Influences of Adherence to Different Levels of Corporate Governance: an Application of Time Series Models in a Company of the Telecommunications Sector

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**ABSTRACT**

The objective of this study was to measure and evaluate the impacts of the adherence to one of the Differentiated Levels of Corporate Governance of BM&FBOVESPA in profitability indicators (ROA, ROE and Net Margin) and risk (volatility of stock returns) from Tim Participações S.A. company. The review period is between 2003 and 2014. To identify the impacts of this operation was initially applied the intervention analysis methodology in profitability series of the analyzed company. However, the results were not statistically significant. Then, the volatility of stock returns was modeled in order to check the reaction of the stock market after the governance level change. The results confirmed that such event was able to impact the volatility, it is, influence the investor behavior regarding to the risk reduction of the stock market.

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**INTRODUCTION**

In 1990 emerged the first discussions between investors, academics and legislators on corporate governance, after accounting scandals involving important foreign companies. Thus, through governance practices it is seeking to increase the company's value, contributing to its longevity and facilitating the access to investment capital (Michelin, 2010). Some monitoring mechanisms ensure the alignment of interests and reduce conflicts in relations between managers and shareholders.

According to Silveira (2005), companies with corporate governance structure adequate to practices recommended by market players, hold better results and its stock price is better evaluated by the market than those with a governance structure that is not so appropriate.

In Brazil, an alternative to legislative reforms on the subject came on 2000 with the creation of the Differentiated Levels of Corporate Governance (DLCG). The first agreements of additional practices of corporate governance were consolidated between open capital companies and the Stock Market of São Paulo (BM&FBOVESPA). In addition to the positive effects that corporate governance entails for companies, much has been discussed about incentives for investors to decide for companies with more developed levels of governance.

Among the Brazilian companies that are in search of managing for corporate excellence is Tim Participações S.A., a Brazilian telephone company subsidized by Telecom Italia, which began its operations in 1998. Tim became the second largest mobile phone company in Brazil in number of customers and a leader in net revenues of services until 2008, and currently has 73.4 million customers, being the leader in the prepaid segment.

According to information available on the company’s website, this is the only company in the telecommunications sector belonging to the top group of companies that comprise the Differentiated Corporate Governance Index (IGC), Stock Index with Differentiated Tag Along (ITAG) and Carbon Efficient Index (ICO2), besides being part of the Corporate Sustainability Index (ISE).

In May 2011, it was resolved at the Meeting of Management Council of Tim Participações: (i) the Company's migration to the New Market; (ii) the proposal of conversion of preferred shares into common shares at a ratio of 0.8406 (weighted average of the previous 60 days); and (iii) authorize the Council to begin negotiations with the BM&FBOVESPA and the Securities Commission aiming the adhesion of the Company to the New Market Rules. In August of that year, the company has only common shares traded on the New Market of BOVESPA, using the code "TIMP3" and

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representatives American Depositary Receipts (ADRs) of the Company's common shares on the New York Stock Exchange.

A priori, companies listed in governance levels have a management with more control and more transparency, which can motivate investors to prefer investing in shares of these companies and not in those not listed, with reflexes in market values (Aranha et al., 2015). Facing this issue, this paper aims to measure and evaluate the impacts of the adherence to Differentiated Levels of Corporate Governance of BM&FBOVESPA on profitability (ROA, ROE and Net Margin) and risk (volatility of stock returns) from Tim Participações S.A. company in the 2003-2014 period.

Thus, this study is justified by the importance of conducting an empirical and statistical research using current data to measure this relation. Additionally, this research aims to contribute to the expansion of empirical results of the relations between corporate governance and firms’ performance.

Theoretical Framework: Governance Levels in Brazil:

The need to increase the capital base in order to get support for investments took a lot of companies to choose the capital market, through going public. Thus, by its specific and efficient features, this modality has been a key factor of success for the financial and market development of many companies (Lopes and Valentim, 2011).

Going public is an alternative option to conventional financing mechanisms (own or third party capital) and can be considered as an important source of funds for companies. The considerable development of the capital market in the last decade occurred by the large number of companies that went public.

According to Assaf Neto (2001, p.23):

"Going public with IPO is a possibility of raising funds, which presents itself as one of the most advantageous for companies that are established as joint-stock companies, which have a considerable size of products or services and are well accepted by consumers".

However, according to Lopes and Valentim (2011), this market still does not approach the reality of the most developed countries regard to the acceptance by the savers. From this perspective, there is the need to generate greater reliability, especially regarding to the access to reliable information. Therefore, corporate governance has emerged, and because of its normalizing characteristics constituted a process that through the information management seeks to reduce the gap between the company's controlling and its minority shareholders (Lopes and Valentim, 2011).

Created by Bovespa in December 2000, the Corporate Governance levels include rules for companies and differentiate them according to the commitment degree with governance, aiming the development of the Brazilian stock market (Colombo and Galli, 2010).

Differentiation of levels:

According to publication of the BM&FBOVESPA (2014), the special segments of listing - Bovespa Mais, New Market, Level 2 and Level 1 were created at the time of realization that to develop the Brazilian stock market, it was necessary to have appropriated segments to different profiles of companies. All segments prize for strict rules of corporate governance. These rules go beyond the obligations that companies have towards the Law of joint-stock companies. That is, the goal is to improve the evaluation of companies that decide to join voluntarily to these levels of listing.

The adherence of the companies, at Level 1 or Level 2, depends on the commitment degree and is formalized through a contract between the company and the BM&FBOVESPA. Companies that are classified at Level 1 should present improvements in providing information to the market and promote the dispersion of the controlling share (Almeida et al., 2008).

In addition to the requirements for Level 1, companies listed on Level 2 adopt a broader set of rules of governance practices in order to prioritize and expand the rights of minority shareholders. The companies listed at this level have the right to maintain preferred shares. If the control of the company is transferred, holders of common and preferred shares have the same rights of controlling shareholders, anticipating the tag along right of 100% of the price paid for the common shares of the controlling shareholder. The preferred shares also give voting rights to shareholders in critical situations, such as the approval of mergers and acquisitions of the company and contracts between the controlling shareholder and the company, always that such decisions are imposed to the approval at the shareholders' meeting.

The New Market requires companies to commit themselves to the highest standard of Corporate Governance. The companies listed in this special segment can just emit common shares, which are shares with voting rights, and should voluntarily adopt corporate governance practices in addition to those presented in the legislation, expanding shareholders' rights besides the adoption of a more transparent and comprehensive information divulgence policy.

According to the information on the BM&FBOVESPA (2014), the rules related to the governance structure and shareholders rights are:

The capital must be composed exclusively of common shares with voting rights;
In the case of control sale, all shareholders are entitled to sell their shares at the same price (tag along of 100%);

In case of delisting or cancellation of the contract with BM&FBOVESPA, the company must do public offer to repurchase the shares of all shareholders, at least, by the economic value.

The Management Council must be composed of five members at least, being 20% of independent directors and two years maximum term;

The company also undertakes to maintain at least 25% of the shares in circulation (free float);

Release of more complete financial data, including quarterly reports with cash flow statement and consolidated reports reviewed by an independent auditor;

The company must provide annual financial reports in an internationally accepted standard;

Need to monthly disclose the securities negotiations of the company by directors, executives and controlling shareholders.

Aiming to enable small and medium-sized companies to access the stock market and gradually grow, BM&FBOVESPA created in May 2014 the Bovespa Mais. In this segment, the funding is lower compared to the New Market, however, are enough to finance its growth plans. Through Bovespa Mais, investors are attracted by the potential for stronger growth in the business.

Another feature is that companies can be listed on the stock exchange and have up to seven years to carry out the IPO (Initial Public Offering). During this time, entrepreneurs: (i) can invest in the professionalism of their business aiming just the listing and then have more time to conduct the public offering of shares; (ii) are exempt of the registration fee (fee charged by BM&FBOVESPA for companies’ registration); (iii) receive gradual discount on listing maintenance fee, being a 100% discount in the first year.

The Bovespa Mais is composed by companies that assume commitments of high standards of corporate governance and transparency to the market, and have the benefit of being analyzed by two specialized institutions, which will be selected by APIMEC (Paulista Association of Stock Market Investors) and BM&FBOVESPA support all costs for the production of four research reports (two reports a year, from the listing) made by these institutions.

**Influences of adherence to different levels of corporate governance:**

Some studies have handled the subject, suggesting that companies listed in Different Levels of Corporate Governance of BM&FBOVESPA have positive ex-post returns as well as superior economic and financial performance compared to the other companies (Martins et al., 2006); (Colombo and Galli, 2010); (Fernandes et al., 2011). Regarding to the stock returns, the results found by the authors show that the relation between governance and stock returns may be positive, but not statistically significant, as well as the adherence to these levels contributes to the increase of the shares liquidity of the companies.

Batistella et al. (2004) analyzed the reaction of the Brazilian stock market to the adherence of publicly traded companies to Level 1, and found that this adhesion is not recognized by the market as sufficient to cause a significant effect on stock returns of the studied companies.

Aranha et al. (2015) assesses if there are differences in the behavior of stock prices of the Brazilian Electric Sector companies listed on corporate governance segment of the BM&FBovespa in relation to those not listed. The results found by the authors also showed that statistically there was no significant difference in stock prices in the surveyed period.

The electricity sector is also covered in the research of Rodrigues et al. (2015), with respect to the business performance of the segment that joined the differentiated levels of corporate governance, drawing a comparison of the performance of listed companies in different levels and highlighting the theoretical framework proposed by the Firm Theory. The authors found that the vast majority of companies surveyed did not show performance variation before and after adherence. When comparing the performance of all selected companies, it was observed that companies listed on the new market of corporate governance gained a superior performance than companies listed on Level 1. The results also showed that in the same segment, companies did not obtain similar average performance.

**Methodology:**

**ARIMA models:**

Considering the observations \(\{X_t, t = 1, \ldots, N\}\) of a time series, a decomposition model consists to write \(X_t\) as a sum of three components: \(X_t = T_t + S_t + e_t\), where \(T_t\) and \(S_t\) represent the trend and seasonality, respectively, and \(e_t\) is a random component, of mean zero and constant variance (stationary). The trend can be seen as a gradual increase or decrease of observations over a period, and seasonality shows fluctuations occurred in periods (less than one year) and can be monthly, quarterly, daily etc.; and the random component or error shows the irregular random fluctuations (Morettin and Toloi, 2006).

If \(\{e_t\}\) is a white noise, then \(E(e_t, e_s) = 0, t \neq s\). Eventually we can relax the proposition of \(e_t\) being a white noise, it is, uncorrelated, supposing that it is a stationary process.
The series given by \( X_t = T_t + S_t + e_t \) is a non-stationary series (Morettin and Toloi, 2006). The main interest is to obtain a stationary series and this requires that the series is free of trend and seasonality. In general, the series found present seasonality and/or trend and estimating \( T_t \) and \( S_t \) and subtracting the \( X_t \), we obtain the random component \( e_t \).

A widely used method in the analysis of parametric models is known as Box and Jenkins approach (Box and Jenkins, 1976). This methodology consists to adjust autoregressive integrated moving averages models (ARIMA) to a stationary time series.

Developed in 1926 by Yule, the autoregressive models of order \( p \), AR(p) is represented by:
\[
X_t = \mu + \varnothing_1 X_{t-1} + \varnothing_2 X_{t-2} + ... + \varnothing_p X_{t-p} + \alpha_t,
\]
and we can assume without loss of generality that \( \mu = 0 \) or we take \( X_t = X_t - \mu \). Thus, \( \varnothing(B)X_t = \alpha_t \), being \( \varnothing(B) = 1 - \varnothing; B - ... - \varnothing_p B^p \) the autoregressive operator of order \( p \) \( \alpha_t \) is a white noise.

Regarding to moving average models (MA), it is recognized that it is given by
\[
X_t = \alpha_t - \theta_1 \alpha_{t-1} - ... - \theta_q \alpha_{t-q},
\]
and the series is seen as a weighted sum of \( q \) previous observations of the noise, and \( \alpha_t \) is called process of moving averages of \( q \) order, denoted by MA(q). Setting the moving average operator and \( q \) order by \( \theta(B) = 1 - \theta; B - ... - \theta_q B^q \) we can write
\[
X_t = \theta(B)\alpha_t.
\]

Often, a series is adjusted by an AR(p) model for a very large \( p \). One way to decrease the number of parameters is to include terms of moving averages in the model, that is, we will have an autoregressive and moving averages model (ARMA), denoted by ARMA \((p, q)\):
\[
X_t = \varnothing_1 X_{t-1} + \varnothing_2 X_{t-2} + ... + \varnothing_p X_{t-p} + \alpha_t - \theta_1 \alpha_{t-1} \text{ or }
\varnothing(B)X_t = \theta(B)\alpha_t
\]

If \( \Delta^d X_t \) is stationary, we can say that \( W_t \) can be represented by an ARMA model \((p, q)\), it is,
\[
\varnothing(B)W_t = \theta(B)\alpha_t. \text{ If } W_t \text{ is a difference of } X_t, \text{ then we say that } X_t \text{ follows an autoregressive integrated moving average model, ARIMA } (p, d, q) \text{ of order } (p, d, q), \text{ that is, }
\varnothing(B)W_t = \theta(B)\alpha_t. \text{ So }
\varnothing(B)(1 - B)^d X_t = \theta(B)\alpha_t.
\]

**Intervention models:**

According to Morettin and Toloi (2006), the intervention is a change in level or slope occurred in the series in a particular instant of time, by some known or unknown cause, that is, by some interference, the series switches from the segment that it was developing in an instant or over a period of time. These phenomena that appear in some series are not estimated by the ARIMA model.

The intervention occurs when the path of a time series is distorted due to some phenomenon or by a decision adopted by the economic agents, so can be natural or human-induced. This nomenclature was developed by Glass (1972) and based on Box and Tiao (1965) who have used this method without calling it intervention (Samohyl, et al., 2002).

A general class of models that take into account the occurrence of multiple interventions, is given by:
\[
Y_t = \sum_{i=1}^{k} I_t(B)X_{t-j} + N_t \text{ where } Y_t \text{ is the response-variable of the model; } k \text{, the number of interventions in the series; } I_t(B), \text{ the value of the transfer function; } X_{t-j}, \text{ the binary variable; } N_t, \text{ the noise of the model. } N_t \text{ can be modeled by an ARIMA class model, proposed by Box and Jenkins (1976).}
\]

There are two basic structures of intervention analysis Pulse \((P^T)\) and Step \((S^T)\). The intervention of Pulse type corresponds to a dummy variable, which assumes value 1 at the time of the event, and 0 at times when the event has not occurred, it means, \( I_t = (P^T) \), where \((P^T) = 1, \text{ for } t \equiv T \text{ and } (P^T) = 0, \text{ for } t \neq T \). While the Step variable has a value equal to 0 before the occurrence of the event and value of 1 afterwards to it, being its mathematical representation characterized by: \( I_t = (S^T) \), where \((S^T) = 0, \text{ for } t < T \text{ and } (S^T) = 1 \text{ for } t \geq T \).

Basically, the construction of intervention models consists in adding to the ARIMA class models the effects of exogenous variables, through a transfer function. In this case, if observed the occurrence of an event, regardless to the phenomenon that originated the time series, which can influence the behavior of the series, it is suggested the use of a model with intervention in order to capture the effects caused (Pessanha et al., 2012).

**Methods for the volatility extraction:**

In Modern Finance Theory, volatility appears as an essential element to be considered in the evaluation of asset pricing processes, financial decision-making and in risk management. It is characterized by oscillations in the price of goods, in a given time interval and as higher is the price fluctuation, higher is the volatility of this market (Pessanha et al., 2014).
Volatility will be addressed in this study based on ARCH class models (Heterocedastic Autoregressive Models), introduced by Engle (1982) in order to estimate the variance of inflation. According to Morettin and Toloi (2006), these models are non-linear regarding to the variance and aim to model the volatility, that is, the conditional variance that evolves in time.

Another usual model is the stochastic volatility, considering that in the classic models of time series of ARMA type, it is assumed that innovations are a sequence of white noises. In the analysis of economic data, these innovations occur in clusters, suggesting that in certain periods the economic variables become more or less volatile than usual. It is noteworthy that the adjustment of ARMA models aims to remove the serial correlation of a given series, if it exists. If so, there is

$$\varnothing(B) = \hat{\theta}_t + \theta(B)X_t$$

$$X_t \sim ARCH(r).$$

Thus, for $X_t$, it is assumed that the series is not correlated, it means, is the residue of an ARMA model application to the original series.

To verify if the series has conditional heterocedasticity, two tests can be used: Box-Ljung test and the Lagrange multiplier test (ML) from Engle (1982). If the series $X_t^2$ presents significant correlation since the volatility $h_t$ is given by past values, you can use the partial autocorrelation function of $X_t^2$, to determine the order of ARCH, $X_t^2$ is a $h_t$ estimator and has a behavior of an AR model. In order to model the volatility, which generally treats about a return, appeared the models of ARCH family, introduced by Engle (1982) and developed by Bollerslev (1986) and Glosten et al. (1993).

**Construction of data and variables:**

The variables used in this paper are arranged in the form of time series. A description of each one and the impact expected by the adherence to New Market variable in the profitability indicators ROA, ROE and NM are shown in Table 1. For the calculation of these indicators was used quarterly series between the first quarter of 2003 and the third quarter of 2014. The intervention was defined according to the event occurrence, in November 2011.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Expected Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adherence to New Market</td>
<td>Dummy variable that takes the value 0 (zero) for the non-occurrence of the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>event and one (1) for the occurrence.</td>
<td></td>
</tr>
<tr>
<td>Return on Assets (ROA)</td>
<td>Calculated from the ratio between the net income, after Income Tax, and</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td>Equity. It measures the return earned on the investment (preferred and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>common shares) of the company's owners.</td>
<td></td>
</tr>
<tr>
<td>Return on Equity (ROE)</td>
<td>Calculated by the ratio between net income, after Income Tax, and the Total</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td>Assets. It measures the overall efficiency of management in generating</td>
<td></td>
</tr>
<tr>
<td></td>
<td>profits with its available assets.</td>
<td></td>
</tr>
<tr>
<td>Net Margin (NM)</td>
<td>Shows net income for each sold unit. In other words, it corresponds to the</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td>&quot;left over&quot; for shareholders regarding to gains from sales and services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(after deductions). It is calculated by the formula net income divided by</td>
<td></td>
</tr>
<tr>
<td></td>
<td>net revenue.</td>
<td></td>
</tr>
</tbody>
</table>

For the study of volatility, we used the series of stock returns in the period between January 1st, 1999 and November 12, 2014. The company was chosen due to its representation on the national scene and because it is the only company in the telecommunications sector which belongs to the New Market segment. The data required for the construction of the variables used in this study were obtained from the Economática database. For the analyzes, we used the Gretl software.

**RESULTS AND DISCUSSION**

**Intervention analysis:**

Figure 1 shows the behavior of the original profitability series of Tim company. In order to measure the impacts of adherence to the New Market on the company's profitability it was used the intervention analysis.
As previously mentioned, may be present in a time series trend and seasonality factors. Therefore, it is required by way of confirmation, a spectral analysis to detect the presence of seasonality and tests application to detect the presence of stochastic trend (Morettin and Tolo, 2006).

The test performed for confirmation was the augmented Dickey-Fuller (ADF), proposed by Dickey and Fuller (1981). The purpose of the test is to verify the existence of a unit root in ARIMA models and verify the need to do the difference in the studied series before the model adjustment. In the test, was observed the presence of the stochastic trend component in the series of return on equity (ROE) and net margin (NM). Thus, it was necessary to perform the first difference (d = 1) in the original series, to make them stationary.

At first, a visual analysis of the series behavior allows us to infer that the intervention occurred abruptly and temporarily. The adjustment models of the studied series were generated and selected by the Box and Pierce tests, the Akaike Information Criteria and the Criteria of Forecast Mean Square Error (FMSE). To check if the adjusted model is a white noise, it was used the Ljung-Box test, which indicates that the most appropriate model is the stationary.

From the analysis of stationary series, it was observed in the autocorrelation (ACF) and partial autocorrelation (PACF) functions of each company, which lags had significant autocorrelation, making possible the suggestion of the number of parameters to be used in the adjustment of autoregressive moving average models (ARIMA). Estimates of ARIMA parameters and of intervention variable for the profitability indicators ROA, ROE and NM are shown in Table 2.

### Table 2: Estimates of ARIMA parameters and interventions for ROA, ROE and NM variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>ARIMA (2,0)</th>
<th>Estimatives</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>$\beta_1 = 0.234659$</td>
<td>$\beta_2 = 0.492431$</td>
<td>$\omega_t = -0.847259$</td>
</tr>
<tr>
<td>p-value</td>
<td>0.05443*</td>
<td>0.00006***</td>
<td>0.76538</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.122005</td>
<td>0.122336</td>
<td>2.83909</td>
</tr>
<tr>
<td>ROE</td>
<td>ARIMA (1,0)</td>
<td>$\beta_1 = -0.312364$</td>
<td>$\omega_t = -0.815793$</td>
</tr>
<tr>
<td>p-value</td>
<td>0.01827**</td>
<td>0.38206</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.132355</td>
<td>0.933282</td>
<td></td>
</tr>
<tr>
<td>NM</td>
<td>ARIMA (1,0)</td>
<td>$\beta_1 = -0.363153$</td>
<td>$\omega_t = -0.462471$</td>
</tr>
<tr>
<td>p-value</td>
<td>0.135613</td>
<td>0.653313</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.00741***</td>
<td>0.47902</td>
<td></td>
</tr>
</tbody>
</table>

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

It can be said, from the results presented in Table 2, that the intervention represented by the adherence to New Market was not significant to the profitability of Tim company. This fact could be explained by the insignificance of the event front of the investments of a large size company, therefore, did not represent a change in the behavior of the original series to become an intervention. Borgatto and Sáfadi (2000) consider that in some cases the intervention is obscured by some factors, such as the tendency component. Colombo and Galli (2010) add that it happens because the benefits of adherence to the different levels of governance can be visible only in a second moment when the company has access to cheaper sources of financing, the risk perception falls and the shares gain value.

**Adjustments of ARMA and ARCH Models:**

Figure 2 illustrates the original series and the returns of the shares from Tim Participações company. Through an initial and more visual analysis of graphics, it can be said that volatility is more concentrated between 1999 and 2010, where is observed higher peaks, which represent greater risks for investors. It is necessary to note that this period is before the governance level change. According to Pessanha et al. (2014), this erratic behavior of volatility (heteroscedasticity) on price and on the return of the company stock value, as well as the signs of the presence of stylized facts of the financial series provide clues about the use of ARCH class statistical models, as instruments of support for decision-making, evaluation and risk control.

The graphics of the autocorrelation and partial autocorrelation functions showed that the return series studied is not white noise. Thus, we continued with the adjustment of ARMA models, represented by Table 3. The stationarity and normality were also tested in order to identify the most suitable volatility model. Figure 3 illustrates the normality test proposed by Jarque and Bera (1987).

Through descriptive statistics, it is observed that the series has positive asymmetry, rejecting the hypothesis of normality of returns. Another point to be considered is the excess of kurtosis and the high value of the Jarque-Bera statistic, it means, the series
is leptokurtic, because presents observations concentrated in the center and in the tails, compared with the normal distribution.

This is a common feature of economic series, wherein the kurtosis estimates vary between 4 and 50 (the normal distribution has kurtosis equal to 3), indicating the non-normality. It is noteworthy other features as the grouping of volatility, long memory and asymmetry of positive and negative shocks.

**Fig. 2:** Original series of shares values and original series of share returns values from Tim Participações Company.

<table>
<thead>
<tr>
<th>Observations 1999-01-04 – 2014-11-12 for the variable Id_closure_Tim (4137 valid observations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>0,0000694624</td>
</tr>
<tr>
<td>Standard Deviation</td>
</tr>
<tr>
<td>0,0362808</td>
</tr>
</tbody>
</table>

Jarque-Bera Test = 7449,86
p-value = 0,000000

**Fig. 3:** Descriptive statistics of Tim return series.

<table>
<thead>
<tr>
<th>Table 3: ARMA parameters estimates for the returns of Tim company.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Models</td>
</tr>
</tbody>
</table>
| AR(2) | $\hat{\theta}_1 = 0,346871$  
$\hat{\theta}_2 = 0,57129$  
Standard Deviation = 0,113355  
0,000221***  
MA(2) | $\hat{\theta}_1 = 0,301138$  
$\hat{\theta}_2 = 0,626065$  
Standard Deviation = 0,112918  
0,007666*** |

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

After adjusting the ARMA class model, it was applied in the residual the ARCH-Lagrange Multiplier test (ARCH-LM) proposed by Engle (1982), to prove the presence of heteroscedasticity in the series. The null hypothesis for this test is the lack of correlation of variances in the residuals of estimated ARMA model for the stock returns of a company.

However, the p-values shown in the test indicated the presence of strong autocorrelation of the residuals for the adjusted ARMA model. Thus, we continued with the application of GARCH and TARCH models that incorporate in its parameters, the heteroscedastic standard of return volatility of the share values of the company analyzed in this study.

To verify if the adherence to New Market impacted on the volatility of the stocks and consequently caused impacts on the risk for investors, it was introduced in the models a dummy variable, which took value 0 before and 1 after the occurrence of the event. The ARCH-ML test was reapplied to evaluate the adjustment of the conditional variance of the return series to the adjusted model.

Based on the p-value presented by ARCH-ML test shown in Table 4, the hypothesis of heteroscedasticity in the residuals of the returns after the adjustment of the ARCH model was rejected. In other words, the test showed that the adjustment of the conditional variance was satisfactory for the series.
The results presented in Table 4 indicate that the adherence to New Market affected the volatility behavior of the studied company. Despite the low coefficient, the dummy variable was significant in the adjusted model. The relationship between variables was indirect, that is, the strategy adopted by Tim negatively impacted on the volatility of stock returns. It is emphasized that this was an expected result, because the adherence to this level requires the company's adoption of additional governance practices than those provided by law, as well as the expansion of shareholders rights and stricter disclosure of information, a fact that reflects in the stock market of the company through the risk reduction involved in trading its shares.

The functions of autocorrelation and partial autocorrelation after the adjustment of volatility are shown in Figure 4. The significance of the parameters and the acceptance of the null hypothesis of white noise, by Box and Pierce test indicate that the model was well adjusted.

### Table 4: Modeling of ARMA and ARCH return for Tim Company

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Deviation</th>
<th>z Statistics</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR(1)</td>
<td>-0.0442551</td>
<td>0.00341259</td>
<td>-12.97</td>
<td>0.0000***</td>
</tr>
<tr>
<td>AR(2)</td>
<td>0.0146918</td>
<td>0.00346853</td>
<td>4.236</td>
<td>0.0000***</td>
</tr>
<tr>
<td>Variance Equation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coefficient</td>
<td>Standard Deviation</td>
<td>z Statistics</td>
<td>p-value</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.000002</td>
<td>0.000004</td>
<td>7.316</td>
<td>0.0000***</td>
</tr>
<tr>
<td>New_Market</td>
<td>-0.002785</td>
<td>0.004519</td>
<td>-4.487</td>
<td>0.0000***</td>
</tr>
<tr>
<td>Residual_quad</td>
<td>0.984407</td>
<td>0.006269</td>
<td>157.0</td>
<td>0.0000***</td>
</tr>
<tr>
<td>Garch(1)</td>
<td>0.0000506</td>
<td>0.0000380</td>
<td>1.331</td>
<td>0.0000***</td>
</tr>
</tbody>
</table>

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

### Fig. 4: Autocorrelation and partial autocorrelation functions of residuals.

**Conclusion:**

Corporate governance has several approaches. A major concern is to ensure alignment between the main actors to previous agreed codes of conduct, through mechanisms that try to reduce or eliminate interest conflicts and breaches of fiduciary duty. Governance levels differentiate companies in the degree of commitment to the rules and can reflect on economic efficiency, maximizing value for shareholders.

The impacts of the adherence strategies to one of these levels by Tim Participações S.A. company were assessed in different ways in this paper. Initially, with the intervention analysis to see if such strategy is an intervention capable of modifying the behavior of the return series on assets (ROA), on equity (ROE) and on Net Margin (NM). Based on the presented data, the adhesion to the New Market did not cause any impact on the profitability metrics of the company, considering that this is a strategy for long-term benefits.

Another analysis was conducted in order to check the reaction of the stock market in face of the adherence to New Market, through the application of ARCH class models in the value of the shares return of Tim.

The results showed that in general, it can be said that the strategy of level change caused a negative impact on the volatility of the shares, reducing the risk for the shareholders of the studied company. Although it presented a low coefficient, the impact of the variable can be considered by the high statistical significance. Based on the literature about the subject, investors would be willing to pay a “governance award” by the commitment to corporate governance practices and by low risk, so it is expected the appreciation of the shares.

Finally, we consider the limitations of this work the restricted number of observations arising from the short-term of the event and the probabilistic character of results. Thus, with the results obtained here, we do not have the pretension of exhausting studies on the subject, but to contribute to the
discussion of an important issue for decision making. It is also suggested that future studies assess the impact of the change in listing segment on lucrative ness and profitability indexes of other companies, as well as the use of other statistical models.

REFERENCES


