Revista Catarinense da CIÊNCIA CONTÁBIL

ISSN 2237-7662, Florianópolis, SC, v. 18, 1-15, e2806, 2019

DOI: 10.16930/2237-766220192806
Available at http://revista.crcsc.org.br

CRCSC CONSELHO REGIONAL DE CONTABILIDADE DE SANTA CATARINA

TEMPORARY RELATIONSHIP BETWEEN QUARTERLY EARNINGS AND STOCK RETURN IN BRAZIL

FRANCIANE DE OLIVEIRA ALVARENGA
Universidade Federal do Rio de Janeiro. ***Address:*** *Rua Coronel Elpídio Gonçalves da Costa, 587B, Vila Marchetti | 36307-246 | São João Del Rei/MG | Brazil.*
http://orcid.org/0000-0002-4008-1429
francianealvarenga@ufsj.edu.br

LEILA BATISTA MELLO
Universidade Federal do Rio de Janeiro. ***Address:*** *Rua Filodentro, casa 133 – Condomínio Capim Melado, Freguesia | 22750-650 | Rio de Janeiro/RJ | Brazil.*
http://orcid.org/0000-0002-8478-9162
leilalbm63@gmail.com

MANOEL VITOR DE SOUZA VELOSO
Universidade Federal de Alfenas. ***Address:*** *Rua Osvaldo Henrique Valadão, 65/202, Rezende | 37623-370 | Varginha/MG | Brazil.*
http://orcid.org/0000-0003-4118-6780
manoel.souza@unifal-mg.edu.br

MARCELO ALVARO DA SILVA MACEDO
Universidade Federal do Rio de Janeiro. ***Address:*** *Av. Pasteur, 250 – Sala 250 – FACC/UFRJ, Urca | 22290-240 | Rio de Janeiro/RJ |Brazil.*
http://orcid.org/0000-0003-2071-8661
malvaro.facc.ufrj@gmail.com

ABSTRACT

The objective of this study is to analyze the time series properties of quarterly accounting earnings and their relationship with the stock price (return) in Brazilian companies with shares in the Ibovespa from 2010 to 2016, after adoption of IFRS. Thus, of the 58 companies with shares active on the date of collection, 48 companies were analyzed, since those companies with no information in those years were withdrawn, totaling 1624 observations. For that multivariate model of time series of autoregressive vectors (VAR) was used and tests were applied to time series analyzed in order to verify their properties. The research findings pointed out that there is no long-term relationship and nor causality between quarterly earnings and stock returns in the companies studied. In addition, it has been observed that return is more sensitive to changes in quarterly earnings than the reverse. By decomposing the variance of the forecast errors of average earnings and average stock return, the results showed a direction of causality toward quarterly earnings for stock returns. The impulse-response function also allowed us to observe that stock return is more influenced by earnings shocks than the opposite, showing a short-term adjustment.

Keywords: Quarterly Accounting Earnings. Stock Price. Time series.

Submitted on 12/28/2018. **Reviewed on** 03/07/2019. **Accepted on** 03/19/2019. **Published on** 04/23/2019.

1 INTRODUCTION

In an increasingly developed and complex market, accounting plays an extremely important role external users as regards the ability to provide information that influences their decisions – also called informativeness or information content.

Considering that accounting reports are the main source of economic and financial information of companies, the adoption of International Financial Reporting Standards (IFRS) had as main objective to guarantee the improvement of disclosed information, making them more understandable, relevant, reliable and comparable – that is, useful for the decision-making process of users, especially those who are external to the company (Antunes, Grecco, Formigoni, & Mendonça Neto, 2012).

Companies having information content in an efficient marketplace cause the information disclosed to interfere with investors' expectations about their future returns and therefore affect company's current value. In the last 50 years, this subject has motivated several researchers to prove this relationship, although research shows contrary results since its emergence (Ball, & Brown, 1968; Kothari, 2001; Lev, & Amir, 1989).

Antunes *et al*. (2012) mention the importance of analyzing the information generated and disclosed after adoption of IFRS, since they have brought significant changes in the recognition, measurement and disclosure of equity and performance elements. Thus, implications for the different standards of economic, financial, and performance indicators are expected from new financial statements, making it important to review current parameters of indicators and the analysis process itself, especially financial analysts and financial professionals.

The objective of this study is to analyze the time series properties of quarterly accounting earnings and their relationship with the stock price (return) in Brazilian companies with shares in the Index of the São Paulo Stock Exchange (Ibovespa) from 2010 to 2016, after the adoption of IFRS. It is believed that accounting after the adoption of IFRS is no longer developed simply for fiscal purposes and to obtain credit, starting to focus on the essence of the form. Such fact would reflect a greater relation between profit and return, since there were changes in profit measurement, making them timelier and more reliable.

Foster (1977) argued that time-series research is important for accounting and finance, such as the "smoothing literature": managers may be aware of the stochastic process that generates the accounting series when making smoothing decisions.

Kothari (2001, p.148) states that the interest in time series of quarterly gains arises for at least four reasons: 1) quarterly earnings are seasonal in many industries due to the seasonal nature of their core business; 2) quarterly earnings are more timely, so that using projections as proxies, for market expectations, it is likely to be more accurate than using a stagnant annual earnings forecast; 3) Generally Accepted Accounting Principles (GAAP) require that quarterly reporting period be an integral part of the annual, so that companies are required to estimate annual operating expenses and allocate them to quarterly periods (most important, quarterly results are potentially more powerful to test the hypothesis of positive accounting theory and capital market research); and 4) there are four times more quarterly earnings than annual earnings, which means less stringent data availability requirements, using quarterly data to achieve the same degree of forecast accuracy.

Better understanding of the causal vector between profit and price is extremely important for the Brazilian market, as investors are constantly seeking new ways to predict the companies' future results more accurately. The results of an analysis on the time series of return and stock price will allow investors to check whether there is evidence that the efficiency hypothesis and the importance of accounting serve as mechanisms for transmitting information content and whether they underpin Brazilian market.

In addition, for the period analyzed, it is considered that after full convergence of accounting standards in 2010, most of companies reported significant increases in both profit and net worth as a result of this convergence. Thus, the effective economic performance of Brazilian

companies was superior to what could be shown by the analysis of previously produced reports. (Santos, 2012).

Thus, Santos (2015) points out that IFRS-standard accounting reports more accurately reflect the economic reality of companies, thus requiring more attention from analysts and time-series scholars covering this transitional period of standards.

2 THEORETICAL REFERENCE

Several studies have used time series to analyze the relationship between profit and return both in the world and in the Brazilian market. Each work has an approach, vision and form of analysis of the accounting data that differs from this study; one of the focuses of this article being the discussion of results obtained after implementation of IFRS in Brazil for companies belonging to Ibovespa.

Long before IFRS implementation, Foster (1977) examined the time behavior of profit, sales, and expenditure quarterly series of 69 companies during the period from 1946 to 1974. For this, it adopted a Box-Jenkins time-series methodology. Based on the inspection of transverse autocorrelation function, we concluded that each series has an adjacent component from quarter to quarter and a seasonal component. Advanced forecasting results have shown that these two components can be successfully modeled at the individual enterprise level. The use of several quarterly forecast models in security price analysis is also examined. The results are consistent with market adjustment for seasonality in quarterly earnings, the variation interpretation of each quarter of earnings.

O'Hanlon (1991), on the other hand, verified whether return on equity (ROE) would have an impact on stock returns, or vice versa. To do this, he used Granger Causation Test methodology in 222 companies in the United Kingdom, with annual data from 1968 to 1987, and the results pointed out that there is bidirectional causality among the variables. ROE has more influence on the return of shares than otherwise.

Differently, Martikainen and Puttonen (1993), who investigated the informational efficiency of stock markets, focusing on the relationship between stock prices, ROE and corporate cash flows, performed a cointegration analysis in 21 companies in Finland, with data from 1974 to 1989. Concluding that stock returns influence ROE, not the other way around. Such result was different from that presented by O'Hanlon (1991). In addition, the cointegration analysis indicated that by including error correction based on non-stationary price variables, it significantly improved the association found between accounting and stock market variables.

Jindrichovska (2001) investigated the relationship between accounting data and market price return of shares of companies listed on Prague Stock Exchange (PSE), through a cointegration analysis. A total of 63 industrial companies from Czech Republic were analyzed between 1993 and 1998. The evidence showed that there is a relationship between the studied variables for measurements of one year or more.

In a discussion of the relationship between accounting variables and prices, Kothari (2001) presents an association study that tests the positive correlation between accounting performance (e.g. profits or cash flow from operations) and stock returns, both measured in current relatively long time periods, e.g., one year. Because market participants have access to many more timely sources of information about a company's cash flow generation capability, association studies do not assume that accounting reports are the only sources of information for market participants. The author stresses that there is no causal relationship between the accounting information and the share price, and that the objective was to test how quickly accounting measures capture the changes in the set of information that are reflected in stock returns over a period.

In line with previous research, Galdi and Lopes (2008) analyzed the relationship between accounting profit and share prices, through a cointegration analysis in 41 companies in Latin

America. In addition to the cointegration test, they investigated Granger's causality between profit and share price. In their results, the authors showed that there is a long-term relationship between profit and share prices for most of the companies analyzed.

Tswei (2013) also evaluated the relationship between accounting data and the return, through the stock market price. The author evaluated companies from Taiwan with quarterly data from 1981 to 2012, using vector error correction (VEC). He observed low relevance in the long-term analyzes, in contrast with greater relevance in the short term.

In Brazil, Lopes (2002, p. 58-59) reports that "the evidence regarding Latin America in international accounting literature practically does not exist. The national literature has also been presenting few contributions to the empirical study of the accounting role in the Brazilian market."

In Lopes's (2003) study of causality between profit and return, the author found evidence that, for small lags (one to three periods), there is causality in the sense of profit for return, but these conclusions could not be extended, since only two companies were analyzed.

Shortly before IFRS is implemented in Brazil, Van Doornik (2007) verified the relationship between accounting and macroeconomic variables that predicted the economic-financial behavior of a Brazilian company using VAR. The study was conducted at Petróleo Brasileiro S.A. (Petrobrás) and pointed out that VAR has greater predictive capacity than the multiple equation system.

With similar findings to O'Hanlon (1991), in the United Kingdom, Costa Jr, Meurer and Cupertino (2007) verified, in Brazilian companies, the relationship between ROE and RET series through Granger causality. The study was conducted in 97 companies listed on BM&FBovespa with quarterly data from 1995 to 2007. The results showed that there is bidirectional causality among the variables. Like O'Hanlon (1991), in the period from 1968 to 1987, the authors had results that showed that ROE exerts a greater influence on the return of shares than the opposite.

On the other hand, Costa Jr., Martinez, Coelho and Cupertino (2008) analyzed the properties of quarterly profit time series of Brazilian companies from 1995 to 2006, and verified that there is a negative relation between the successive variations of quarterly profits – that is, companies that increased their earnings above average over a given period, tended to vary below average in subsequent periods.

Sonza and Kloeckner (2009) verified the short-and long-term relationship between accounting profit and the respective share price by using the cointegration analysis method and VEC for 20 companies of BM&FBovespa, with quarterly data from 1990 to 2008. In their results, the authors pointed out that profits influence the stock price in the long run; their findings diverge in some points from that presented by Costa Jr, Meurer and Cupertino (2007).

Using data prior to the implementation of IFRS in Brazil, Pimentel and Lima (2010) analyzed the properties of quarterly profit time series from 1995 to 2009, of 71 Brazilian companies listed on the stock exchange, using an autoregressive model. The results pointed to a significant relationship between earnings and stock prices, but the direction of causality is not usually defined – suggesting that the profit-to-return ratio should be analyzed at the company-specific level. The authors also mention that the increase in extraordinary items in recent years results further weakened the relationship between unexpected short-term gains and revisions in future earnings expectations, as captured in the price change announcement period. These extraordinary items, in the income statement, were no longer allowed as of the adoption of IFRS.

Also prior to convergence to international standards, Campos, Lamounier and Bressan (2012) verified, through the Granger causality test, the relationship between the quarterly series of accounting profits and RETs of Brazilian companies with different levels of disclosure requirements. The sample analyzed consisted of 75 companies listed on BM&FBovespa, from 1995 to 2010. The variables analyzed were ROE and RET. It was not verified that the causality between ROE and RET is greater for companies that have a higher level of requirement of disclosures of the accounting information, allowing to infer that net profits of the companies

disclosing more accounting information do not have more causality with RET than the others companies – in this case there was still no need for further disclosure and disclosure in accounting data.

Using periods before and after IFRS implementation, Brugni, Favero, Flores and Beiruth (2015) evaluated 36 companies in Brazilian capital market from 2003 to 2013, seeking to investigate whether there were incentives for the accounting information disclosed to follow the actions, not otherwise. To this end, we first explored the time relationship between the surprise component of profits and the stock price, through the application of Granger causality test. Later, the logistic regression technique was used to identify potential incentives that could increase the probability of occurrence of the causality vector, in the Granger sense, from price to profit. The results indicate that, of the companies analyzed, 11 have the surprise component of Granger profit – causing price – and in 10 the market is able to anticipate, in the short term, the surprise component of future profit.

Also in the Brazilian stock market, Deorce, Carrasco Gutierrez, Reis and Castro (2018) investigated the cause and effect relationship between ROE and RET in Brazil, analyzing temporal precedence and looking for evidence on predictive capacity. Through Granger causality test, they analyzed the cause and effect relationship between ROE and RET of the companies listed on the BM&FBovespa from 1995 to 2009 – that is, prior to the international standards implementation. The results indicated that, in general, there is no evidence of causality between RET and ROE in any direction, and it is not possible to point out, in these cases, temporal precedence, which demonstrates the low power of improvement of forecast variance with the inclusion of one of the variables.

Given the few time-series studies after implementation of IFRS in Brazil, using the theoretical assumptions and the empirical evidence presented and discussed in previous section, we should question whether such evidence remains about the relation between accounting profits and the returns/prices of shares, with samples subsequent to implementation of IFRS in Brazil. Therefore, the hypotheses of this research are:

H1: There is a long-term relationship between quarterly profits and the return of shares of Brazilian companies with interest in Ibovespa from 2010 to 2016 – that is, after implementation of IFRS.

H2: There is causality between quarterly profits and the return of shares of Brazilian companies with interest in Ibovespa from 2010 to 2016 – that is, after implementation of IFRS.

3 METHODOLOGY

3.1 Type of research

Considering that the research has inherent characteristics to the positive tradition of Accounting, this work adopts an empirical-analytical methodological approach in order to search the properties of quarterly profits time series in relation to the stock price return.

In order to meet the research objectives, this study can be classified as an explanatory investigation. For Gil (2002, p. 42), the purpose of the explanatory research is to "deepen the knowledge of reality and explain the reasons why […] the central concern of this type of research is to identify the factors that determine or contribute for the phenomena to occur."

Research has quantitative nature when using sampling, processing and data analysis techniques, which according to Oliveira (2011, p. 81), "quantitative research uses statistical methods such as descriptive statistics to confirm hypotheses." Martins (2002) corroborates that this type of research seeks to privilege practical studies and to worry about causal relations between variables.

As for the technical procedures used, this research can be classified as bibliographical, since it uses material already prepared by other authors, such as books and scientific articles. For Marconi and Lakatos (2002, p. 71), "bibliographic research is not simply a repetition of what has

already been said or written about a certain subject, but allows the examination of a subject under a new focus or approach, reaching innovative conclusions." In addition, it is considered as *ex-post-facto* that according to Gil (2002, p. 49) consists of a systematic and empirical investigation, in which "the researcher does not have direct control over the independent variables."

3.2 Data collection and selected variables

The database used in this study was generated on April 13, 2017, through information contained in Economática software database. A historical series between the years 2010 and 2016 was used for companies listed on the stock exchange and which had interest in Ibovespa, on the date of collection. Thus, 58 companies with active shares in portfolio were selected, at the time of data collection, of 16 sectors and of various sizes.

The objective of this study was to analyze the time series properties of quarterly accounting profits and their relationship with the price (return) of shares in Brazilian companies with shares in Ibovespa from 2010 to 2016, the analysis of variables per share (VPS) and the return on the stock (RET) was based on quarterly data, starting in the first quarter of 2010, until the fourth quarter of 2016, totaling 28 quarters.

Considering 58 companies with shares between 2010 and 2016, only 48 companies were analyzed, since those with no information in the said years were withdrawn, totaling 1624 observations.

Ball e Watts (1972), mentioned by Costa Jr. *et al.* (2008), point out that the procedure for restricting business remarks, with data for most of the series, has the effect of concentrating the analyzes only on "surviving" firms, and thus the decreases observed in profit series will be few and underestimated.

The quarterly accounting results consist of accumulated earnings in three months (January-March, April-June, July-September and October-December).

The share price (P) is the official closing price in local currency, adjusted for dividends. Thus, the first available price for the date was selected, considering a window of five working days. Subsequently, RET was calculated quarterly as follows:

$$RET = nl \left(\frac{P_t}{P_{t-1}} \right)$$

Where: nl = natural logarithm

Tp = is the price adjusted for dividends at the end of t period

Quarterly returns were calculated considering March-May, June-August, September-November and December-February ranges for the first, second, third and fourth quarters, respectively. This method is also used by Pimentel and Lima (2010) and aims to capture any feedback reaction associated with earnings announcement for the quarter.

Considering that only companies that had information for all periods were analyzed, and in order not to underestimate the results, a joint analysis was performed, using the average profit of the companies in each quarter, in order to know the relation between profit and return from 2010 to 2016, after adoption of IFRS. Thus, consolidating the quarterly averages of all companies, and not each separately, 28 quarters totaled in seven years.

3.3 Analysis tool

In order to reach the objective proposed, a multivariate model of time series of VAR was used and tests were applied to time series analyzed in order to verify their properties. VAR model is widely used to capture the evolution and interdependencies between multiple time series, generalizing the concept of univariate autoregressive models into a multivariate space.

VAR method describes a linear function of the past evolution of a set of variables over the same period of time. Thus, Caiado (2002) states that these models examine linear relationships between each variable, and the lagged values of itself and all other variables; they take into account the existence of relations of interdependence between variables and allow to evaluate the dynamic impact of random disturbances on their system – which makes them particularly useful and efficient in predicting the future behavior of interrelated time series. For this, all included variables are considered as endogenous, forming a system of equations estimated by the Ordinary Least Squares (OLS) Method. (Gujarati, 2011)

A basic condition for the application of VAR methodology is that the time series is stationary, e.g., it does not present a tendency or seasonality. According to Gujarati (2011), a time series is stationary when its mean and variance are constant over time and covariance value between two time periods depends only on the distance or lag between the two periods, not the period of effective time at which covariance is calculated.

The first stage of the work consisted in checking that the time series is stationary. A study of autocorrelation function of the series was performed to know if for the 27 lags of the series in question were within the limits of a 95% confidence interval for the correlation between their values. The Increased Dikey-Fuller test was also used to verify the stationarity of these series.

After the stationarity check, Engle-Granger cointegration tests were performed. If there are cointegration relationships between the series, they are said to have a stable linear relationship in the long run, or equilibrium between them (Gujarati, 2011).

In the next step, we performed Granger causality test (1969). This test aims to overcome the limitations of using simple correlations between variables, since correlation does not imply causality alone (cause and effect relation). Thus, a variable X causes another variable Z in the sense of Granger, if the observation of X, in the present or in the past, helps to predict the future values of Z, for some time horizon. Carneiro (1997) states that the identification of a statistical relationship between two or more variables, however strong it may be, cannot establish a causal relationship between them. For him, any causal relationship must originate from outside of statistics, basing itself fundamentally on some established theory or even common sense. The causal relationship between the variables is key within the time series analysis, because, although the regression analysis deals with dependence of one variable in relation to others, this dependence does not imply a causal relationship. Since the future cannot predict the past, if the variable X causes (in the sense of Granger) the variable Y, then changes in X must precede changes in Y.

Finally, the impulse-response function (IRF) and the variance decomposition will be investigated, which allow to verify the relations (effects) of profit shocks in return and vice versa. Enders (2010) mentions that, through impulse-response instruments, it is possible to visualize the response of a particular variable to a specific shock in innovations (residuals) of the model (increase of one unit), while the other shocks remain constant. In addition, it is possible to observe how long the shock dissipates to return to the stable long-term trajectory (error correction).

To estimate the tests and models presented previously, Gretl statistical software was used. In the following section, the main results obtained by estimates presented in the proposed methodology are presented and discussed.

4 PRESENTATION AND ANALYSIS OF RESULTS

In order to analyze the time series properties of quarterly accounting profits and their relationship with the price (return) of the shares in Brazilian companies with interests in Ibovespa, the multivariate VAR time series model was used and tests were applied to the time series analyzed in order to check their properties. It should be noted that Ibovespa is formed by shares of the companies with the highest liquidity and the highest financial volume traded of the stock market's total turnover, being considered the main index of the stock market, serving as a reference for investors around the world.

The analysis was started describing the series of average profit and average quarterly return of companies, according to Figures 1A and 1B. By means of the figures, it can be noticed, initially, that the behavior of the quarterly series does not coincide.

A B

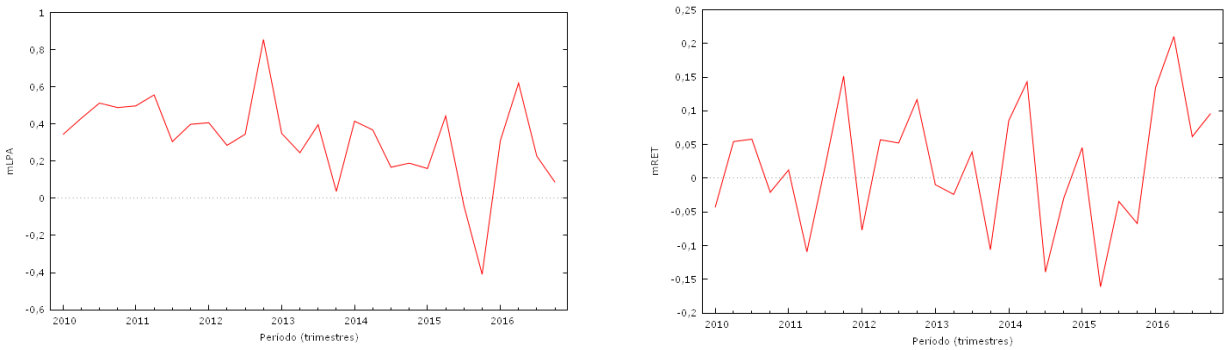


Figure 1. Quarterly average profit (mLPA) and (B) quarterly average return (mRET) series from 2010-1 to 2016-4
Source: Prepared by the authors (2017).

Then, the correlograms of the series in question were generated to check their stationarity, as shown in Figure 2.

A B

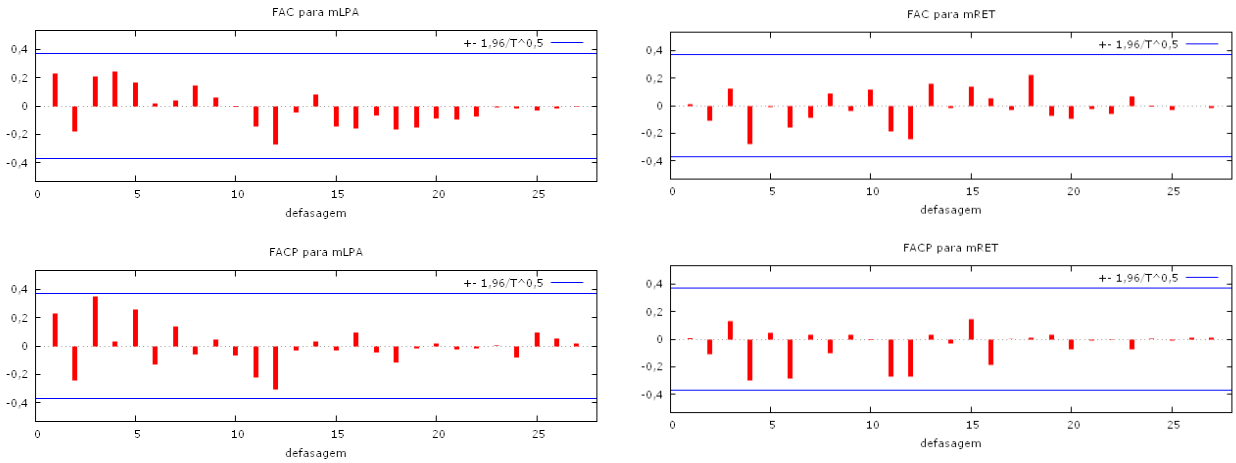


Figure 2. (A) – Autocorrelation Graph (FAC) and partial autocorrelation (FACP) of quarterly average profit; (B) – Autocorrelation Graph (FAC) and partial autocorrelation (FACP) of quarterly average return; from 2010-1 to 2016-4.
Source: Prepared by the authors (2017).

The correlograms allowed us to see that correlations in the 27 possible lags are within the confidence limits at the 95% level, stating that the series are stationary. The Dickey-Fuller unit root test was done, confirming that the series have a unit root. Therefore, it would be necessary

to work with the series first differences so that they were considered stationary. It was decided not to differentiate the series by the fact that the correlograms already presented non-significant autocorrelations (statistically null), indicating stationarity, and also because, with the first differences, the sample, which is already small, would be reduced in one observation, and may further reduce the chances of finding a causal or long-term relationship between the series.

In order to know if the series have a long-term relationship, the Engle-Granger cointegration test was performed (Table 1). For the series to be cointegrated, unit root tests are done on the profit, return, and residue series of cointegrante regression (mLPA as a function of mRET). The profit and return series will be cointegrated if the quarterly average profit and return has a unit root (p-value>significance level) and the residuals do not have (p-value<significance level).

Table 1
Engle-Granger cointegration test at 5% level of significance

Series	P-value of unit root test
mLPA	0.3906
mRET	0.1256
Cointegrante regression residues	0.8564

Source: Prepared by the authors (2017).

According to Table 1, mLPA and mRET series and cointegrating regression residual series have unit root (p-value>0.05). Thus, we can say that the series are not cointegrated, indicating that they are not related to the long term, but rather to the short term, thus rejecting the first hypothesis of this study.

The Granger causality test can be seen in Table 2.

Table 2
Granger causality test

Direction	Lags	P-value (F-test)	Decision
mLPA → mRET	3	0.2034	mLPA does not cause granger mRET
mRET → mLPA	3	0.1932	mRET does not cause granger mLPA

Source: Prepared by the authors (2017).

It can be seen in Table 2 that, as the causality test was not significant for both directions, the causality between the series was not verified. Therefore, the second hypothesis is rejected as well. It is worth noting that, since there are only 28 observations in the series in question, cointegration and causality tests may be underestimated.

However, as we have the stationarity of the two series, we proceeded with the bivariate VAR(d) adjustment, where "d" is the number of lags chosen from among those indicated, by some information criterion. For this, the Akaike (AIC), Bayesian (BIC) and Hannan-Quinn (HQC) information criteria were used to select the appropriate number of lags for VAR setting. Table 3 presents the result for such selection.

Table 3
Selection of lags for adjustment of autoregressive vector model (VAR)

Criteria	Value	Lags
AIC	-5.0225	8
BIC	-3.3298	8
HQC	-4.6921	8

Source: Prepared by the authors (2017).

The AIC had the lowest value and should choose the number of lags indicated by this criterion, but the other criteria also indicated that the number of lags was eight, confirming that there were eight lags indicated – VAR (8).

After this step, VAR adjustments were made, and the first one to be tested was VAR (8), as indicated by the criteria for the selection of lags. However, VAR model(8) did not present residues distributed as white noise, and were not stationary. The adjustment was also attempted for "d" assuming values (7, 6, 5, 4, 2 and 1), all presenting non-stationary residues. With the exception of VAR model (3), which presented stationary residues, as can be seen in Table 4, where the Ljung-Box autocorrelation test for stationarity of the residuals is presented to each equations of the adjusted model VAR (3), testing the H0: the residues are stationary, using Q statistic with chi-square distribution.

Table 4
Ljung-Box test for residual autocorrelation

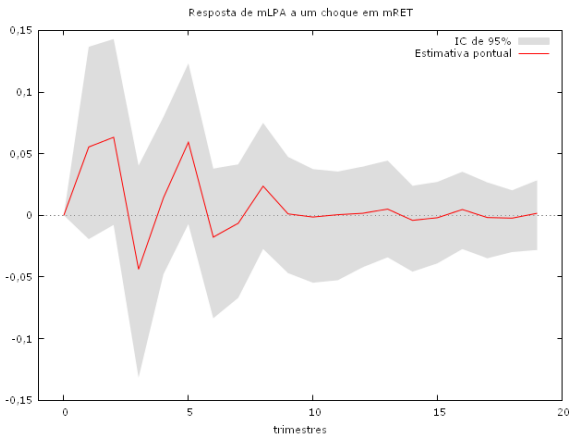
Dependent variable	Q statistic	P-value
mLPA	8.9535	0.2034
mRET	10.2522	0.1932

Source: Prepared by the authors (2017).

With the model identification and adjustment, the analyzes of the impulse response functions and the variance decomposition were performed. The results are shown in Figures 3A and 3B and Table 4.

In the impulse-response functions (FIR), we simulated an unanticipated shock on return to profit, and profit on return. Figure 3A shows the impulse-response function for profit and 3B for return. The functions are represented by their point estimate and the gray area corresponds to a 95% confidence interval.

A



B

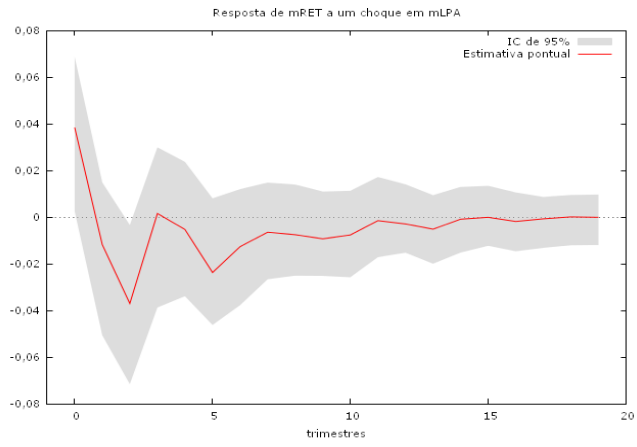


Figure 3. (A) – FIR of average profit to a return shock; (B) – FIR of the average return to a profit shock.
Source: Prepared by the authors (2017).

It can be seen in Figure 3A that LPA response to the return shock stabilizes approximately within nine periods (two years and one quarter) – which, for a series of 28 quarters, indicates a short-term adjustment, not having any effect on the profit in the following quarters. In Figure 3B, the result of the return impulse-response function to a profit shock suggests a negative effect on the return, falling from the second quarter and remaining until the twelfth quarter (three years) approximately, making it ineffective from the fourth year, when the

curve becomes uniform. However, it can be seen that the adjustment period is higher than that of Figure 3A, indicating that the return is more influenced by profit shocks than the opposite, which may, if the analysis had a longer period, be indicative of long-term relationship. But in the period studied, what can be observed is a short-term adjustment.

Such result is similar to Kothari (2001) in his study, when he pointed out that there is no causal relationship between the accounting information (quarterly profit) and the share price (return). But using the time series, the objective would be to check how quickly accounting measures capture the changes and reflect them in the stock price in a given period.

This is a fact that also corroborates the results of Tswei"s (2013) survey, which evaluated the relationship between accounting data and the return on the stock market price. Taiwanese companies with quarterly data from 1981 to 2012 were evaluated using VEC. The author observed low relevance in the long-term analyzes, in contrast to greater relevance in the short term.

Complementing, in Table 5, estimates of variance decomposition of prediction errors for average profit and average quarterly return are shown, showing the effect for one, four, eight and 12 quarters.

Table 5
Decomposition of the variance of forecast errors of Average Profit (mLPA) and Average Return (mRET), quarterly

Period (quarters)	mLPA decomposition (%)		mRET decomposition (%)	
	mLPA	mRET	mLPA	mRET
1	100.00	0.00	21.92	78.08
4	81.87	18.13	34.48	65.52
8	76.92	23.08	38.72	61.28
12	76.47	23.53	39.29	60.71

Source: Prepared by the authors (2017).

Regarding the average profit, it is noticed that after four quarters (one year), the return explains 18.13% of the average profit, and that after eight and 12 quarters, the average return explains almost the same proportion of the average profit, 23.08% and 23.53%, respectively. Most of the explanation of average profit is given by profit itself.

On the other hand, in relation to the average return, the average profit corresponds to a more expressive part of the variance errors decomposition, and in the first quarter, the average profit can explain 21.92% of the return and, after four, eight and 12 quarters, profit explained above 34% up 39.29% of the return. That is, the profit was able to explain more of the return than the opposite - which also goes against the findings of Lopes' (2003) study, which investigated the causality between profit and return, and found evidence that, for small lags (one to three periods), there is causality in the sense of profit for return, that such conclusions cannot not be extended, since only two companies were analyzed.

5 FINAL CONSIDERATIONS

The importance of quarterly profits in investors' decisions and their temporal and seasonal aspects encourages research on the subject, but in Brazil, as already discussed by Lopes (2002), there are few contributions to the empirical study of the importance of accounting in the Brazilian market.

The study used an econometric model that allows to verify the dependence relation between the quarterly profits and the action returns, in order to identify the causality direction

and the temporal magnitude of its effects after changes of the Law no. 6.404, revoked by Law no. 11,638, dated December 28, 2007, which introduced IFRS in Brazil.

The results reject H1, that there is a long-term relationship between quarterly profits and the return of shares of Brazilian companies with interest in Ibovespa from 2010 to 2016 – that is, indicate that no long-term relationship was found. This fact differs from the results found by Sonza and Kloeckner (2009), but adheres to the results found by Pimentel and Lima (2010).

In addition, H2 was also rejected that there is causality between the quarterly profits and the return of shares of Brazilian companies with interests in Ibovespa in the period from 2010 to 2016. Even knowing the research constraints, in view of the use of quarterly data of 45 companies between 2010 and 2016, the results allow us to conclude that the return is more sensitive to changes in quarterly profits than the inverse. The return curve adjustment in three years shows the initial negative effect, which then has no further effect at all.

This research findings are in line with the results found by Pimentel and Lima (2010), who affirmed the significant relationship between earnings and stock returns. But in its results the direction of causality is not usually defined – suggesting that the profit-to-return ratio should be analyzed at the company-specific level.

In addition, the results of this article, even though carried out in the period after adoption of IFRS, coincide with those of Foster (1977) and O'Hanlon (1991), in which they exert more influence on the return of shares than the opposite. However, they differ from Martikainen and Puttonen (1993), because they came to the conclusion that are stock returns that influence the accounting results rather than the reverse.

Lopes (2003) also found a causal relationship in the sense of profit for return, although its restriction lies in the fact that it analyzed only two companies. Costa Jr, Meurer and Cupertino (2007), as well as O'Hanlon (1991), have found results in which the accounting has a greater influence on the return of shares, than the opposite.

By decomposing the variance of the forecast errors of average earnings and average stock return, the results showed a direction of causality toward quarterly earnings for stock returns. In addition, the results of the impulse-response function, which indicates that the return is more influenced by profit shocks than the opposite, in the analyzed period, show short-term adjustment.

The results of this research show that, despite the rejection of the two hypotheses, using decomposition of average profit prediction error variance of the companies reveals the influence on the actions return that adjust in the short term, highlighting the interference of the information in the share price. Corroborating the indication of Enders (2010) on the use of impulse-response instruments, it is possible to visualize the response of a particular variable to a specific shock in innovations (residuals) of the model (increase of one unit), such instruments not yet widely used in the research cited here.

It is worth mentioning that, if there was a longer period for the analysis, the results could be indicative of a long-term relationship, thus suggesting that future studies could increase the series analyzed.

As a future work, one can analyze the series from 1995 to 2016, with the inclusion of a point of intervention in 2010 (when the law was amended), with the aim of increasing the series and verifying if the results still prevail or whether there will be a statistically significant change in the profit and return ratio in the period. Finally, it is possible to carry out time-series surveys using accounting and market data to better elucidate the results found.

REFERENCES

Antunes M. T. P., Grecco, M. C. P., Formigoni, H., & Mendonça Neto, O. R. (2012). A adoção no Brasil das normas internacionais de Contabilidade IFRS: o processo e seus impactos na qualidade da informação contábil. *Revista de Economia e Relações Internacionais, 10*(20), 5-19.

Ball, R., & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting Research, 6*(2), 159-178.

Ball, R., & Watts, R. (1972). Some time series properties of accounting income. *Journal of Finance*, 27, 663-681.

Brugni, T. V., Favero, L. P. L., Flores, E. S., & Beiruth, A. X. (2015). O vetor de causalidade entre lucro contábil e preço das ações: existem incentivos para a informação contábil seguir o preço no Brasil? *Revista Contabilidade Vista & Revista, 26*(1), 79-103.

Caiado, J. (2002). Modelos VAR, taxas de juro e inflação, literacia e estatística. *Actas do Congresso da Sociedade Portuguesa de Estatística*, Lisboa, Portugal, 10.

Campos, O. V., Lamounier, W. M., & Bressan, V. G. F. (2012). Retornos das ações e o lucro: avaliação da relevância da informação contábil. *Revista de Contabilidade e Organizações, 6*(16), 1-38.

Carneiro, F. G. (1997). *A metodologia dos testes de causalidade em economia*. Série Textos Didáticos, Número 20. Brasília: Departamento de Economia/UnB.

Costa Jr., N. C. A., Meurer, R., & Cupertino C. M. (2007). Existe alguma relação entre retornos contábeis e retornos do mercado de ações no Brasil? *Revista Brasileira de Finanças, 5*(2), 233-245.

Costa Jr., N. C. A., Martinez, A., Coelho, R., & Cupertino, C. M. (2008). Propriedades das séries temporais de lucros trimestrais das empresas brasileiras. *Revista de Contabilidade e Organizações, 2*(2), 19-35.

Deorce, R., Carrasco Gutierrez, C., Reis, A., & Castro, E. (2018). Causalidade entre os retornos contábeis e os retornos do mercado de ações brasileiro. *Revista Ambiente Contábil, 10*(1), 1-20.

Enders, W. (2010). *Applied econometric time series*. New York: Wiley.

Foster, G. (1977). Quarterly accounting data: time-series properties and redictive-ability results. *Accounting Review, 52*(1), 1-21.

Galdi, F. C., & Lopes, A. B. (2008). Relação de longo prazo e causalidade entre o lucro contábil e o preço das ações: evidências do mercado latino-americano. *Revista de Administração, 43*(2), 186-201.

Gil, A. C. (2002). *Como elaborar projetos de pesquisa* (4a ed.). São Paulo: Atlas.

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica, 37*(3), 424-438.

Gujarati, D. N. (2011). *Econometria Básica*. São Paulo: Bookman.

Jindrichovska, I. (2001). The relationship between accounting numbers and returns: some empirical evidence from the emerging market of the Czech Republic. *The European Accounting Review, 10*(1), 107-131.

Kothari, S. P. (2001). *Capital markets research in accounting*. Recuperado em 22 de março, 2019, de http://web.mit.edu/kothari/www

Lev, B., & Amir, E. (1989). Value Relevance of nonfinancial information: the wireless communications industry. *Journal of Accounting and Economics, 22*.

Lopes, A. B. (2002). *A informação contábil e o mercado de capitais*. São Paulo: Pioneira Thomson Learning.

Lopes, A. B. (2003). Testing the relation between earnings and returns using the Granger-causality test: an exploratory study in Brazil. *Encontro Brasileiro de Finanças*, São Paulo, SP, Brasil, 3.

Marconi, M. A., & Lakatos, E. M. (2002). *Técnicas de Pesquisa* (5a ed.). São Paulo: Atlas.

Martikainen, T., & Puttonen, V. (1993). Dynamic linkages between stock prices, accrual earnings and cash flows: a co-integration analysis. *Annals of Operations Research, 45*(1), 319-332.

Martins, G. A. (2002). *Manual de elaboração de monografias e dissertações* (3a ed.). São Paulo: Atlas.

O'Hanlon, J. (1991). The relationship in time between annual accounting returns and annual stock market returns in the U.K. *Journal of Business Finance and Accounting, 18*(3), 305-314.

Oliveira, A. B. S. (2011). *Métodos da Pesquisa Contábil*. São Paulo: Atlas.

Pimentel, R. C., & Lima, I. S. (2010). Time-series Properties of Earnings and Their Relationship with Stock Prices in Brazil. *Business and Economics Research Journal, 1*(4), 43-65.

Santos, E. S. (2012). Impacto Total do Processo de adoção do IFRS nos Resultados das Empresas Brasileiras. *Encontro ANPAD*, Rio de Janeiro, RJ, Brasil, 36.

Santos, E. S. (2015). Impacto total do IFRS no lucro e patrimônio líquido das empresas brasileiras. *BASE- Revista de Administração e contabilidade da Unisinos, 12*(3), 225-241.

Sonza, I. B., & Kloeckner, G. O. (2009). Co-integração entre o lucro contábil e o preço das ações negociadas pela bovespa: um estudo empírico. *Encontro Brasileiro de Finanças*, São Leopoldo, SP, Brasil, 9.

Tswei, K. (2013). Is transaction price more value relevant compared to accounting information? An investigation of a time-series approach. *Pacific-Basin Finance Journal, 21*(1), 1062-1078.

Van Doornik, B. F. N. (2007). *Modelagem econométrico-financeira de uma empresa baseada em vetores auto-regressivos*: uma aplicação à Petrobras S.A. Dissertação de mestrado em Administração, Universidade Federal de Brasília, DF, Brasil.