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REVISTA DE CONTABILIDADE E CONTROLADORIA

ANALYSIS OF THE RESIDUAL INCOME VALUATION AND ABNORMAL EARNINGS GROWTH MODELS: A PRACTICAL APPROACH USING ANALYSTS' FORECASTS

Análise dos Modelos de Avaliação pelo Lucro Residual e Crescimento Anormal dos Lucros: uma abordagem prática utilizando projeções dos analistas

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ABSTRACT

This paper revisits two valuation models based on accounting figures: the Residual Income Valuation (RIV) and Abnormal Earnings Growth (AEG). Our research design has two approaches: i) we demonstrate theoretical integration of both models; and ii) we show in a practical manner that models converge to the same results based on real data of analysts forecast consensus. We apply statistical tests on empirical data from analyst's forecasts available on Thomson One Analytics database. We use information of 45 firms listed on the IBovespa segment from BMF&BOVESPA in 2008 with historical data from 2003 to 2007 and analysts' projections from 2003 to 2010. Our results do not show a significant mean difference of the valuations, but those from the RIV model are more dispersed than those produced by the AEG model. Furthermore, our results are consistent with international evidences and present additional evidences of application of valuation models based on accounting information in Brazil. Our findings support the use of valuation models based on accounting figures by analysts, investors, rating agencies and regulators to provide additional analyses of firm's future prospects.

Keywords: Residual Income Valuation; Abnormal Earnings Growth; Analysts' Forecasts; Accounting Figures.

RESUMO

Este artigo revisita dois modelos de avaliação de empresas baseados em números contábeis: Avaliação pelos Lucros Residuais (RIV) e Crescimento Anormal dos Lucros (AEG). Nossa pesquisa tem duas abordagens: i) Demonstramos a integração teórica de ambos os modelos; e ii) Apresentamos de um modo prático que os modelos convergem para os mesmos resultados com base em dados reais do consenso das previsões dos analistas. Nós aplicamos testes estatísticos em dados empíricos a partir das previsões dos analistas disponíveis no banco de dados Thomson One Analytics. Nós utilizamos as informações de 45 empresas listadas no segmento IBovespa da BMF&BOVESPA em 2008 com dados históricos de 2003 a 2007 e as projeções dos analistas, de 2003 a 2010. Nossos resultados não mostram uma diferença significativa de média das avaliações, mas aqueles a partir do modelo RIV são mais dispersos do que os produzidos pelo modelo AEG. Além disso, nossos resultados são consistentes com evidências internacionais e apresentam evidências adicionais de aplicação de modelos de avaliação baseados em informações contábeis no Brasil. Nossos resultados fornecem sustentação para o uso de modelos de avaliação de empresas baseados em números contábeis por analistas, investidores, agências de rating e reguladores para fornecer análises adicionais dos prospectos futuros de empresas.

Palavras-chave: Avaliação pelo Lucro Residual; Crescimento Anormal dos Lucros; Projeções dos Analistas; Números Contábeis.

1 INTRODUCTION AND MOTIVATION

There are many studies in the literature on firm valuation models based on accounting information, particularly examining companies in developed countries (KOTHARI, 2001), where accounting standards can also affect the economic reality faced by businesses and the variables used as inputs in the valuation models (OHLSON, 2005).

In Brazil, there is a need for more studies to capture the reality of a developing market with characteristics that are distinct from those of other countries (OHLSON AND LOPES, 2007; LOPES and WALKER, 2008). Accounting numbers are not very informative in Brazil, and "the evidence that valuation models based on accounting numbers function under these circumstances adds much to our knowledge of their validity and utility" (OHLSON AND LOPES, 2007, p. 102). In fact, valuation models will works independently of the countries GAAP, however, the quality of the numbers reported is the question. To control for this risk, we used the consensus of analyst's forecasts to test the validity of theoretical integration of both models.

Brazilian research about firms' valuation already presents some evidence on the application of models based on accounting information, comparing models, discussing the relevance of the accounting numbers and providing application tutorials. In this respect, we can mention the works of Lopes (2001), Dimitri (2004), Lustosa and Cupertino (2004), Galdi and Lopes (2006), Ferreira et al. (2008) and Calijuri et al. (2008).

The most traditional model in the literature and in the market, particularly in Brazil, is the discounted cash flow model (ALMEIDA et al., 2009, p.1). But this model does not consider accruals, which many authors believe provide complementary information to cash flow figures (SLOAN, 1996; PENMAN AND YEHUDA, 2007). For example, the portion of revenue from installment sales is recognized in the accruals, and in this case a portion of the revenues that are not accounted for as cash flow at time t_0 will become so at $t+_n$ because of the properties of the accounting system. There is also the case of depreciation (expenses that are not realized as cash flow at moment t_0). Therefore, all this information is already contained in the net accounting income.

In fact, Brazilian literature focuses on relevance of accounting numbers as inputs to valuation models analyzing the relation between accounting information and share prices. However, the studies of Ohlson and Lopes (2007) provided the integration among models starting from dividend discounted model, the evolution of discounted cash flow model and the usefulness of residual income valuation (RIV), before the abnormal earnings growth (AEG) development. Empirical evidence from Almeida et al. (2009) used accounting figures available on appraisal reports of firms' valuation showing that there is no difference between values estimated from RIV and AEG, neither when compare values estimated by accounting models from those estimated by discounted cash flow model available in these reports.

Notwithstanding of particular differences on methodological issues, the robustness of valuation models occurs when they predicts the same value for a single firm. For example, Penman (2005) argues that valuation models should converge to the same value. In the same way, Martins (2001, p. 7) states that on the long run, all models converge to a single earnings value and the differences on flows is due to the different temporal distributions of exactly the same cash flow. These considerations highlight the influence of accrual basis on valuation models.

Palepu, Healy and Bernard (2004) provided a complete tool to assess businesses divided in four steps: business strategy analysis, accounting analysis, financial analysis and prospective analysis. Hence, from a theoretical standpoint all models should converge to the same value (or small distance), and if they do not, some premise assumed on any of these steps was probably incorrect. To avoid problems with assumptions or one ask to estimate long horizon with different growth rates, we use data of consensus of analysts' forecasts available as input to the residual income valuation model (RIV) and the abnormal earnings growth model (AEG).

The most important points in the valuation process are the premises assumed for the projected value of future cash flow and the discount rate (or cost of capital rate). The models will converge to the same value only when the premises are adequate. Since the valuation models based on accounting information have been amply validated regarding their statistical and mathematical bases (OHLSON, 1995; OHLSON, 2005; PENMAN AND YEHUDA, 2007), we attempt to answer the following question in this study: Is it possible to obtain similar prices using RIV and AEG models considering the same assumptions in the Brazilian scenario?

Firstly, we start discussing the models integration and convergence; secondly, we investigate whether there is a statistically significant difference between the average prices estimated by applying RIV and AEG, based on the same premises.

We use information from Thomson One Analytics, which contains forecasts and accounting figures of firms listed on the Bovespa segment in BMF&BOVESPA. Our sample covers the period from 2003 to 2007 for accounting information and 2003 to 2010 for analysts' forecasts. The sample contains 45 companies followed by analysts during the entire period analyzed. We decided to use data of companies which all data for the study were available.

The results show that the RIV model is better adjusted to the market price than the AEG model, when analyzing the standard deviation of the estimated price in relation to the observed price. This evidence suggests that analysts may be overly optimistic, mainly in the short run, in projecting earnings flows, which are the inputs of the AEG model. However, there was no statistically significant difference between the means of these two models, showing that both converge to the same value and can be used complementarily.

The paper is organized into five sections including this introduction. The second section contains the theoretical reference based on a review of the literature, highlighting related studies and the derivation and convergence of the models. The third section, methodology, presents the procedures and premises for the empirical study and the descriptive statistics. The fourth section summarizes the results obtained and the fifth section presents our final considerations.

2 THEORETICAL BACKGROUND AND MODELS INTEGRATION

2.1 BUSINESS VALUATION PROCESS

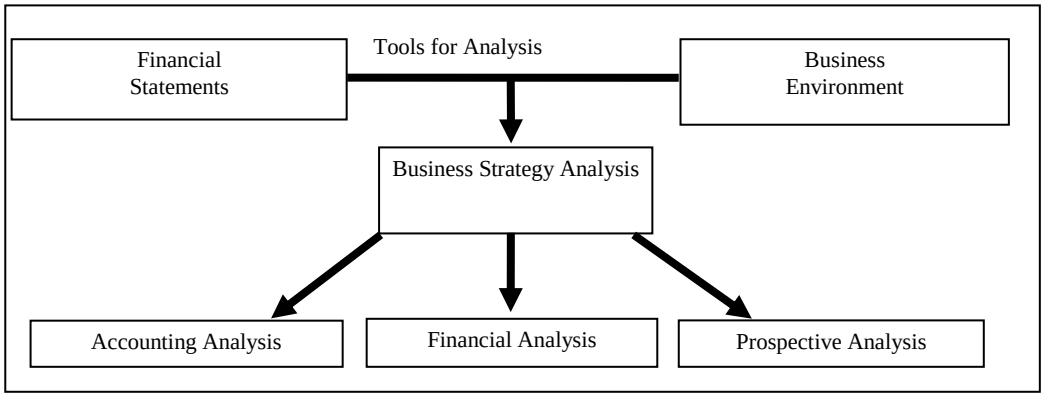
The process of business valuation relies on various information sources. Among them the most commons are the financial statements, market expectations and analysts' forecasts (PALEPU, HEALY AND BERNARD, 2004).

The rule of capital markets is to allocate savings in projects with positive net present values. On this hand, investors have money to invest in well-managed firms that will try to produce returns above the cost of capital. On the other hand, entrepreneurs need capital to develop their business. In this context, emerge the need for financial intermediaries such as financial institutions, venture capital firms, mutual funds and so on, and information intermediaries such as analysts, auditors and rating agencies (PALEPU, HEALY AND BERNARD, 2004).

The focus on analysts' forecasts is due to the fact they are intermediate agents between companies and investors. Their assessments seek to reduce the information asymmetry among various capital market agents (PALEPU, HEALY AND BERNARD, 2004). Usually they provide equity reports to the market showing macro and microeconomic analyses of firms' environment and their valuations, usually using discounted cash flow model. In the Brazilian context, Almeida et al. (2009) identified three basic approaches were used in the appraisal reports: shareholders' equity, business valuation multiples and discounted cash flow model. This evidence shows that in the environment of Brazilian public companies listed on Bovespa, specialists in business valuation use the models required by Comissão de Valores Mobiliários (CVM, Brazilian Security Exchange Commission) even the rule allowing the application of additional models.

We presented the flow chart below, showing steps that should be followed to obtain an accurate valuation and briefly explained each step in Figure 1, according to Palepu, Healy and Bernard (2004):

Figure 1: Analysis Using Financial Statements



Source: Adapted from Palepu, Healy and Bernard (2004).

- **Business Strategy Analysis (Step 1)**

The purpose of business strategy analysis is to identify the key sources of profits and business risks and to evaluate the firm's potential to generate profits. This entails analysis of its business segment and strategy to create a sustainable competitive advantage (GHEMAWAT AND LEVINTHAL, 2001; PALEPU, HEALY AND BERNARD, 2004; PORTER AND McGAHAN, 1997). Evaluation of the firm's competitive strategy facilitates evaluating wither current profitability is sustainable. In summary, it enables the analyst to make more accurate predictions on the firm's future performance.

- **Accounting Analysis (Step 2)**

The purpose of accounting analysis is to evaluate the degree which firm's accounting represents its business reality. It allows identifying the places where there is accounting flexibility and how appropriate the firm's accounting policies and estimates are. This allows analysts to assess the degree of distortion in the accounting figures. In this respect, it reduces the subjectivity of accounting choices using financial statements and its notes.

- **Financial Analysis (Step 3)**

The objective of this analysis is to use financial data to assess the firm's present and past performance and to evaluate its sustainability. The two main tools used are accounting ratios and cash flow analysis. These must be applied as systematically and efficiently as possible. In this step the historic data are analyzed and it will be used in the next step.

- **Prospective Analysis (Step 4)**

This analysis focuses on the expectation of firm's future prospects, based on the premises obtained in the previous steps. It comes last because it relies on knowledge of the other factors. While a firm's intrinsic value is a function of its future cash flow performance, it is also possible to evaluate the firm's value based on its current book value of equity and future return on equity (ROE) and growth prospects (GALDI AND LOPES, 2006).

Figure 1 shows that the most comprehensive analysis relies not only on published accounting and financial statements, but also on other aspects of the firm's business. This often depends on the ability of the analyst or specialist in business valuation to find information from various sources.

2.2 REVIEW OF BRAZILIAN LITERATURE

There are various methods to be applied in the business valuation process, among them the use of time series, regressions to assess the relevance of information and mean tests of estimated prices against observed prices (FAMÁ AND LEITE, 2003; PENMAN, 2005; GALDI AND LOPES, 2006; FERREIRA et al., 2008).

Each of the various existing models (such as the dividend model, discounted cash flow or DCF, RIV and AEG models) uses a variable that is discounted by a particular discount rate to estimate the present value. Galdi and Lopes (2006, p. 4) state that "in practice, capital market analysts most often use the free cash flow for the firm (FCFF) method, but some valuations are done using free cash flow to equity (FCFE) and others consider both flows."

Saliba (2008) investigates the valuation process by using multiples valuation. He argues, based on finance theory, DCF model takes into account errors in market prices and the time (long term) corrects mispricing. On the other hand, multiples valuation assumes that there are errors in pricing, but the estimated price is correct on average. Using several methodological approaches, the paper evidenced the relative performance of the operating cash flow and the EBITDA multiples are consistent than other multiples.

However, the seminal study in Brazil developed by Lopes (2001), using the RIV model background, showed that in the Brazilian capital market stock prices are more closely related to book value of equity than net income. After publication of this study, accounting based models began to be tested more frequently in the Brazilian market, but the number of such studies is still scarce.

Brazilian research applying accounting based valuation models moved toward statistical approach mostly. On the other hand, research using analysts' forecasts investigates bias, accuracy, precision and their role in the capital markets. In this paper, we tried to combine the literature about accounting valuation models and analysts research.

Galdi et al. (2008) investigated the application of DCF and RIV using analysts' forecasts and presented evidences that there is statistical difference between value estimated by both models, and price-to-book ratios based on DCF model has more explanatory power. However, the regression coefficients of RIV model are greater than the DCF model coefficients, a result not explored by authors.

The Brazilian evidences about research using analysts' data are scarce as well. For example, Martinez (2006) investigated the role of new information before and after earnings announcement. His evidences shown that Brazilian market reaction is different from international results, in other words, the author conclude negative earnings surprises were anticipated by negative abnormal returns before earnings announcement and positive earnings surprises is incorporated in positive abnormal returns after earnings announcement.

In this context, Martinez (2009) found evidences that analysts, on average, are optimist, even when firms report losses, and this compromises the performance to reach the market, precision and accuracy. However, the results provide evidences that firms highly covered by analysts increase their accuracy, as well as, firms' size.

Recently, studies investigated the role of analysts as intermediary informational agents in the corporate governance arrangements. For example, Martinez (2011) shows us that the presence of analysts covering firms enhances transparency and reduces earnings management, measured by discretionary accruals, mainly for firms covered by many analysts. Moreover, analysts errors reduces when increase the number of analysts covering a firm.

In this way, Dalmácio et al. (2010a) and Dalmácio et al. (2010b) presented evidences that firms with high quality corporate governance mechanisms contributes to increase the accuracy of analysts' forecasts, in other words, the better the corporate governance, the better the analysts accuracy.

2.3 RIV AND AEG INTEGRATION

The main conceptual and practical differences of discounted cash flow to accounting valuation models are that these models use of accrual basis and the choice of the initial value. Normally the initial value (or the anchor) of accounting based models is the book value of equity at time zero (BV_0), to which the present value of residual income (or abnormal earnings) is added. This is the basis of the RIV model. In contrast, in the AEG model the anchor value is no longer BV_0, but rather the earnings per share projected for the first period (eps_1), discounted by a cost of capital, which is equivalent to the BV_0 per share added to the present value of the portions of the AEG, called abnormal earnings.

The RIV model needs the book value and net income to operate. These are obtained from the balance sheet and income statement. In contrast, the AEG model allows the user to value a company only from information on the net income projected by analysts.

Below we present the derivation of the RIV model and its passage to the AEG model, so that the two models become equivalent, according to the following steps:

(A) Present Value of Expected Dividends (PVED): The firm's value is equal to the present value of its future flow of dividends, given a discount rate (r).

$$P_0 = \sum_{t=1}^{\infty} R^{-t} E_t[d_t] \qquad (1)$$

Where:
P_0 = present value of the firm
R = (1+r)
d_t = dividends
r = discount rate
R^{-t} = inversion $d_t/(1+r)$
$E_t[.]$ = mathematical operator of the expected value given the information at time t

(B) Clean Surplus Relation (CSR): This is also called the "all inclusive" or "comprehensive" concept, because it assumes that all the variations in book value pass through the income statement, except dividends and capital infusions.

$$PL_t = PL_{t-1} + LC_t - d_t \Rightarrow PL_t - PL_{t-1} = LC_t - d_t \quad (2)$$

Where:
BV = book value of equity
NI = net accounting income
d_t= dividends

(C) Abnormal Earnings: This approach considers more than one premise or definition. Abnormal earnings (L_t^a) are the residual earnings above or below the cost of capital. In this respect, it relies on the economic concept of the opportunity cost of capital, calculated by means of the BV in the previous period multiplied by the risk-free rate of return (r):

$$L_t^a = LC_t - r.PL_{t-1}$$

$$\text{or } L_t^a = LC_t - (R-1)PL_{t-1} \qquad (3)$$

It turns out that L_t^a does not depend on the company's dividend policy. Algebraic manipulation of **(A)**, **(B)** and **(C)** leads to the residual income valuation model, as follows:

1st Step:

Isolate dividends in equation (1):

$$PL_t - PL_{t-1} = LC_t - d_t$$

$$d_t = PL_t - PL_{t-1} - LC_t \qquad (4)$$

2nd Step:

Include the abnormal earnings from equation (4) in equation (3):

$$L_t^a = LC_t - (R-1)PL_{t-1} \qquad (3)$$

$$LC_t = L_t^a + (R-1)PL_{t-1} \qquad (5)$$

Substituting (5) into (4) produces:

$$d_t = PL_{t-1} - PL_t + L_t^a + (R-1)PL_{t-1}$$

$$d_t = PL_{t-1} + (R-1)PL_{t-1} - PL_t + LC_t^a$$

$$d_t = PL_{t-1} + [1+(R-1)] - PL_t + LC_t^a$$

$$d_t = PL_{t-1}.R - PL_t + L_t^a \qquad (6)$$

3rd Step:

Substitute (6) into (1):

$$P_0 = \sum_{t=1}^{\infty} R^{-t} E_t[PL_{t-1}.R - PL_t + L_t^a]$$

Now consider the first three periods for simplification:

$$P_0 = \frac{PL_0.R - PL_1 + L_1^a}{R} + \frac{PL_1.R - PL_2 + L_2^a}{R^2} + \frac{PL_2.R - PL_3 + L_3^a}{R^3} + \sum_{t=4}^{\infty} \ldots$$

The first term in each period can be simplified as follows:

$$P_t = \left[\frac{PL_0.\cancel{R}}{\cancel{R}} - \frac{PL_1}{R} + \frac{L_1^a}{R}\right] + \left[\frac{PL_1.\cancel{R}}{R^{\cancel{2}}} - \frac{PL_2}{R^2} + \frac{L_2^a}{R^2}\right] + \left[\frac{PL_2.\cancel{R}}{R^{\cancel{3}}} - \frac{PL_3}{R^3} + \frac{L_3^a}{R^3}\right] + \sum_{t=4}^{\infty} \ldots$$

Therefore,

$$P_t = \left[PL_0 - \frac{PL_1}{R} + \frac{L_1^a}{R} \right] + \left[\frac{PL_1}{R} - \frac{PL_2}{R^2} + \frac{L_2^a}{R^2} \right] + \left[\frac{PL_2}{R^2} - \frac{PL_3}{R^3} + \frac{L_3^a}{R^3} \right] + \sum_{t=4}^{\infty} \ldots$$

Hence, the second term of one period cancels the first term of the next period, so that only the following terms remain:

$$P_0 = PL_0 + \sum_{t=1}^{\infty} \frac{L_t^a}{R^t} - \frac{PL_\infty}{R^\infty}$$

The second term does not cancel out at infinity because the first term at time t is always eliminated by the second term at t-1. At infinity, the second term "remains", but this term can be disregarded because at the limit:

$$\lim_{t \to \infty} \frac{PL_t}{R^t} = 0$$

Therefore, the equation can be written as:

$$P_0 = PL_0 + \sum_{t=1}^{\infty} R^{-t} L_t^a$$

To make the RIV and AEG models equivalent it is necessary to treat the RIV by the number of shares (per share basis) and assume that:

- for the RIV, $P_0=BV_0$;
- for the AEG, $P_0=eps_1/r$, so $PL_0 = \frac{eps_1}{r}$, where eps_1 is the earnings per share at time t_1 discounted by a cost of capital equal to the opportunity cost of the BV per share, hence:

$$P_0 = \frac{eps_1}{r} + \sum_{t=2}^{\infty} R^{-t} AEG_t$$

In passing from the RIV to AEG model, BV_0, which anchors the RIV model, is equal to the AEG model's anchor, eps_1/r. At this point, the CSR is no longer considered (OHLSON, 2005; PENMAN, 2005). Therefore, the abnormal earnings of the RIV model or the portions of the AEG that are brought to present value are the corrections of the accounting value to the market value.

The AEG value is equal to the variation of residual (or abnormal) earnings for a constant cost of capital considering the CSR:

$$\begin{aligned} AEG_t &= NI_t + r.d_{t-1} - (1+r)NI_{t-1} \\ &= NI_t - NI_{t-1} - r\,(NI_{t-1} - d_{t-1}) \\ &= NI_t - NI_{t-1} - r\,(BV_{t-1} - BV_{t-2}) \\ &= NI_t - r.BV_{t-1} - (NI_{t-1} - r.BV_{t-2}) \end{aligned}$$

Therefore, the future abnormal earnings flows are equal for both models and the anchor of each model could be altered. For the AEG, there is no need to project the BV. This takes the balance sheet out of the process, since the growth of BV by the RIV model is the net income minus dividends given by the CSR (PENMAN, 2005).

To estimate the discount rate *r*, the cost of capital could be calculated by a reverse engineering procedure (OHLSON AND LOPES, 2007), estimated as follows:

$$r = A + \sqrt{A^2 + \frac{eps_1}{P_0} \times \left(\frac{\Delta eps_2}{eps_1} - (\gamma - 1) \right)}$$

where:

$$A = \frac{1}{2}\left(\gamma - 1 + \frac{dps_1}{P_0} \right)$$

Assuming, $1 \leq \gamma < R$. When γ is greater than or equal to 1, a constant growth parameter can be assumed.

Lopes (2001, p. 107) stated that "this relation makes accounting of great importance in valuing companies. This new role of accounting is based not based on considerations of accounting standards, but rather on a logical analytical deduction within the mainstream of financial theory."

It is interesting to note that according to Martins et al. (2007, p. 8), although the cost of capital equation is complex, it only depends on the following variables: current price, dividend per share expected at the end of period 1, expected earnings growth from period 1 to period 2 and the parameter *γ.* However, nothing prevents estimating the cost of capital in another form.

3 METHODOLOGY

We used accounting information and analysts' forecasts available in the Thomson One Analytics database. Our methodological procedures is motivated by the little literature presenting the RIV and AEG models in a practical manner, we can highlight the studies of Brief (2007), Penman (2005) and Calijuri et al. (2008).

A limitation of this study is related to the data set. There is a small sample of firms covered by analysts in Brazil., nevertheless, we developed a sample of 45 firms listed on the Bovespa segment from BMF&BOVESPA in 2008 and we use historical data from 2003 to 2007 and analysts' projections from 2003 to 2010. In this case, we avoided the subjectivity to forecast future flows of abnormal earnings or residual income that is usually stated *ad hoc*.

Based on Penman (2005) study, we estimated the value of each firm according to both models specifications and defined two approaches: i) we divided the estimated price by the current price (P_0) to measure the dispersion of the estimated value to the real one; and ii) we used estimated nominal values. We used the same discount rate (*r*) of 10% for practical purposes as Penman (2005), assuming as risk-free rate.

The models used were:

$$P_0 = \frac{eps_1}{r} + \left[\frac{g_s - g_L}{r - g_L} \right] \qquad \text{(AEG)}$$

$$\mathrm{P}_0 = PL_0 + \sum_{t=1}^{t=5} R^{-\tau} L_t^a \qquad \text{(RIV)}$$

Where:

$$g_s = \frac{eps_2 - eps_1}{eps_1} - \frac{r \times dps_1}{eps_1}$$

$$g_L = \frac{eps_t - eps_{t-1}}{eps_{t-1}} \text{ em que } t \to \infty$$

Ohlson and Lopes (2007) considered that the growth rate, g_L, usually is near of the overall economy, between 3-4%, while Penman (2005) assumed 5% and we use the same rate as Penman (2005). To obtain estimates without problems, g_L needs to be smaller than g_s and *r*.

Table 1 below presents the descriptive statistic of the values estimated by each model:

Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
RIV/P	45	1.049	1.475	-0.072	8.669
AEG/P	45	1.167	2.382	-3.659	13.744
RIV	45	10924.93	14533.25	-1876.713	82789.21
AEG	45	9455.571	14694.29	-26924.46	45920.13

Remark: RIV/P is the value estimated by the RIV model divided by P_0; AEG/P is the value estimated by the AEG model divided by P_0; and RIV and AEG are the nominal values estimated by the respective models.

It can be seen that the variable RIV/P, although it has a lower mean than AEG/P, it has a lower standard deviation, resulting in an estimate nearer the real value of the companies. On the other hand, for the nominal (or total) estimated values the standard deviations are very near for both models.

To find out whether these values are statistically different, we carried out a nonparametric mean tests, called Mann-Whitney Test, because the sample may not follow the assumptions of normality. To analyze the normal distribution of the sample we applied Kolmogorov-Smirnov Test in each variable considering significance level at 0.05. The following table shows us the p-values:

Table 2: Kolmogorov-Smirnov Normality Test

Variable	Obs.	KS	P-Values
RIV/P	45	0.285	<0.01
AEG/P	45	0.140	0.034
RIV	45	0.267	<0.01
AEG	45	0.242	<0.01

Remark: RIV/P is the value estimated by the RIV model divided by P0; AEG/P is the value estimated by the AEG model divided by P0; and RIV and AEG are the nominal values estimated by the respective models.

Analyzing the p-values of the Kolmorov-Smirnov Tests, the sample does not follow a normal distribution. Because of this result, we applied Mann-Whitney Test to compare the estimation of both valuation models RIV and AEG.

4 EVIDENCES

Since the literature demonstrates that RIV and AEG valuation models converge, theoretically, in time horizon to the same value, we decided to carry out mean tests on the estimates obtained by each model. This provides more

robustness to the results obtained in the descriptive statistic and the propositions demonstrated theoretically, since Penman (2005) just presented descriptive analysis.

As discussed in the methodology section, we performed nonparametric tests to compare results in two moments. Firstly, we compare the statistical difference between estimated values scaled by prince in t_0 (P_0). Secondly, we applied nonparametric test to compare statistical difference on estimated nominal value. Table 3 presents the results of Mann-Whitney test (nonparametric) for the values estimated by each model scaled by P_0:

Table 3: Results of the Nonparametric Mann-Whitney Tests

Variables	N	Median	Null Hypotheses: H_0: RIV/P = AEG/P
AEG/P	45	0.6072	**Mann-Whitney W Statistics:** 2017.0
RIV/P	45	0.6226	**P-Value:** 0.8087

Remark: RIV/P is the value estimated by the RIV model divided by P0; AEG/P is the value estimated by the AEG model divided by P0.

Table 3 shows us that the null hypotheses formulated between medians are equal. The p-value obtained is 0.8087, which do not allow us to reject H_0. In this case, the values estimated by both models and scaled by P_0 are not statistically different.

Table 4: Results of the Nonparametric Mann-Whitney Tests

Variables	N	Median	Null Hypotheses: H_0: RIV = AEG
AEG	45	6734.9	**Mann-Whitney W Statistics:** 2003.0
RIV	45	8698.8	**P-Value:** 0.7225

Remark: RIV and AEG are the nominal values estimated by the respective models.

We performed the same analysis for the nominal values estimated by the RIV and AEG models as presented in table 4. Just as previously, the results show that the values estimated by the RIV and AEG models cannot be considered different in this sample. Thus, there is no statistical difference between the means.

The nonparametric tests strengthen the theoretical hypothesis that there is no difference between the valuations estimated by AEG and RIV models for the listed Brazilian companies considered in the sample.

We conjecture that the difference in the standard deviations might be caused by an intertemporal effect of accruals between models variables due to different level of conservatism practices. Another possible explanation is that, according to other studies, analysts are more optimistic in the short run (PENMAN, 2005; MARTINEZ, 2007), which can affect their earnings forecasts and increase the standard deviation of the AEG model.

5 FINAL CONSIDERATIONS

This study investigates the practical application of RIV and AEG firms' valuation models based on accounting figures using analysts' forecasts. Both have been widely studied in the literature but not extensively examined for Brazilian firms.

We applied nonparametric Mann-Whitney Test to verify the possibility of a statistical difference between the values obtained by the two models. Our results indicate there are no statistically significant difference between models, confirming the hypotheses formulated and the theoretical underpinnings. Additionally, we found that the estimated values were consistent with the observed prices (P_0) used as scale.

The evidence indicates that these models can be utilized together by analysts, investors and other market agents to assess companies' values. The RIV model showed a better fit to the market value than the AEG model, but it requires more criteria, since it is necessary to use financial statements, which could be more conservative, while the AEG model relies on net income projected by analysts as a direct input.

Another point observed is the greater standard deviation of the value estimated by AEG model when compared to RIV estimated value. This evidence agree with other findings in the literature, according to which analysts are more optimistic in the short run, causing this variability on estimated value.

Finally, the results and demonstration of the models corroborate the perspective proposed by Martins (2001), Penman (2005) and Ohlson and Lopes (2007) that the values estimated by the models should converge, despite the temporal differences between the cash basis and accrual basis accounting.

There are some limitations in this study that do not allow us to test the value relevance of accounting information estimated by analysts due to the short sample and the discounted rate could differ from each firm.

We believe this study contributes through the dissemination of business valuation models based on accounting figures among market agents, providing additional evidence to researchers, analysts that could apply such models and regulators, encouraging the use of alternative methods.

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