, I. A. (2004) have applied panel analysis to understand the complexities of the capital market and evaluate the information issued by analysts.

The methodology allows the identification of factors that influence investment decisions, such as macroeconomic policies, market indicators, and corporate variables. It was used by Fama & French (2004), who analyzed the efficiency of financial markets and the relationship between expected returns and different risk factors.

Applied to the context of finance, it allows dealing with the heterogeneity between the observation units, enabling the inclusion of specific variables of each company or asset and making the analysis more adapted to the complexity of the capital market. It also provides control for individual and temporal effects, minimizing views that may arise in longitudinal studies. These characteristics were useful in the studies of Roll (1978) and Lakonishok & Smidt (1984), which explore the quality of analysts' recommendations and their relationship with the future performance of assets.

DESCRIPTION OF THE SAMPLE AND VARIABLES USED

The sample of this study is composed of 176 companies operating in the Brazilian capital market, listed and active with the Brazilian Securities and Exchange Commission (CVM). The time series comprises from 2010 to 2020, with 4,031 initial observations. The information was obtained from the Economática database.

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PRESENTATION OF THE ECONOMETRIC MODEL

The model proposed for this research has the following notation:

$$EPA = \alpha + \beta_1 REG_{t-1} + \beta_2 VM_{t-1} + \beta_3 ALV_{t-1} + \beta_4 TAM_{t-1} + \beta_5 END_{t-1} + \beta_6 VAREC_{t-1} + \beta_7 NM_{t-1} + \mu \quad (1)$$

Its analysis is also segregated by 10 sectors that make up the companies that operate with the Securities and Exchange Commission, namely: (1) Industrial Goods; (2) Communication; (3) Cyclical Consumption; (4) Non-cyclical consumption; (5) Financial; (6) Basic materials; (7) Oil & Gas; (8) Health; (9) Information technology and (10) Public utility.

The variables are defined in Table 2 below.

Table 2 Description of the variables

Variable	Description	Formula	Source
Dependent variables:			
EPA Absolute	It is the difference between analysts' consensus earnings per share and observed earnings per share, without considering the direction of that difference. It is a measure that establishes how far the forecast is from the actual result, without considering whether the forecast was too high or too low	$ERRO\ ABSOLUTO = \lvert previsão - valor\ real \rvert$	Graham, Harvey e Rajgopal (2005)
EPA with Positive Value	It occurs when the analyst's forecast is greater than the actual observed value. In this case, the analyst overestimates the actual result.	$ERRO\ POSITIVO = previsão - valor\ real$	Graham, Harvey e Rajgopal (2005)
EPA with Negative Value	It occurs when the analyst's forecast is lower than the actual observed value. In this case, the analyst underestimates the actual result.	$ERRO\ NEGATIVO = previsão - valor\ real$	Graham, Harvey e Rajgopal (2005)
Variable of interest:			
REGt-1	This is the *dummy* variable to represent companies that have informed, in the reference form of the Securities and Exchange Commission, regulation risks section, that they are subject to state regulation. Although the company informed more than one state regulatory agent, the value of 1 for regulated and 0 for non-regulated was considered. The regulatory effect of the CVM itself was not considered for this study.	1 if regulated, otherwise.	Carrigan & Coglianese (2015)
Control variables:			
VMt-1	Market value of the company.	$VM_{t-1} = \frac{Valor\ de\ Mercado}{Patrimônio\ Líquido}$	Damodaran (2007), Jensen (2010) e Ross & Jordan (2018)
ALAVt-1	Company leverage.	$ALAV_{t-1} =$	Modigliani & Miller (1963) Jensen,

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		$\frac{Passivo\ Exigìvel}{Patrimônio\ Líquido}$	Black & Scholes (1972) e Diamond & Rajan (2001)
TAMt-1	Company size.	$TAM_{t-1} = Ln\ do\ Ativo$	Grinblatt, Masulis, & Titman (1984), Zingales, & Rajan (1996) e Brigham & Ehrhardt, (2008)
ENDt-1	Indebtedness of the company.	$END_{t-1} = \frac{Passivo\ Circulante}{Passivo\ Exigível\ a\ LP}$	Gatchev, Spindt, & Tarhan (2009), Jensen (2010) e Scholes, Wolfson, Erickson, Maydew, & Shevlin (2014)
VARECt-1	Change in the company's revenues.	$VAREC_{t-1} = \frac{Receita_t - Receita_{t-1}}{Receita_t}$	Carroll, Choi, Laibson, Madrian, Metrick (2005), Dreman (2008) e Barber, Huang, Ko, & Odean (2020)
NMt-1	Dummy variable to represent companies that were registered in the B3 Novo Mercado year before.	1 if Novo Mercado, the opposite case.	Bebchuk, Cohen & Ferrell (2002), Coffee Jr. (2002), Yermack, D. (2004) e Edmans. & Holderness, (2017)

Source: Prepared by the authors.

The Panel Analysis model will be displayed, using the fixed effect and the random effect. In the fixed effect model, according to Wooldridge (2010), specific effects are incorporated for each individual unit. In this aspect, the model assumes that there are specific and constant characteristics associated with each individual unit and thus the characteristics affect the response of the dependent variable.

In the random effect, Greene (2002) points out, the specific characteristics of the individual units are random variables. Thus, the variation between the individual units is modeled as a normal distribution, and the specific effects are estimated from this distribution.

ANALYSIS OF RESULTS AND DISCUSSION

To begin the analysis of the results of the proposed model, Table 3 presents the descriptive statistics, the description of the number of observations for each variable of the model, the mean obtained, the standard deviation and the maximum and minimum values.

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Table 3 shows that the maximum number of observations obtained is with the dummy variables Regulation and Novo Mercado, with 4,041 observations. The variable with the lowest number of observations is the Market Value, with 2,510 observations. The dependent variable Analyst Forecast Error is presented with absolute values, regardless of whether it is above predicted or below predicted. The dependent variable "Analyst Forecast Error" is displayed with absolute values, regardless of whether they are higher or lower than the forecasts. During panel analysis, the analyst's forecast errors will be segregated into positive and negative errors, contemplating values both above and below the forecast.

Table 3 Descriptive Statistics

Variables	Obs	Average	Standard deviation	Min	Max
EPA_ABS	3.943	0,2596954	0,5956543	0,001	3,461
EPA_ANALISTA	3.943	-0,0809333	0,4950894	-2,664	0,957
REG	4.041	0,4345459	0,4957586	0	1
VM	2.510	2.488.668	2.348.065	0,2734073	1.141.953
ALAV	3.459	0,5619238	0,1847894	0,1667384	0,9509413
THERE	3.686	1.633.538	1.624.489	1.358.799	2.082.213
END	3.452	0,9587491	1.117.988	0,1218015	6.076.517
VAREC	3.263	0,301906	0,9210234	-0,9795607	3.313.866
NM	4.041	0,5953972	0,4908758	0	1

Source: Prepared by the authors.

Table 3 allows us to evaluate the characteristics of the sample by variable that makes up the model, thus helping to understand the econometric model presented in Table 4 – Panel Analysis.

The descriptive statistics presented in Table 3 allow us to identify that the REG (Regulation) and NM (Novo Mercado) variables are binary, with results of zero and one. They affect the proposed inferential model the greater the number of observations with results of zero, thus decreasing the total number of observations of the model.

While the variable EPA_ABS, being in modulus, does not present a negative sign, the variable EPA_ANALISTA presents a minimum negative number and the average itself has a negative sign, showing a tendency of a greater amount of prediction error than of positive errors.

The variable MV (Market Value) presents values far from minimum and maximum, captured by the standard deviation, indicating a large dispersion of the market values of the sample obtained.

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The Asset Size values were treated in natural logarithm to correct scaling problems in relation to the other variables. The variables ALAV, END, and VAREC are indices, so it makes sense to treat the TAM as a logarithm.

The VAREC (Revenue Variation) presents a negative minimum number and distant minimum and maximum values, which is captured by the standard deviation, showing a heterogeneous behavior of the companies in these samples to the companies in relation to the evolution of revenue.

Table 4 – Panel Analysis is structured with a fixed effect and a random effect segregated by the three aspects of the Analyst's Forecast Error, with the Absolute, positive and negative, and segregated by ten sectors.

Table 4 Panel Analysis

Variables	EPA Absolute	EPA Positive	EPA Negative	EPA Absolute	EPA Positive	EPA Negative
REG	-0,049* (0,03)	-0,031* (0,02)	0,039 (0,03)	-0,041 (0,04)	-0,044* (0,02)	0,028 (0,04)
VM	-0,042*** (0,01)	-0,021*** (0,00)	0,043*** (0,01)	-0,037*** (0,01)	-0,017*** (0,00)	0,038*** (0,01)
ALAV	0,0495*** (0,07)	0,223*** (0,05)	-0,545*** (0,09)	0,515*** (0,08)	0,252*** (0,05)	-0,554*** (0,10)
THERE	0,023** (0,01)	0,036*** (0,01)	-0,017 (0,01)	0,011 (0,01)	0,010 (0,01)	-0,015 (0,02)
END	0,018 (0,01)	0,007 (0,01)	-0,015 (0,01)	0,011 (0,01)	0,006 (0,01)	-0,008 (0,02)
VAREC	-0,006 (0,01)	-0,005 (0,01)	-0,014 (0,02)	-0,004 (0,01)	-0,006 (0,01)	-0,025 (0,02)
NM	0,018 (0,03)	0,020 (0,02)	-0,033 (0,03)	0,047 (0,04)	0,033 (0,03)	-0,082* (0,05)
Constant	-0,310* (0,16)	-0,504*** (0,11)	0,256 (0,20)	-0,195 (0,20)	-0,153 (0,14)	0,267 (0,25)
Estimator	Random Effect	Random Effect	Random Effect	Fixed Sector Effect	Fixed Sector Effect	Fixed Sector Effect
Obs	2006	887	1100	1722	755	952
R^2	0,056	0,116	0,063	0,079	0,156	0,097

Source: Prepared by the authors./Note: Standard error in parentheses. *, **, *** significant at 10%, 5% and 1%, respectively.

Analyzing the results presented in Table 4, the number of observations used in each model is highlighted: in the random effect with absolute EPA, there were 2,006 observations, while the lowest number of observations occurred in the fixed effect with positive EPA with only 755 observations.

The R2 calculated in each model, i.e., the explanatory capacity of the set of variables in relation to the behavior of the dependent variable (EPA), was 5.56%

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absolute EPA in random effect, lower explanatory capacity among the models, and 15.6% in Positive EPA with fixed effect.

The association between the dependent variable Analyst's Forecast Errors and the main variable Regulation reports a statistically significant result of 10% in random effect in absolute and positive EPA and in the fixed effect in positive EPA. The regulation coefficient also registers a negative sign, allowing the inference that, for the sample, the greater the presence of regulation, the lower the analyst's error, both in the absolute value and in the overestimated estimate.

The results obtained in this research are corroborated by previous studies, such as that of Gormley & Matsa (2016), which identified that more regulated companies are more associated with greater forecasting errors, suggesting that regulatory complexity can make it difficult for analysts to accurately assess them. In the same vein, there are the studies of Barth, Kasznik & McNichols (2001) and Leuz, Nanda & Wysochi (2003). According to them, accounting regulation affects the quality and availability of information disclosed by companies. The consequence of this is the impact on analysts' forecast error.

There is also a study by Hutton, Marcus & Tehranian (2009), which deal with how financial regulation affects the assessment of risks by companies. They inferred that regulation can impact how companies manage and analysts interpret risks, which can influence forecasting errors.

The results obtained with the observed sample point in the same direction as in previous studies.

The Market Value variation was statistically significant at 1%. However, the coefficient for both fixed and random effect in the Negative APS presented a positive result, i.e., a direct association, while the other results were a negative coefficient with an inverse association. Thus, it is concluded that, both in absolute error and in positive error, the higher the market value of the company, the lower the analyst's error, which does not occur with a negative error, which has a positive association with the company's market value.

Enterprise value is a relevant measure that can influence analysts in their forecasts and direct how it affects future stock prices. The results obtained in this sample are corroborated by studies by Kothari, Leone & Wasley (2005) and Zuo (2016),

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by inferring statistical significance of the size of the asset in relation to the analysts' forecast error.

Also the variable leverage showed similar behavior to the market value, being statistically significant at 1%, and with a negative association in all models, except for the analyst's negative error in both the fixed and random effects. It is inferred that analysts with an anchoring bias tend to err on the lower estimates of companies that have higher leverage.

The results related to the leverage variable are in line with studies by Myers & Majluf (1984), which highlight the importance of capital structure and how leverage can affect the value of the company, as well as Frank & Goyal (2009). There are also the studies of Myers & Majluf (1984) on the impact of leverage on corporate finance, and those of Graham and Harvey (2001) on leverage and market behavior. They create a theoretical framework for understanding the problem, although not specific about the relationship of analysts' prediction error. They address how leverage decisions influence market perceptions and expectations, which can have implications for analysts' forecasts.

The variable Asset Size was significant at 5% in the random effect with absolute error and at 1% in the random effect with positive. In the other models, it was not statistically significant. In this sense, the larger the size of the asset, the greater the chance that analysts will make mistakes in the companies' forecasts.

Studies by Cornett, Marcus, Saunders & Tehranian (2003) indicate that company size is a relevant variable that can influence analysts' forecasts, just as Francis & Olsson (2008) point out that factors such as company complexity and size can be factors of complexity, affecting analysts' forecast errors. According to Brown, Leone & McVay (2012), accounting practices can be influenced by the size of companies, which, by extension, affect analysts' forecasts. The results found in this sample are consistent with the research of the aforementioned authors.

The variables Indebtedness, Revenue Variation and Novo Mercado were not statistically significant.

The relationship between analysts' forecasts, future returns, long-term growth, stock offerings, consistency of analysts' forecasts and the companies' sector of operation, and the relationship between the actual performance of companies associated with the sector in which they operate and analysts' forecasts are fields of

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study by authors such as Dechow, Hutton & Sloan (2000). Bartov, Givoly & Hayn (2002), Li (2010) and Lee & So (2015). These scholars evaluate the influence of the company's sector of operation on the forecast made by the analysts and how this characteristic affects the analyses.

When analyzing by sector, it was detected that the communication, basic materials and public utility sectors were presented in at least one of the statistically significant models to explain the error bias of market analysts. These sectors are extremely disparate both in performance and in the number of participants in the Brazilian capital market.

FINAL CONSIDERATIONS

The objective of this research was to understand whether the effect of regulation somehow affects the analyst's error when predicting future information from companies. For this, the reference forms that companies listed on the Brazilian Securities and Exchange Commission issue to the capital market regulator were analyzed.

Brazil has a diverse range of regulatory agents that go beyond the traditional view of administrative regulation of prices and services, but also with the effect of entry and exit barriers and relationships that even affect competition, competitiveness, trademark and patent law, environmental, consumer, health safety and quality.

The research problem that was sought to be answered in this research was whether regulation significantly affects analysts' forecast error. The hypothesis was that regulation has the effect of significantly reducing analyst error. The model adopted to infer this relationship between prediction error and regulation was panel analysis with fixed and random effect. Three metrics were also adopted to determine the forecast error, the absolute value, the positive and the negative.

The models adopted to evaluate the analyst's forecast error were based on the concept of systematic errors, either due to confirmation or anchoring bias. Another aspect evaluated was the segregation of the model by ten sectors, informed by the companies to the securities and exchange commission.

The results obtained do not allow us to refute the proposed hypothesis that regulation influences the analysts' error in forecasting with regard to absolute error and positive error. The study reveals that analysts' forecasts may be erroneous, with

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information far from what was realized, and may still present a confirmation bias, which implies overestimating the most regulated companies.

The results obtained by this research are relevant to understand phenomena and factors that affect the information generated by Brazilian capital market analysts and that are used by investors in this market.

It is suggested that future research should relate the number of state entities that impose regulation on the sectors and evaluate which sectors, given the number of regulatory agents, can influence analysts' forecast errors.

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