The PCAOB sanctions on the Brazilian auditing firms and the reaction of the Brazilian market - an event study

Sanções do PCAOB sobre as firmas de auditoria brasileiras e reação do mercado brasileiro - um estudo de evento

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Abstract

The objective of this work is to measure the financial effect reflected in the behavior of certain companies' shares listed in the Brazilian capital market and audited by Big Four audit firms after public sanctions issued by PCAOB in the period from 2002 to 2017. To achieve this goal, the research methodology applied was the event study, based on historical closing prices of shares extracted by the Economática database. The results presented corroborate the semi-efficient hypothesis of the Brazilian market, since it was possible to observe that the company mentioned in the sanction issued by PCAOB and the companies listed in the IBOVESPA index and audited by BigFour audit firms, suffered abnormal returns following the publication of PCAOB censures in at least one of the periods analyzed for the events under study.

Resumo

O objetivo deste trabalho é de mensurar o efeito financeiro refletido no comportamento das ações de determinadas companhias listadas no mercado de capitais brasileiro e auditadas por firmas de auditoria Big Four, após a divulgação de eventos de sanções emitidas pelo PCAOB no período que compreende os anos de 2002 a 2017. Para alcançar este objetivo, a metodologia de pesquisa utilizada foi a de estudo de evento, a partir do histórico dos preços de fechamento das ações extraído da base de dados Economática. Os resultados apresentados corroboram para a hipótese semiforte de eficiência do mercado brasileiro, uma vez que foi possível observar que a empresa citada na sanção emitida pelo PCAOB e as empresas que compõem o índice IBOVESPA e que são auditadas por firmas de auditoria BigFour, sofreram retornos anormais após a publicação das censuras do PCAOB em pelo menos um dos períodos analisados para os eventos em estudo.

Practical implications

The practical implications are related to the evidence provided of how the Brazilian capital market reacts to events that involve Big Four independent audit quality failures. The results presented corroborate the semi-efficient hypothesis of the Brazilian market.

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1 INTRODUCTION

The objective of this work is to measure the financial effect reflected in the behavior of companies' shares listed in the Brazilian capital market and audited by Big Four audit firms after public sanctions issued by Public Companies Accounting Oversight Board - PCAOB in the period from 2002 to 2017. The study is justified considering that, after more than a decade of existence of the Sarbanes-Oxley Act (SOX), Brazil collects 17 disciplinary orders issued against audit firms and partners who failed in quality inspection processes. The public penalties include Big Four audit firms, including the U$8 million censure published on December 5, 2016 against Deloitte Brazil, the largest one ever imposed in PCAOB's history.

PCAOB is a private non-profit entity that responds to SEC (Securities and Exchange Commission) and has as its mission the protection for investors through regulating activities on the audits of publicly traded companies and brokerage firms (PCAOB, 2017). SOX is comprehensive to all listed companies registered at SEC, which include cross-listing entities in the United States. Lopes, Tukamoto & Galdi (2007) point out that "the institutional environment in Brazil is characterized by poor investor protection and uninformative accounting numbers", and therefore, it is an option for firms with better prospects to commit themselves to an superior governance systems by cross-listing in the US.

According to the PCAOB's annual report released on 27 March 2018, by the end of 2017, there was 1,925 registered firms, which 889 of them were represented by companies not part of U.S jurisdictions. Considering the acronym "PCAOB" as proxy in Web of Science scientific basis, the universe of scientific matters related to PCAOB - update by the year 2017 - is presented as follows: a) United States of America: 117 or 81%; b) Canada - 11 or 8%; c) Singapore: 4 or 3%; d) Australia and Norway: 3 or 2%; and e) England and Malaysia: 2 or 1%. It shows that the scientific production is concentrated in the United States as expected, and, on the other hand, indicates an absence of studies on this matter in Brazil.

Thus, the relevance of this work relates to the understanding of how PCAOB sanctions issued against audit firms are perceived by the Brazilian capital market. Weber, Willenborg & Zhang (2008) applied the Event Study methodology to understand stock and audit market affects when a publicized accounting scandal involving a Germany listed entity and its independent auditor (in that case, KPMG) occurs. They report two key conclusions: first, that KPMG's clients sustain negative abnormal returns around the scandal event date; second, that KPMG faced market share losses because of auditor reputation attrition. This means that, it is possible that, even when bargaining power exists, scandals and regulatory sanctions (considered as relevant firm-specific factors) affect both auditor market share and client's stock returns.

Boone, Khurana & Raman (2014) sought to examine whether the PCAOB's sanction suffered by Deloitte Touche Tohmatsu in 2007 affected the turnover, fees and Deloitte's audit quality in comparison to other Big Four audit firms within three years after the public censure issuance. They also measured the impact of that same event on Deloitte's market share in local audit markets (Boone, Khurana & Raman, 2016). The results have shown that PCAOB's sanction is associated with reduced ability to maintain customer retention as well as to attract new clients.

Additionally, Acito, Hogan & Mergenthaler (2018) recently investigate whether PCAOB-identified audit deficiencies lead to higher audit fees or turnover likelihood for clients of Big Four auditor. As a part of their results, they found that auditor turnover is higher when deficiency exposure is high, but that this relation is observed for smaller clients; since for big clients the audit fees and audit turnover can be moderated through bargaining power.

Finally, Muriel (2013) also examined if there is an increase in client dismissals at Deloitte and negative stock market reaction of Deloitte's clients when the 2007 PCAOB's sanction is public released. As a result, dismissals in the post-sanction period are more likely to occur, but there is no strong evidence related to a negative market reaction; one explanation given by the author is that investors may not perceive the content as informative due to time lapse between when the issues occurred and the sanction's announcement date.

This study represents an opportunity to broaden the context in Brazil about regulatory impacts from the perspective of investors. Apostolou & Crumbley (2008, p. 37) highlight that since "auditors cannot evaluate every transaction of a company, they have to make judgments and decisions dictated by a risk assessment and cost-benefit analysis" in order to guarantee the financial statements are free of material errors. Studies involving independence auditor's quality, in which PCAOB plays a substantial role, contributes to discuss the audit results and its impact in the information reliability to the market.

This paper follows two assumptions: **H$_A$**: stock returns of listed companies object to PCAOB's sanction against Big Four auditing firm, showed negative impacts in the comparison and event windows; **H$_B$**: stock returns of listed companies that integrate IBOVESPA index and which are audited by Big Four auditing firm that suffered PCAOB's penalty, showed negative impacts in the comparison and event windows.

2 THEORETICAL REFERENCE

2.1 Regulatory theory in the field of external audit

According to Healy & Palepu (2001, p. 406), demand for financial reporting "arises from information asymmetry and agency conflicts between managers and outside investors". They argue that regulators, standard setters, auditors and other capital market intermediaries enhances the information disclosure by management. Watts & Zimmerman (1983) point out that quality-assuring devices involve mechanisms that increase the probability the auditor will report a breach in a contract he is to monitor.

DeAngelo (1981b) explain that the value of an audit depends on the auditor's perceived ability to: (1) discover errors or breaches in the accounting system, and (2) withstand client pressures to disclose selectively in the event a breach is discovered. For DeAngelo (1981b), audit quality is not independent of audit firm size. The author claims that the larger the auditor - measured by the number of current clients - and the smaller the client - considering the proportion to the auditor's total quasi-rents -, the higher the perceived quality of the audit. DeAngelo (1981a) points out that SEC is concerned with to auditor fees arrangements, because if an accountant agrees to receive significantly less than the expected, that suggests the risk to produce "dishonest reporting" enhances.

As disclosed by PCAOB's annual report, the purpose of the regulator is to improve the quality of the audit, reducing risk of audit failures of public entities listed on capital market (PCAOB, 2017); in addition, the regulator also aims to promote public confidence about the process of preparation and disclosure of financial report, as well as about the profession of independent audit. The promotion of public trust is also a task of the Brazilian stock market regulator, an autarchy that oversees and develops Brazilian's securities market, protecting market investors against illegal acts, absence of disclosure of mandatory information, demand manipulation, etc. (CVM, n.d.).

Regulation is a broad concept, encompassing more than one scientific approach. Regulation distinguishes between positive and normative theory of regulation (Hertog, 2010). The first approach reflects an analysis of cause and effect, while the other investigates what kind of regulation is the most efficient. The positive theory is adopted, supported by both theories of regulation of the public and private interest. From the perspective of theory of public interest, the fundamentals are market failures and efficient government intervention (Hertog, 2010). On the other hand, the theory of private interest states that economic regulation operates to the benefit of the industry that is regulated (Stigler, 1971). The complementarity between these theories is interesting for the independent audit approach in accounting science, since the mission of the regulators of this profession is established aiming the preservation of a social good (as exposed at the beginning of this chapter); involving, however, non-members of the public sector - PCAOB itself is an example.

These theories are balanced by the theory of competition among interest groups. According to this approach, regulation tends to the side that exercises the greater pressure (Cardoso *et al.*, 2009). In accounting and financial scenarios, the ideal of this theory reflects the understanding that regulation is a "product of different groups among themselves and the State" (Cardoso *et al.*, 2009), reasoning closely linked to the agency theory regarding shareholders and stakeholders (Jensen & Meckling, 1976).

In this research, the application of the theory of competition among interest groups, aims to debate the perspectives involving the emergence of PCAOB as regulatory entity of the independent auditor's activity. It also aims to clarify the importance of PCAOB to the protection of society, represented in this context by minority investors of publicly held companies.

2.2 PCAOB attributions and practical results observed

According to PCAOB's annual report (PCAOB, 2017), the regulator's work program is divided into four major areas: 1) registry of independent audit firms; 2) quality inspections in audit firms' engagements; 3) definition of audit technical standards; and 4) application of coercive instruments when deficiencies are identified. Section 104 of the SOX Act determines that PCAOB annually inspect the firms that emit more than 100 audit reports, within one year, for SEC listed companies; for the other firms, the mandatory inspection's frequency is three years (Ito, Niyama & Mendes, 2008).

According to data published in the PCAOB's annual report regarding the year of 2017, 60 non-American firms were inspected in 28 jurisdictions. In other words, PCAOB's quality program in Brazil jurisdiction comprises audit engagements of SEC listed companies and those clients that are relevant subsidiaries of SEC listed companies. An audit engagement is considered relevant when it plays a substantial role in the consolidated audit level, either for validation of the financial statements, either for implementation or operation of internal controls (SOX assurance).

The mapping of all disciplinary orders already issued by PCAOB for registered companies and/or associated people in Brazil is detailed in Table 1.

Table 1. All disciplinary orders issued by PCAOB to Brazil's jurisdiction

Registered company / Associated people	Big Four	Publication date	Nature of sanction
KPMG Auditores Independentes	KPMG	03/29/2017	Absence of criminal process reporting
Juarez Lopes de Araújo	Deloitte	03/29/2017	Refusal to colaborate with a PCAOB investigation (a)
Michael John Morrell	Deloitte	03/29/2017	Idem to (a)
Wander Rodrigues Teles	PwC	03/20/2017	Accounts receivable audit failure
Walter Vinicius Barreto Brito Silva	Deloitte	12/05/2016	Amendment and inclusion of audit documents after opinion date (b)
Simone Pacheco Lemos do Amaral	Deloitte	12/05/2016	Idem to (b)
Marco Aurelio Paulino Neves	Deloitte	12/05/2016	Idem to (b)
Renata Coelho Sousa Castelli	Deloitte	12/05/2016	Omission regarding amendment and inclusion of audit documents after opinion date (c)
José Fernando Alves	Deloitte	12/05/2016	Idem to (c)
Leonardo Fonseca Freitas Maia	Deloitte	12/05/2016	Idem to (c)
Joao Rafael Belo Araujo Filho	Deloitte	12/05/2016	Idem to (c)
James Roderick Talbot Oram	Deloitte	12/05/2016	Revenue audit failure
André Ricardo Aguillar Paulon	Deloitte	12/05/2016	Refusal to colaborate with a PCAOB investigation
Wanderley Olivetti	Deloitte	12/05/2016	Obstruction and refusal to colaborate with a PCAOB investigation (d)
Maurício Pires Andrade Resende	Deloitte	12/05/2016	Idem to (d)
José Domingos Prado	Deloitte	12/05/2016	Idem to (b)
Deloitte Touche Tohmatsu Auditores Independentes	Deloitte	12/05/2016	Issue of unqualified opinion on Gol Linhas Aéreas Inteligentes S.A's 2010 report

Elaboration by the authors, from PCAOB data.

The events of interest correspond to the disclosure dates of the PCAOB sanctions imposed on Big Four audit firms in Brazilian jurisdiction from 2002 to 2017, but only those sanctions that relates to audit procedures failures in an integrated audit environment. Since KPMG sanction does not correspond to these characteristics, it is not part of our analysis.

Table 2. Events of interest

Big Four	Fiscal year under audit	Date
PwC	2010, 2011	03/20/2017
Deloitte	2010	12/05/2016

Elaboration by the authors.

PCAOB's sanction against Deloitte's work (Event 1 or "Deloitte Event") at Gol S.A. in 2010 financial statements reflected non-compliance with external audit requirements, since the auditors changed their working papers after audit report's issuance. This sanction exposes several fragilities to external users, mainly investors, since it is related to the risk of incomplete content information used as basis for their decision-making process and represents the largest sanction ever imposed in PCAOB's history. Note that this event encompasses disciplinary orders issued against the firm and also against some professionals who were part of the audit team and that were involved in this scandal.

Event 2 corresponds to "PwC Event", which censorship regards the absence of proper addressing the material misstatement risk related to accounts receivable balances and net revenue of a SEC publicly listed company's subsidiary. This error culminated in the resubmission of previously disclosed accounting-financial report, as well the issuance of opinion regarding internal controls reporting.

2.3 Efficient market hypothesis (EMH)

Several studies have proposed examining the impact of public information disclosure to investors since Fama *et al.* (1969). Ball & Brown (2014) examined the process by which stock prices adjust to information based on efficient-market hypothesis and the conclusions are that financial market pricing relates to public information disclosure, aligned with Fama et. al (1969). Recent studies analyzed financial market's reaction to information published by PCAOB, i.e. Dee, Lulseged and Zhang (2010) concluded that clients audited by Deloitte suffered negative stocks' returns ten days before and after the date of the sanction's publication.

The efficient-market hypothesis considers that there are three levels of efficiency; in other words, three levels of speed at which the shares prices the information. Based on Fama (1970), these levels are as follows: i) weak, which incorporates all available public information contained in past prices; ii) semi strong, which aggregates to i) all public information available in current prices; iii) strong, which includes, in addition to i) and ii) non-publicly available information.

The impact on shares' pricing assumes that information analyzed is important to the user who makes the decision. According to the conceptual framework for preparation and disclosure of the financial report, useful information should be, besides relevant, complete, neutral and free of error (CPC, 2011). Therefore, the role played by the independent audit regulator is essential to the proper capital market functioning through maintaining a credibility relationship between the company and the investor (Kos *et al.*, 2014).

Recent researches indicates absence of statistical significance when testing stock pricing hypothesis, such as: event studies involving return analysis and average liquidity of companies' American depositary receipts (Lemes & Neves, 2008), independent audit reputation (Homero Junior, 2014), among other matters. For Antunes *et al.* (2006), in the event of an efficient-market hypothesis refutation, the investor should "identify those badly priced shares to achieve abnormal returns." That is, for their own risk protection, investors need to improve the understanding of Brazilian's stock market operation when they face relevant disclosure information.

Despite PCAOB's revision process could be evaluated as extensive, it is important to understand that when a new information damaging auditor's credibility is available to the market, it may raise concern about the validity of the information considered in decision-making process for the current period.

3 METHODOLOGICAL PROCEDURES

This work focus on quantitative approach based on inferential technics (Martins & Theóphilo, 2009). The event study objective is characterized as descriptive (Kliger & Gurevich, 2014). The method applied is the deductive inference, with empirical-theoretical approach, since it is possible to predict the phenomena related to the tested hypothesis (Lakatos & Marconi, 2003). The event study methodology was applied by stages according to MacKinlay's (1997) adaptation as detailed in the following phases.

Event window definition

According to Baraldi, Jucá & Matsumoto (2016), the event window period corresponds to 5 days of effective trading sessions in Brazilian stock exchange that succeed and precede the publication dates of PCAOB's disciplinary orders objects of this research. The period of 11 days - includes "zero" date - comprised by the event window does not overlap with the time series of the estimation period, since if privileged information leaks, shares' prices negotiated in this window are already contaminated. Finally, the stock prices analyzed correspond to the daily closing prices adjusted for dividends (Homero Junior, 2014).

Sample definition

In compatibility with the tested hypothesis, samples were determined as follows: i) companies mentioned in the sanctions issued by PCAOB; and ii) companies listed in the IBOVESPA index and audited by Big Four audit firms. The sample does not include orders issued against individuals associated to audit firms, since they derive from the original sanction against the firm's legal entity. Therefore, Table 3 presents the sample detail of the events comprised by this study.

Table 3. Sample detail of events studied

Share code	Event date	Auditor
goll4		
abev3		
ccro3		
cmig3; cmig4		
cple3	12/05/2016	Deloitte
cpfe3		
cyre3		
pcar4		
csna3		
ugpa3		
enbr3		
estc3		
ggbr3 ; ggbr4		
goau3 ; goau4		
itaub3 ; itaub4		
klbn3 ; klbn4 ; klbn11	03/20/2017	PwC
krot3		
rent3		
petr3 ; petr4		
qual3		
radl3		
sanb3 ; sanb4 ; sanb11		

Elaboration from *Económática* database.

This step also includes deleting shares not negotiated in the period under review.

Selection of the normal return calculation method

The method of normal return's measurement defined for this research is known as the market model, as explained by Bodie, Kane and Marcus (2014). The objective of this study is to determine the existence of abnormal returns relative to the expected normal return and, for that, in accordance with Camargos and Barbosa (2005), the abnormal return was obtained as follows:

$$RA_{it} = R_{it} - E(R_{it}) \qquad (1)$$

Where: RA_{it} is the abnormal return of share i on date t; R_{it} is the actual return of share i on date t; $E(R_{it})$ is the return calculated by the model of share i on date t.

To estimate the actual return, statistics of continuous capitalization that implies a symmetric distribution (Soares, Rostagno & Soares, 2002) were utilized.

$$R_{it} = Ln \ (P_{it} \ / \ P_{it-1}) \quad (2)$$

Where: P_{it} is the share price i on date t; P_{it-1} is the share price i on date t-1.

Defining the estimation window to measure abnormal returns

The estimation period corresponds to the 180 days prior to the 5 trading days immediately preceding the occurrence of each event (Dee, Lulseged & Zhang, 2011); resulting in 173 effective trading days to estimate the parameter of the model. The selection of the estimate window is based on previous research practices; the authors additionally investigated that there were no other relevant firm-specific events occurring in this estimation period.

Null hypothesis definition

In statistical terms, the hypothesis representation is considered as follows:

H₀: the average abnormal returns between estimation and comparison windows and between estimation and event window are equal (PCAOB's sanction does not negatively affects shares behavior);

H₁: the average abnormal returns between estimation and comparison windows and between estimation and event window are not equal (PCAOB's sanction does negatively affects shares behavior).

Measuring individual abnormal return

Abnormal return calculation:

$$E(R_{it}) = \alpha_{it} - \beta(R_{mt}) + \varepsilon_t \quad (3)$$

Then the abnormal return resulting from the market model will be demonstrated by the following equation:

$$RA_{it} = R_{it} - \alpha_{it} - \beta_i(R_{mt}) + \varepsilon_t \quad (4)$$

Where: RA_{it} is the abnormal return of share i on date t; R_{it} is the actual return of share i on date t; α_{it} and β_i are the estimated regression parameters; R_{mt} is the return of the market index; ε_t is the residue for the period t.

Parameters α_{it} and β_i represent, respectively, the constant and the coefficient of the linear regression. The market index chosen was IBOVESPA, extracted from *Economática* database, since it is "...Brazil's main stock market index… the leading indicator of the average performance of most-active and benchmark stocks in the Brazilian equities market" (B3, 2015), resulting in a reference point to investors.

Aggregating individual abnormal returns

The individual abnormal returns, when accumulated, allows the measurement of arithmetic average of abnormal shares' returns in each of the events days in study (Famá & Silva, 2011).

$$CAR = \sum^n_{(t=1)} RA_{it} \quad (5)$$

Where: RA_{it} is adjusted market return of share i on date t; n is the number of companies on date t; t is the share i on the date t-1.

4 PRESENTATION AND ANALYSIS RESULTS

The individual beta was estimated through linear regression based on historical shares prices regarding the market portfolio (IBOVESPA) during the estimation period. Appendix demonstrate the beta's significance for each regression sample, at a 5% significance level.

To evaluate the normality of the samples' distribution in each event, the Kolmogorov-Smirnov was applied (Baraldi, Normand & Matsumoto, 2016). At a 95% confidence level, the results of each analyzed window did not indicate normal distribution. Due to this fact, non-parametric tests were used to compare the average abnormal returns. The results in each event and each window period will be demonstrated in the following tables.

Table 4. Summary of results obtained from ARs and CARs for the estimation and comparison windows (Event 1)

Share code	Sig.			
	AR - Wilcoxon	**AR - Sign Test**	**CAR - Wilcoxon**	**CAR - Sign Test**
goll4	0.378	0.504	0.000	0.000
abev3	0.660	0.504	0.000	0.001
ccro3	0.870	0.894	0.980	0.350
cmig3	0.032	0.35	0.000	0.000
cmig4	0.028	0.142	0.000	0.000
cple3	0.093	0.229	0.003	0.001
cpfe3	0.642	1.000	0.000	0.142
cyre3	0.378	0.504	0.000	0.000
pcar4	0.378	1.000	0.000	0.000
csna3	0.967	0.688	0.000	0.000
ugpa3	0.689	0.504	0.000	0.000

Elaboration by the authors.

The results presented by Table 4 demonstrate the comparison between individual abnormal returns average (AR) and cumulative abnormal returns (CAR) calculated for the sample shares traded in 56 effective trading days after the occurrence of the Event 1 for estimation and comparison windows. Wilcoxon test results demonstrate that all shares - except ccro3 - contain sig. < 0,05 (or 5%). Since approximately 82% of the sample represents significant statistical results, it is possible to conclude that there was market reaction in relation to PCAOB's sanction against Deloitte for the period of 60 days after the occurrence of the event. Signs test reaffirm this conclusion, except for ccro3 and cpfe3.

Table 5. Summary of results obtained from ARs and CARs for the estimation and comparison windows (Event 2)

Share code	Sig.			
	AR - Wilcoxon	**AR - Sign Test**	**CAR – Wilcoxon**	**CAR - Sign Test**
enbr3	0.922	0.504	0.021	0.011
estc3	0.405	0.894	0.000	0.000
ggbr3	0.234	0.504	0.000	0.000
ggbr4	0.215	0.229	0.000	0.000
goau3	0.121	0.142	0.000	0.000
goau4	0.129	0.350	0.000	0.000
itaub3	0.493	0.688	0.000	0.000
itaub4	0.763	0.688	0.000	0.000
klbn4	0.671	0.688	0.000	0.000
klbn11	0.316	0.688	0.000	0.000
krot3	0.181	0.142	0.000	0.000
rent3	0.293	0.229	0.000	0.000
petr3	0.361	0.229	0.941	0.045
petr4	0.206	0.229	0.001	0.002
qual3	0.036	0.504	0.000	0.002
radl3	0.101	0.229	0.000	0.000
sanb4	0.493	1.000	0.000	0.000
sanb11	0.365	0.894	0.000	0.000

Elaboration by the authors.

The results presented by Table 5 demonstrate the comparison between individual abnormal returns average (AR) and cumulative abnormal returns (CAR) calculated for the sample shares traded in 56 effective trading days after the occurrence of the Event 2 for estimation and comparison windows. Wilcoxon test results demonstrate that 94% of the sample indicates market reaction in relation to PCAOB's sanction against PwC for the period of 60 days after the occurrence of the event. Signs test reaffirm this conclusion.

Table 6. Summary of results obtained from ARs and CARs for the estimation and event windows (Event 1)

Share code	Sig.			
	AR - Wilcoxon	**AR - Sign Test**	**CAR - Wilcoxon**	**CAR - Sign Test**
goll4	0.155	0.549	0.004	0.012
abev3	0.131	0.227	0.003	0.001
ccro3	0.790	0.549	0.010	0.065
cmig3	0.594	1.000	0.003	0.001
cmig4	0.790	1.000	0.003	0.001
cple3	0.722	1.000	0.003	0.001
cpfe3	0.286	0.065	0.477	1.000
cyre3	0.155	0.549	0.004	0.012
pcar4	0.248	0.227	0.003	0.001
csna3	0.477	1.000	0.328	1.000
ugpa3	0.033	0.227	0.003	0.001

Elaboration by the authors.

The results presented by Table 6 demonstrate the comparison between individual abnormal returns average (AR) and cumulative abnormal returns (CAR) calculated for the sample shares traded in 11 effective trading days included in the event window of the Event 1 for estimation and event windows. Wilcoxon test results demonstrate that 73% of the sample indicates statistical results are significant for refutation of the null hypothesis (cpfe3 and csna3 presented sig. > 0.05).

It is possible to conclude that the results point to a negative market reaction of PCAOB's sanction against Deloitte for the event window period. The conclusion reached by this work is divergent from the results obtained by studies with similar investigation (Homero Junior, 2014). This divergence of results is probably explained by the magnitude of PCAOB event analyzed, since Homero Júnior (2014) does not cover an event at the size of a SOX regulator's censure.

The results presented by Table 7 demonstrate the comparison between individual abnormal returns average (AR) and cumulative abnormal returns (CAR) calculated for the sample shares traded in 11 effective trading days included in the event window of the Event 2 for estimation and event windows. Wilcoxon test results demonstrate that 39% of the sample indicates statistical results are significant for refutation of the null hypothesis. The shares which sig. < 0.05 (or 5%) are: enbr3, itaub3, itaub4, rent3, petr3, petr4 and qual3. In respect to Signs test, itaub3, itaub4 and petr3 also presented sig. > 0.05 (or 5%), turning down the statistical results indicated by Wilcoxon test to 22%. Thus, both tests points that there was no market reaction in relation to PCAOB's sanction against PwC in the event window period.

Table 7. Summary of results obtained from ARs and CARs for the estimation and event windows (Event 2)

Share code	Sig.			
	AR - Wilcoxon	AR - Sign Test	CAR – Wilcoxon	CAR - Sign Test
enbr3	0.790	1.000	0.006	0.012
estc3	0.155	0.227	0.722	1.000
ggbr3	0.534	1.000	1.000	1.000
ggbr4	0.594	1.000	0.594	0.549
goau3	0.131	0.227	0.182	0.549
goau4	0.155	0.549	0.155	0.549
itaub3	0.424	0.549	0.01	0.065
itaub4	0.477	0.549	0.016	0.065
klbn4	0.374	0.227	0.155	0.227
klbn11	0.722	1.000	0.594	0.549
krot3	0.534	1.000	0.477	0.549
rent3	0.929	0.549	0.004	0.012
petr3	0.859	1.000	0.026	0.065
petr4	0.131	0.227	0.003	0.001
qual3	0.374	1.000	0.003	0.001
radl3	0.286	0.549	0.075	0.227
sanb4	0.790	1.000	0.248	0.549
sanb11	0.657	0.549	0.859	0.549

Elaboration by the authors.

5 CONCLUSIONS

This study sought to measure the financial effect reflected in the behavior of companies' shares listed in the Brazilian capital market and audited by Big Four audit firms after public sanctions issued by PCAOB in the period from 2002 to 2017. Event 1 sample ("Deloitte Event") comprised 10 companies and 11 shares traded on B3 on the event date, while Event 2 sample ("PwC Event") comprised 12 companies and 20 shares traded on B3 on the event date.

Previous research has showed that audit firm reputation is relevant for market share management (audit fees and audit turnover are two key factors in that discussion). From an investor's perspective, reputation also impact the stocks returns, as the informational content of a PCAOB sanction is related to low audit quality; and can also be related to a fraud occurrence. A limitation of this work is related to the time lapse between the audit work and the PCAOB disciplinary orders' issuance, which does not enable us to investigate a wider sample of occurrences.

The results presented here support the semi strong efficiency hypothesis of Brazilian's capital market, since it was possible to observe abnormal returns after PCAOB's censures announcements in at least one of the events under study. The application of non-parametric statistic test for paired data in the periods of comparison and event windows of "Deloitte Event" and "PwC Event" events indicated negative market reaction caused by PCAOB's censure disclosure against Big Four audit firms.

Comparative research on the relationship among the PCAOB, Big Four auditors, and the Brazilian capital market form a significant field of studies. As recommendation, it is suggested that new future academic research consider another composition of days for comparison and event windows. In addition, it can also include as another research step a questionnaire application with investors of publicly-held companies to capture their perception about the relevance of PCAOB' sanctions to the proper functioning of the capital market.

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Appendix - Summary of regression results testing

Code	Beta	t Statistic	P-value
goll4	1.924126	7.61	0.000
abev3	0.3490554	6.87	0.000
ccro3	0.9794134	11.40	0.000
cmig3	1.32997	11.01	0.000
cmig4	1.420119	11.52	0.000
cple3	1.160457	10.42	0.000
cpfe3	0.525638	8.61	0.000
cyre3	1.075978	11.37	0.000
pcar4	0.8787848	8.65	0.000
csna3	2.312176	12.18	0.000
ugpa3	0.4825863	8.10	0.000
enbr3	0.5418355	7.13	0.000
estc3	0.9689456	7.53	0.000
ggbr3	1.046462	6.28	0.000
ggbr4	1.338886	8.57	0.000
goau3	1.184853	6.84	0.000
goau4	1.535346	8.40	0.000
itaub3	0.9882159	15.02	0.000
itaub4	1.045844	19.01	0.000
klbn4	0.2740021	2.61	0.010
klbn11	0.3419747	3.00	0.003
krot3	0.9990703	7.94	0.000
rent3	1.07329	9.58	0.000
petr3	1.602163	16.00	0.000
petr4	1.747309	19.06	0.000
qual3	0.8783847	6.72	0.000
radl3	0.5973822	7.36	0.000
sanb4	0.8070723	5.74	0.000
sanb11	1.219926	15.70	0.000

Elaboration by the authors.