

## RELATION BETWEEN SHARE PRICE AND FINANCIAL INDICATORS IN THE BRAZILIAN STOCK MARKET

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**Abstract:** *Given the uncertainty in the financial market, it requires from the decision makers to have a greater care in their estimates. The expansion of the Brazilian capital market has generated the need for an understanding of the factors that determine the formation of the pricing of shares. This study aims to determine, through the panel data methodology during the period 2009 to 2013, the share prices of companies listed on the BM&FBovespa that keep some relations with some financial indicators, including earnings per share, the book value per share and total assets used as a proxy for the company size. The results show that such information is relevant in determining stock prices. The proxy for company size, set based on total assets by sector, showed statistical significance and positive sign, signaling that the size of the company is relevant to the extent that the market reacts asymmetrically between companies considering their size. Sector samples showed the size factor relevant in the sectors of industrial goods, construction and transport. It also notes that the financial statements are good predictors mainly in the sectors of consumer staples, utilities and industrial goods.*

**Keywords:** *stock market, pricing, accounting variables, panel data*

### Introduction

In Brazil, the stock market has undergone considerable expansion in the 2000s. This process was not only a result from the current international liquidity in the early part of the decade, but also the expansion of the market to retail investors and the constant reforms made. Lameira (2005) highlights the actions of *Comissão de Valores Mobiliários*<sup>1</sup> (CVM) to update the regulatory environment by inserting new products, enhancement of investors' interests, and the modernization of operating procedures through more flexible access to the market by the companies that require resources. Pellicani (2011) points out as the main causes for the poor performance of the stock market in the 90s and early 2000s the lack of quality of the shares offered to investors. Thereby the *Bolsa de Valores de São Paulo* (Bovespa) decided to adopt corporate governance measures (stimulating investor interests as well as valuing the companies), creating in 2000 the Differentiated Levels of Corporate Governance (Level 1 and Level 2) and the *Novo Mercado* (New Market). This differentiation aims to highlight the companies committed to greater transparency and better corporate governance practices.

These actions culminate in a greater access to information by investors. Thus, it is expected that the decision of the investor takes into account past elements on potential

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<sup>1</sup>State agency that regulates and supervises the capital market.

companies for acquisition of the paper, as well as future expectations on its performance. These two aspects are present in seminal approach Ohlson (1995), which argues that the accounting information can be an important source of asset pricing.

According to the author, it is possible that the financial statements help in understanding the stock price, being a deciding factor for the investor. In this approach, the expectation of future earnings taken in present values and the information itself obtained in the present, on the immediately preceding period, are relevant factors in the analysis. In the same direction Oliveira, Montezano and Oliveira (2013) observe that agents in the capital market, such as investors, financial executives and investment analysts, are usual consumers of financial information, aiming to feed and help the decision making process. Therefore, they believe that the financial variables can be good sources to estimate the stock price.

Some works originated from the Ohlson model (1995), both domestically and internationally, as the case of Matucheski and Almeida (2006), Brimble and Hodgson (2007), El-Gazzar, Finn and Tang (2009), Oliveira, Montezano and Oliveira (2013) and Gonçalves, Rodrigues and Macedo (2014), have found possible relationships between variables from the financial statements and stock prices. The results confirm that some financial statements can be good covariates. In this context, the main objective of this research is to analyze the validity of such argument that claims the financial statements may contribute to understand the stock pricing in the Brazilian stock market in the period between 2009 to 2013. The aim is to observe if in that period, while the Brazilian economy suffered the effects of the international economic crisis, the stock prices may have their behavior captured by the accounting and financial information and in which sectors of activity they show more relevance. To this end, it will be used the panel data methodology, as it enables to work with longitudinal information from different companies. The database consists of 194 Brazilian listed companies operating in different sectors of activity.

It is important to note that the choice of this period for analysis intends to draw comparisons with the results obtained by other Brazilian studies on this subject. During this period, Brazil faced an international economic environment with recessive traits, due to the financial crisis that began with the North American economic recession, which began in December 2007 to end in June 2009, according to National Bureau of Economic Research (NBER, 2012).

In Latin America, the effects were felt on account of the movement of capital and current transactions. Stock markets and domestic currency, in American dollar terms, show the effects on the economies of this region (Carvalho, 2010). Ferreira and Mattos (2012) observe that the crisis has led to fluctuations in the domestic financial market. The result was a rise in volatility and falling asset prices with simultaneous increase in funds flow movements between markets. They emphasize that there are still sectoral differences of the effects of the crisis. The real estate and financial sectors showed the greatest contagion, reflecting losses recorded in the construction industry, coupled with the lack of internal and external credit.

The article is structured in three sections, besides the introduction and conclusion. The second deals with a brief theoretical review of the Ohlson approach (1995) and empirical evidence on the Brazilian stock market in terms of the importance of the use of an accounting information on pricing actions. The third involves the exposure of methodological procedures, that is, the database and model specification and estimation method, and the fourth section presents the results of the econometric model. Finally, the last section presents the final considerations.

## Literature review

The literature suggests that the accounting information, originated from the financial statements, can contribute to understand the stock pricing process. In this case, the work of Ohlson (1995) presents unique contribution in this field and is subsequently the target of several empirical evidence.

### *Theoretical review*

The pioneering research of Ohlson (1995) argues that you can check the effect of dividends on the market value of companies. Therefore, the starting point is the residual earnings discount model (abnormal), called RIV (residual income valuation), which incorporates accounting nature of information in the estimate. Thus, some aspects are considered as pillars of this model: a) assessment based on RIV; b) linearity and c) clean profit.

The main contribution of the author was associated with the relationship between residual income and the share value of a company. Residual profits are given from the dividend cash flow discount, i.e. the value of a company is derived from the sum of the book value of shareholders' equity and present value of residual expected profits. The discount rate used is the risk-free rate (of the risk neutrality assumption). So it is expected that there is a reduction in expected profit in the event of dividend increase in the previous period, since such a condition reflects in a lower profit and is directly affected by the discount rate.

On the second feature, the series of data related to abnormal profit should have a stochastic behavior and thus approaching a linear type function, by autoregressive model. Finally, the third is based on the argument that the accounting source data is true for both accounting profit, as for the book value of shareholders' equity and dividends. In short, the results derived by the author indicate that the profits of future periods to present value and shareholders' equity per share may be factors explaining the pricing actions.

Besides Ohlson (1995), other authors also argue about a relationship between the financial statements and stock price. Beaver (2002) adds that there are several studies on market efficiency that argue that the accounting information, publicly disclosed, directly reflect on prices. Penman (1996) identifies evidence that the growth rate of corporate profits is related to the return on equity. In this case, the value of the company is directly related to the value of company stock because profit is an important variable in determining stock prices.

In this line, Ohlson and Juettner-Narouth (2005) elaborate the AEG model (abnormal earnings growth) which relates the price for each share enjoying expected earnings per share. In the model, that price is related to the share of profit expectations next year, growth rate of short and long-term earnings per share and the cost of equity. How the present value of dividends per share influence on the share price, then they argue that when dealing with the constant growth in time overlook an important factor.

Hayn (1995) discusses the equity value has influence on the company's profit and hence on the value of the shares. Companies with smaller sized are more likely to signal a loss scenario than those with larger sized. This perception directly affects the future prospects of the company's profits, which creates a direct effect on the action.

Collins, Maydew and Weiss (1997) observe that systematic changes in the economy could directly influence the use of accounting information for decision making in the stock market. According to the authors, some factors may explain this context: the entry of new companies in the stock market, which can influence the investor's perspective through a future prospect of gain and not necessarily the use of financial resources and also that the very instability (crisis period) or change (new technology and new markets) in the economy could not

be reflected at first in the financial information. They observed that the combination of the company's profit information, along with the equity value explain the value of the share. In an isolated perspective, profit has shown less explanatory power and the equity value has signaled greater relevance.

#### *Empirical evidence interactional*

From the seminal work of Ohlson (1995), several other studies have been prepared to understand the effects originated by the financial statements on asset pricing. Brief and Zarowin (1999) study the relevance of book values and dividends on share prices. The first analysis includes the book value and profit, while the second includes the book value and dividends, both in relation to the share price. The authors conclude that companies that pay dividends have in general a greater explanatory power of the carrying amount over the price at the expense of profits or dividends. Regarding the analysis of the book value and dividends, the explanatory power is similar compared to the book value and profit.

On the Australian stock market, Brimble and Hodgson (2007) tested the relationship between share prices (returns) and earnings per share and book value per share. Their findings proves the theory, given the fact that the explanatory variables were significant and with expected signs.

El-Gazzar, Finn and Tang (2009), through an empirical model, studied the dynamics of the share price of the US airline industry companies comparing the periods before and after the sector's regulation. The results point to asymmetry between periods, and the first variable profit showed no significance, while in the second period, its impact was significant and positive.

Dawar (2012) aims to understand how the value of financial variables of enterprises is formed in the Indian car industry. Therefore, it starts from an analysis that empirically determines whether share prices are given by aspects such as the dividend decision, investment and also funding. As a result, it observes that such variables respond partly by fixing share prices in the sector. In this case, it states that it acts as an important signaling instrument about the market information that is not contained in financial reports, although it cannot identify the relevance of capital structure in the target context of the study.

Wang Fu and Luo (2013) study the China's capital market regarding the impact of accounting information on the formation of share prices. Based on data from 60 companies in the country, it concludes that there is a positive relationship between accounting information and the share price. In addition, the earnings per share and return on capital are strongly correlated (statistically significant).

#### *National empirical evidence*

On the Brazilian market, Schiehl (1996) seeks to understand if there are effects of the financial statements of a publicly traded company in its share price. The analysis is segmented into two points: understanding whether the financial statements and the opinion of independent auditors on the financial statements influences the pricing of shares. With a risk and market adjusted return model based on 90 shares traded on the Bovespa, between January 1987 and 1995, the author finds support for stating that the financial statements have significant effects on stock prices of companies, unlike the result obtained under the advice of independent auditors.

Antunes and Procianny (2002), on the other hand, define the objective of understanding the relationship between investment decisions and share prices in the capital market. With data from 87 different shares that had higher average rate of liquidity between March 1989 and August 1999, the authors analyzed variations of the asset (permanent and fixed assets)

and the stock price. In conclusion, it was found that there is a relationship between the variation of the fixed assets and the value of the company's shares.

Matucheski and Almeida (2006) analyze the explanatory power of profit and equity in relation to stock prices. They resorted to data from the period between 2000 and 2005, relating to 103 securities (including common and preferred shares). The analysis is based on the correlation and determination coefficients, as well as the relation between market value and equity. As a result, they found an association between the equity and the stock price, which proves greater power of explanation than between profit and stock prices.

On another point, Galdi and Lopes (2008) study the long-term relationship between accounting profit and price of shares of companies in Latin America. By means of time series methodology, applied stationarity test (KPSS), co-integration (statistical trace and maximum eigenvalue) and Granger causality for the estimations. With profit per share data and share price of 41 companies, from 1995 to 2005 (only companies with at least eight years of information), the authors identified a positive relationship between earnings and stock prices for most companies studied, yet it cannot establish causation between variables based on the concept of Granger (for 27 companies there is no sense of causality).

In the same direction Sonza and Kloeckner (2009) study long-term balances and short-term dynamics between accounting profit and stock price with data from 20 companies between 1990 and 2008. Based on an analysis of co-integration and an error correction vector model, it was concluded that there is a significant long-term relationship between accounting profit and the value of the shares.

Lopes and Galdi (2010) seek to understand the relationship between financial variables and the discount rate with the return of the shares. It used as variables the net income, profitability variation, invested capital, growth opportunity of variation and discount rate from 1678 observations in the period between 1997 and 2008. With the panel data methods with abnormal return, Fame Mac- Beth, with fixed and pooled effects, the authors state that the financial variables have explanatory power in stock returns.

Oliveira, Montezano and De Oliveira (2013) tested the hypothesis of association between stock prices and financial variables, from a sample of 219 publicly traded companies in Brazil, between 1995 and 2007. From a data unbalanced panel model with fixed effects and quarterly data, it used the following variables to test the relationship: the share price, earnings per share, book value per share (shareholders' equity - adjusted by the number of outstanding shares of the company) and dummy variables in company size, sector of activity and income sign (positive or negative).

The authors start from three different models to test the relationship: i) univariate relationship with income (simple linear regression with the price as the dependent variable and current profit representing flow variable); ii) univariate relationship with the asset value (linear regression between price and book value per share - stock variable); iii) multivariate ratio given by the combination of earnings per share and book value per share. As a result, they found that the profit asymmetries arising from sectoral differences, company size and profitability of the sign, were statistically significant. On the other hand, changes in earnings per share and book value per share explain 35% to 40% of the fluctuations in stock prices, which implies that financial information can contribute to the understanding of the formation of stock prices. Specifically, the equity value (if positive) has greater explanatory power than earnings per share.

Finally, the work by Gonçalves, Rodrigues and Macedo (2014) focuses in understanding the effect of net income per share and shareholders' equity per share on the stock price. With 24 companies from the energy sector data, between 2009 and 2010, the authors used multiple regression analysis to establish the relationship between the variables in addition to the

Akaike and Schwarz criteria and standardized coefficients. The results show that both earnings per share and net assets per share have greater joint capacity of explanation with the adoption of IFRS (International Financial Reporting Standards).

## Methodological procedures

### *Model Specification*

According to Oliveira and Frascaroli (2014) factors models are typically used to identify the relationships in finance and highlight the multifactorial model of arbitration for pricing theory (APT). The choice of the factors may be of either an economic and financial reason (interest rates, inflation, GDP, market indices, exchange rates, etc.), or fundamentalist (reasons price / earnings, dividends, etc) or yet statistics (principal components analysis, factor analysis, etc.). According to Alexander (2005), the success of factor models depends as much as on a factors choice and on the method used to estimate the sensitivity of these factors. For the present study the factors chosen are based on the works of Matucheski and Almeida (2006), Brimble and Hodgson (2007), El-Gazzar, Finn and Tang (2009), Oliveira, Montezano and Oliveira (2013) and Gonçalves, Rodrigues and Macedo (2014). Three specifications will be tested. The specification is given in terms of the company  $i$  and the year quarter  $t$ . The model (1) is given by:

$$SP_{it} = \beta_0 + \beta_1 EPS_{it} + \beta_2 BVPS_{it} + U_t + \varepsilon_{it} \quad (1)$$

where  $SP_{it}$  is the stock price,  $EPS_{it}$  earnings per share,  $BVPS_{it}$  book value per share and  $U_t$  is a set of dummies in  $t$  period that capture the specific effects of each period.

Aiming to capture the effects of the size of companies in the pricing, it was decided to estimate two models that include a proxy for the size variable. The functional form of the model (2) is given by:

$$SP_{it} = \beta_0 + \beta_1 EPS_{it} + \beta_2 BVPS_{it} + \beta_3 TAD_{it} + U_t + \varepsilon_{it} \quad (2)$$

where  $TAD_{it}$  is the dummy of the total assets of the company in each quarter, assuming 0 value if the value of total assets is below the third *decile* of distribution, and 1 in the contrary case.

Given the fact that there may be significant differences in asset value across sectors, it was decided to also include a dummy that would capture the size differences of companies amongst sectors. Thus, for each quarter of the sample period and for each sector of activity, companies that are in the 3 bottom *decile* of total assets distribution were considered small and take the 0 value or 1 in the opposite case. This classification is according to the working of Kirch, Procianoy and Earth (2014). Therefore, the template (3) is given by:

$$SP_{it} = \beta_0 + \beta_1 EPS_{it} + \beta_2 BVPS_{it} + \beta_3 TIAD_{sit} + U_t + \varepsilon_{it} \quad (3)$$

where  $TIAD_{sit}$  is the dummy of total assets by industry. If  $\beta_3 \neq 0$ , the conclusion is that the size of the company is important as a determinant of price per share, i.e. the market reacts differently between large and small businesses. Finally, the model (3) is estimated to sectoral samples aiming to capture the relevance of accounting variables, in this case the size of the company may differ considering the sectors of activity of companies, considering that in this period the effects of the crisis were asymmetric.

*Database*

The data used in the analysis refer to the quarterly financial information of publicly traded companies listed on the website of BM & FBovespa, it covers the period between 2009-2013 in thousands of US dollars, and has been collected from Economática tool for stock analysis and investment funds providing financial information of companies. The final sample consists of 194 companies distributed in 9 sectors of activities defined according to the BM & FBovespa, totaling 2749 observations in an unbalanced panel, i.e. not all companies have information from the beginning of the sample. As it can be seen in Table 1, the sectors of cycle consumption, non cycle consumption, public utilities, construction and transport together account for 67.84% of the observations. At first, the base was composed of a universe of 371 companies, from which were excluded the financial ones and those that did not have data from one or more variables needed for the model.

Table 1 – Data frequency for the economic activity sector

<b>Sector</b>	<b>Absolute frequency</b>	<b>Relative frequency</b>
Industrial goods	352	12,80%
Construction and transportation	444	16,15%
Consumer cyclical	500	18,19%
Not cyclical consumer	448	16,29%
Basic materials	358	13,02%
Oil, gas and biofuels	29	1,05%
Information technology	83	3,02%
Telecommunications	62	2,26%
Public utility	473	17,21%
Total	2749	100,00%

Source: Elaborated by the authors

Among the variables collected, there are share prices as the dependent variable, and the list of independent variables selected based on the work of this subject include earnings per share, book value per share, and dummies on the size of the company. Table 2 shows the summary of the abbreviations of the model' variables to facilitate subsequent reading of parameterization and their respective descriptive statistics.

Table 2 – Descriptive statistics

Variables	Notation	Average	Standard Error	Minimum	Maximum
Share Price	SP <sub>it</sub>	21,25039	24,70915	0,3199998	299,1418
Earnings per share	EPS <sub>it</sub>	0,9559508	2,989387	-33,30796	44,05646
Book value per share	BVPS <sub>it</sub>	15,43692	27,92403	-22,69235	360,7186
Total Assets <i>Dummy</i>	TAD <sub>it</sub>	0,696617	0,4598029	0	1
Total Assets by industry <i>Dummy</i>	TAID <sub>sit</sub>	0,6987996	0,4588631	0	1

Source: Elaborated by the authors

Based on the Table 2 informations, it may be observed that the companies analyzed over that period reached the average stock price of R\$ 21,25, average earnings per share of R\$ 0.95, and average book value of R\$ 15.43. Thus the market-to-book of this sample data is larger than the one that pointed out the average companies has had a market valuation above its book value, i.e. the market is valuing something that is not being recorded by the accounting or it is still being made, but in a incompletely way (Santanna, Teixeira & Louzada, 2003). It is noteworthy that this result should be accounted with caution given the fact that the coefficients of variation of these variables were high.

#### *Estimation method*

The panel data model is used when longitudinal observations are available, i.e., by individuals within a time period, which provides information about possible individual heterogeneity<sup>2</sup>. According to Greene (2002) it is widely used to investigate structural and dynamic changes of transition.

This model has some important advantages, and among them Hsiao (2003) highlights opportunity reduction for collinearity issues, oculted variables problems and increasing degrees of freedom, which allow the inter-temporal dynamics and the individuality of the variables be more well controlled regarding the effects of variables' omission. The estimate by panel data considers the observations at different points in time. For the present case its functional form is like:

$$SP_{it} = \alpha_{it} + \beta x_{it} + \varepsilon_{it} \quad (4)$$

where  $SP_{it}$  is the share price,  $x_{it}$  is the matrix of explanatory variables with  $k$  explanatory variables without the constant,  $i = 1, \dots, N$  refers to the drive businesses and  $t = 1, \dots, N$  refers to the quarter,  $\varepsilon_{it}$  is the error term as such as that  $\varepsilon_{it} \sim N(0, \sigma^2)$  with the absence of autocorrelation of IID waste (independent and identically distributed), the parameter  $\alpha_{it} \sim N(0, \sigma^2)$  is a stochastic term inherent in individual units, which captures the individual effects and may or may not be correlated with the independent variable vector as shown by Cameron and Trivedi (2005).

<sup>2</sup> See Cameron and Trivedi (2005) for a better understanding of the benefits that comes from the use of models that capture the heterogeneity of individuals.

If  $Cov(\alpha_i, x_{ij}) \neq 0$ , the estimation should be done by means of a model with fixed effects. There is the idea of eliminating the non-observed effect  $\alpha_i$ , based on the assumption  $E(\varepsilon_{it}|x_i, \alpha_i) = 0$  known as exogenous strict condition. To this end, it should take the average of equation (1) so that the fixed-effect  $\alpha_i$  is eliminated. Thus, there can be used ordinary least squares (OLS) for the fixed-effects estimator.

But if  $Cov(\alpha_i, x_{ij}) = 0$ , that is  $\alpha_i$  it is not correlated with the independent variable vector, it becomes preferable to model these effects as randomly distributed among the observational units using the random-effects model. Since there is correlation between the errors of the same company in different time periods, it makes it appropriate to resort to the estimator of generalized least squares (GLS), rather than the OLS

The choice between the fixed effects model and random effects is given by the Hausman test (1978). The null hypothesis of the test is that there is no correlation between the idiosyncratic error and the independent variables in the random-effects model. So if the null hypothesis is not rejected, the random effects model is consistent and differences of all the coefficients are not systematic. If, however, it is rejected, it indicates that the fixed effects model is more consistent<sup>3</sup>.

## Results

In order to verify the first relationship between accounting information and share prices, the Pearson correlation with statistical significance of 5% was applied. The following Table shows the results.

Table 3 – Pearson correlation

	SP <sub>it</sub>	EPS <sub>it</sub>	BVPS <sub>it</sub>	TAD <sub>it</sub>	TAID <sub>it</sub>
SP <sub>it</sub>	1				
EPS <sub>it</sub>	0.3801*	1			
BVPS <sub>it</sub>	0.6077*	0.2024*	1		
TAD <sub>it</sub>	0,0150	0,0328	-0.0647*	1	
TAID <sub>it</sub>	0,0514*	0,0105	-0,0132	0,6602*	1

Source: Elaborated by the authors.

Note: \*, \*\* and \*\*\* denote statistical significance at levels 1, 5 and 10%, respectively.

According to the results of Table 3, it can be seen that all accounting variables selected in relation to the present share price, show correlation coefficients as expected, in other words, beyond the expected positive signals, but they are also statistically different from zero. Therefore a deterioration in any of these variables may result in the fall of share prices.

<sup>3</sup>Some authors use the Within denomination for estimating fixed effects and FGLS (feasible generalized least squares) - considering the variables by the standard deviation, resulting in more consistent wastes - for random effects.

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Among the variables selected, the book value of the company showed the highest correlation with share prices. It is also possible to observe that the dummy variable based on the total assets of the company was not statistically significant in relation to the dependent variable, unlike the dummy based on assets by sector. After checking the significant correlation between the selected variables with share prices, there were estimated proposed models. Table 4 illustrates the results obtained.

Table 4 – Econometric Model

Variabelas	Model 1	Model 2	Model 3
Cons	9,28821* (1,111359) [8,36]	7,319783* (1,491068) [4,91]	6,364835* (1,285519) [4,95]
EPS	0,5660696* (0,0800547) [7,07]	0,5586982* (0,0802153) [6,96]	0,5439578* (0,0807095) [6,74]
BVPS	0,7391098* (0,0134934) [54,78]	0,739172* (0,0134914) [54,79]	0,7383929* (0,0134894) [54,74]
TAD	- - -	1,318957 (1,023023) [1,29]	- - -
TAID	- - -	- - -	1,814485** (0,8696913) [2,09]
Year Dummys	Yes	Yes	Yes
Hansen	136,62	151,59	125,29
Wald	3331,62	3334,99	3339,95
R2	0,5651	0,5653	0,5958
Firms	194	194	194
N	2749	2749	2749

Source: Elaborated by the authors.

Notes: Standard error in parentheses. Z statistics in brackets. \*, \*\* and \*\*\* denote statistical significance at levels 1, 5 and 10%, respectively.

First it made an estimation of the fixed effects model and the random effects models. However, the Hausman test for all three specifications, that are in Table 4, indicates in all cases the random effects estimator fits better to the purpose, given the fact that rejects the

null hypothesis of no correlation between the specific effects and the explanatory variables. The Wald test of all estimated models indicates rejection of the null hypothesis of no statistic variables significance. In all estimation, there were inserted temporal dummies in order to control the effects of each period.

When evaluating the coefficients of the variables, it appears that for the three estimated models the variable earnings per share affects the formation of the share price, since it is statistically significant considering the 1% significance level. The parameter signal associated with it is positive, thus indicating that increases in company profits culminate in increased price. This result is different from that in the study by Oliveira, Montezano and Oliveira (2013), when using a set of multivariate regression parameters associated with variable per share profit time was not statistically significant, however with a negative sign. Therefore, for the period studied here earnings per share is a good explanatory variable for share price.

As the result of the BVPS effect over the share price, it is observed that for all the estimated models it was statistically significant when considering the level of significance of 1%. The sign was found positive which corroborates the literature of the subject. On the Brazilian capital market, Matucheski and Almeida (2006), Oliveira, Montezano and Oliveira (2013) and Gonçalves, Rodrigues and Macedo (2014) found that this variable has relevance as a determinant of stock prices. So for different periods VPA has shown relevant in determining prices.

In order to verify if in the period under review there were asymmetries in pricing resulting from the size factor of companies, in the 2 model it was introduced a dummy variable based on the total assets of the company in each quarter, assuming 0 value if the value of total assets is below the third decile of distribution, and 1 in the opposite case. In the 3 model, the dummy introduced was generated taking into account the business sector, i.e. for each quarter of the sample period and for each activity sector, companies in the three lower *deciles* assumed value 0 and 1 in the opposite case. The results found in the 2 model was not statistically significant, unlike Oliveira's work, Montezano and Oliveira (2013), which adopted the median of assets in 2007 to separate the sample between large and small companies. The estimation results of 3 model, the size by sector dummy showed statistical significance and positive sign, showing therefore that within each sector the size factor is important in the formation of the share price.

Considering that the relations observed here may differ between the various sectors of activity, namely, that the significance of financial factors as well as the size of the company may differ considering the sectors of their activity, the model (3) was estimated for the six sectors that showed more than 12% of the sample size of this study, which highlight the sectors of industrial goods, construction and transport, consumer discretionary, consumer staples, basic materials and public utilities. The estimation results are shown in Table 5.

In all estimations, there were inserted temporal dummies in order to control the effects of each period. As for the results of the whole sample, the Hausman test for all sectors of activity show that the estimator of random effects adjusts better to the purpose, and the Wald test for all estimated models indicate rejection of the null hypothesis of no variable statistics significance.

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Table 5 – Econometric Model by sector

Variáveis	BI	CT	CC	CNC	MB	UP
Cons	7,2550*	-4,2198**	8,8693*	-7,6965***	9,3071*	8,7236***
	(1,4923)	(1,7607)	(2,2821)	(4,2749)	(2,4092)	(4,8527)
	[4,86]	[-2,40]	[3,89]	[-1,80]	[3,86]	[1,80]
EPS	1,4868*	-0,5225*	1,5314*	2,8682*	0,7176*	1,1232*
	(0,1543)	(0,0747)	(0,4151)	0,5896	(0,1425)	(0,1814)
	[9,63]	[-6,99]	[3,69]	[4,86]	[5,04]	[6,19]
BVPS	0,5472*	1,5594*	0,7064*	2,8446*	0,3338*	0,8441*
	(0,0413)	(0,0821)	(0,0138)	(0,1506)	(0,0380)	(0,0250)
	[13,22]	[18,97]	[51,07]	[18,88]	[8,78]	[33,74]
TAD	9,5465*	2,9241**	1,8703	-3,3022	0,9105	-4,5120
	(2,4899)	(1,1424)	(1,5639)	(3,2810)	(1,4390)	(4,4272)
	[3,83]	[2,56]	[1,2]	[-1,01]	[0,63]	[-1,02]
Year Dummys	Yes	Yes	Yes	Yes	Yes	Yes
Hansen	152,5	32,04	60,22	94,15	119,94	99,51
Wald	586,03	466,53	3020,69	445,40	263,82	1423,18
R2	0,6536	0,5721	0,8769	0,5349	0,4185	0,7771
Firms	25	30	37	35	23	31
N	352	444	500	448	358	473

Source: Elaborated by the authors.

Notes: Standard error in parentheses. Z statistics in brackets. \*, \*\* and \*\*\* denote statistical significance at levels 1, 5 and 10%, respectively. BI: Industrial Goods; CT: Construction and Transportation; CC: Consumer Cyclical; CNC: no cyclical consumption; MB: basic materials; and UP: Public utility.

By analyzing the estimated coefficients of the variable earnings per share is observed that in all sectors they showed statistically significance considering the 1% level. In Figure 1 are shown the magnitude of the effects of EPS in stock prices by sector according to the estimated model.

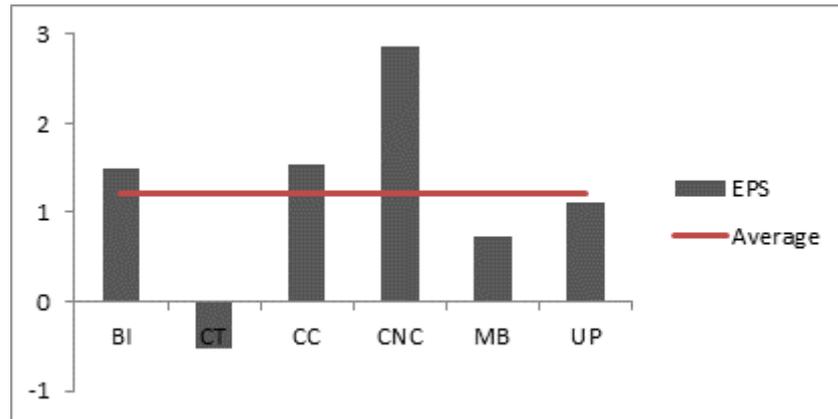


Figure 1 - EPS coefficients of model estimation

Source: Elaborated by the authors.

It is noted that the signal obtained is expected, except for the construction and transport sectors where the effects of EPS are negative. One of the reasons to explain this counterintuitive result is the fact that this sector, among the analyzed here, is the one that suffered the most from the effects of the international financial crisis, as pointed out by the study of Ferreira and Mattos (2012). On the other hand, it seems that the consumer staples sector was the one that showed the greatest magnitude of the coefficient associated with EPS, followed by the consumer staples sector, representing the sectors that during the given period stood out in the Brazilian economy due to Government reaction to the 2008 crisis, causing a reduction in the basic interest rate and credit expansion of public banks, stimulating aggregate demand and benefiting in particular household consumption.

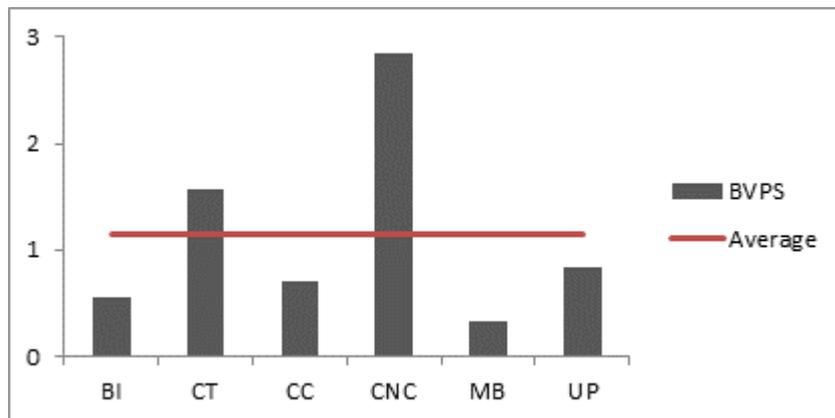


Figure 2 - BVPS coefficients of model estimation

Source: Elaborated by the authors.

In the case of the BVPS, in analyzing Table 5, it seems that, for all sectors of activity, estimated parameters were statistically significant considering the 1% significance level. Figure 2 shows the coefficients obtained from the estimation. It appears that for all sectors of the estimated parameter shows the expected sign, i.e. positive. Therefore, increases in this variable may result in increase in the price of shares of companies from all sectors, being more significant given its magnitude in the consumer staples sector and a smaller influence in the basic materials sector.

In order to verify the existence of asymmetric pricing of shares, originated from the businesses size difference, the estimations included the dummies set based on their total assets. And according to Table 5 results, the sectors with such asymmetry during the studied period were those of industrial goods and construction and transport. For other sectors, this variable was not statistically significant. Therefore, the estimates by sectors show that the pricing asymmetry is not a general fact, but significantly only in sectors that are more exposed to the negative effects of the crisis due to price and income elasticity. According to Ferreira and Mattos (2012) heavy losses were recorded in the construction industry. In the case of the industrial sector, it is noteworthy that since the beginning of 2010 the production of transformation industry did not grow, explained by the stagnation of the sector's productivity and increased substitution of domestic products for external, causing increases in net imports.

The size factor may be relevant to the extent that larger companies may have scale gains in production affecting its cost structure and hence their competitiveness. It also has the fact that larger firms suffer less with the financing constraint. According to Martins and Paul (2014), Brazil is characterized as an emerging market and the asymmetric information problem is an obstacle to the development of its capital market. This may result in a financial market with restrictions on investments, thus smaller companies may have considered their demand for funding inhibited, preventing the execution of profitable investment projects (Aldrighi & Bisinha, 2010).

Finally, when analyzing the R<sup>2</sup> of the estimation, it can be stated that for the period under review the financial information used explains the pricing of 41.85% to 87.69%. The sectors that accounting variables show to be better predictors of share prices were the consumer discretionary, utilities and industrial goods, while the basic materials sector was the one that showed the lowest quality setting.

## Conclusions

The looming uncertainty in the financial markets requires that decision makers have a greater care in their forecasts. For the specific case of the stock market, it may be noticed that the risk in comparison to the fixed income market is higher, culminating in the need for agents to know the dynamics, such as the phenomena inherent in stock prices.

Thus, this study aims to verify if during the period 2009-2013 the share prices of companies listed on the BM&FBovespa keep some relationships with some financial indicators, including earnings per share, book value per share and total assets used as a proxy for company size. The selected variables were based on empirical studies and literature that were collected by the Economatica.

Aiming to capture the effects of the companies size on shares pricing, it was decided to estimate three models, the latter two including a proxy for the size of companies. A size is defined by a dummy based on the total assets of the company in every quarter, and the other ones is by a dummy based on total assets by business sector in each period. This last ones is motivated by the fact that there may be significant differences of assets among sectors. In order to enhance the robustness of the results it was estimated the third model for sector samples, i.e. for samples containing only companies in the same sector of activity allowing us to check if the relevance of financial factors and the effect size of the companies may differ depending on sectors involved.

The empirical strategy adopted was the panel data. The estimation method that best fit the data set used, in accordance with the Hasmaun test, was the random effects. The results for the sample containing all companies and to all specifications were corroborated by the literature and theories on this subject. Both coefficients associated with the variables earnings

per share, as those related to book value per share, were statistically significant and moreover obtained positive sign, showing therefore that increases of company profit or assets culminate in a higher price of its shares. Regarding the inserted dummies, only the set based on total assets by sector, showed statistical significance and positive sign, signaling that the size of the company is relevant to the extent that the market reacts asymmetrically between companies considered large or small.

In the case of sector samples, the results support that the variables earnings per share and book value per share have significant and positive signs for all sectors, except for earnings per share in the construction and transport sector, which recorded a negative sign. The effect size of the companies set based on their total assets shows that it is a significant element in the sectors of industrial goods and construction and transport, which means that in these sectors there are asymmetries in determining stock prices. This result may justify the fact that they both are the sectors that were exposed the most to the negative effects of the financial crisis, the first one, since 2010, shows no growth in their production and in the second there were recorded heavy losses.

Finally, the results show that for the period under review the financial information used here explains the pricing from 41.85% to 87.69% and the sectors that worked as best predictors of share prices were the consumer discretionary, utility and industrial goods, while the basic materials sector was the one that had the lowest setting quality.

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