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Sell-Side and Buy-Side Performance with Target Price in Brazil

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Resumo

Objective: O objetivo desta pesquisa é investigar a performance de analistas *buy-side* e *sell-side* brasileiros na previsão de preços-alvo. Este trabalho investigou a existência de viés, acurácia e nível de atingimento dos preços-alvo.

Method: O método utilizado para investigar a performance foi o de testes de médias. Utilizamos regressões a fim de encontrar elementos que explicassem as diferenças na previsão dos preços-alvos. A amostra foi composta por empresas brasileiras acompanhadas por tais analistas durante os anos de 2013 a 2018, preços-alvo estipulados por analistas *buy-side* de um investidor institucional brasileiro e do consenso de mercado dos analistas *sell-side* extraídos da Bloomberg.

Results: Os resultados indicaram a existência de viés mais otimista por parte dos analistas *buy-side* em todos os testes. Quando utilizadas todas as empresas da amostra, verificou-se melhor acuracidade e melhor nível de atingimento dos preços-alvo pelos analistas *sell-side*. Quando utilizada apenas empresas emissoras de ADR, não houve diferença na acurácia e no nível de atingimento dos preços-alvo, e o viés otimista se reduziu para os dois grupos de analistas. bertura de analistas, menor valor de mercado e menor volume de negociação.

Contributions: Este trabalho contribui com a literatura ao apontar que as divergências no desempenho dos analistas *buy-side* e *sell-side* se revelam evidentes para as empresas com menor e menos rígida cobertura de analistas; confirma que o fraco ambiente institucional contribui para uma precificação (preços-alvo) de menor precisão; e avança na qualidade da amostra em relação a outras trabalhos, ao utilizar as mesmas empresas e o mesmo objeto de estudo (preço-alvo). Este artigo aponta como direção para novas pesquisas a investigação de diferença de preços-alvo em empresas com pouca cobertura de analistas, menor valor de mercado e menor volume de negociação.

Keywords: Analysts, target price, buy-side, sell-side, ADR, valuation.

Introduction

Analysts are informational intermediaries who gather, analyze, and produce information for the investor community (Kothari et al., 2016). Sell-side analysts issue reports that are released to their clients so that they can make their investment decisions and are employed by investment banks and securities brokers (Bradshaw, 2011). Buy-side analysts play the same role, but the results of their analysis are not disclosed, and it should be noted that buy-side analysts have access to sell-side analysts analyzes, while the opposite is not true.

Buy-side analysts are employed by institutional investors, such as mutual funds, pension funds and hedge funds (Groysberg et al., 2008; Brown et al., 2016). They subsidize the investment decisions of these major capital market players (Groysberg et al., 2008). In the Brazilian market, for example, according to data provided by B3, in the period from years 2014 to 2018 the institutional investor was responsible, on average, for 27.3% of B3's share turnover. In the information disclosed it is noted that foreign investors accounted for more than 48% of the negotiations in 2018, raising the doubt as to how much of this negotiation took place through foreign institutional investors.

In the last few decades, hundreds of surveys have been carried out aimed at sell-side analysts (Bradshaw, 2011; Lima Junior, 2017). Due to data limitations, there are a few studies focused on the performance of buy-side analysts (Jung et al., 2018). In addition, the works produced aimed at buy-side analysts show mixed results. Groysberg's work (Groysberg et al., 2008) found greater optimism and less accuracy for buy-side analysts compared to their sell-side peers in forecasting profits. Later, Groysberg (Groysberg et al., 2013) found less optimism on the part of the buy-side compared to the sell-side when only large companies in the market are used and with low volatility in their returns. Hobbs & Singh (2015), in general, concluded that the sell-side still outweighs the buy-side, despite all the conflict of interest documented in the literature. Thus, the quality of the buy-side analyst's performance, a very important and relevant player to the capital markets, remains unresolved in the literature.

As they do not face the conflicts of interest experienced by sell-side analysts, considering the big representativeness of the role of buy-side analysts in the Brazilian market and the fact that the consistency of Brazilian sell-side analysts is less when compared to peers in other markets (Lima & Almeida, 2015), the authors consider Brazil an appropriate market to study and to look answers not given yet satisfactorily by the literature. The expectation of the authors of this work is that the performance of Brazilian buy-side analysts is better than their sell-side peers. Thus, there is the following research question: do Brazilian buy-side analysts perform better in forecasting target prices compared to their sell-side peers?

To answer the question above, target prices stipulated by the two groups of analysts for the same group of shares were used and the bias, accuracy and levels of forecasting were calculated. The methodology used was the same as in Bradshaw et al. (2013). The target price was used because analysts often use it to support their recommendations (Bradshaw, 2002) and because it has become the study benchmark for evaluating the performance of analysts (Bradshaw et al., 2013; Bradshaw et al., 2019). The research also considered the effects caused by the fact that companies are or are not listed on the American market through American Depositary Receipt (ADR).

The forecasts of the buy-side analysts were provided by a Brazilian institutional investor with more than R$ 70 billion under management, being one of the largest asset managers in Brazil in its segment. The sell-side analysts' target price forecasts were taken from the Bloomberg terminal. Stock quotes and accounting, financial and market information for the companies in the sample were extracted from the Economática database.

There are several reasons that make this research relevant. The first is to seek clear evidence about the performance of a very important player in capital markets (buy-side analysts), something that has not yet been resolved in the literature. Second is the fact that, unlike the works cited here, this research uses the target price as a comparison element in place of the profit forecasts, since these show signs of being more conflicting than the target price forecasts (Lima & Almeida, 2015), highlighting the fact that target prices are frequently used by analysts to support their recommendations (Bradshaw, 2002; Costa et al., 2020) and the fact that this has become the reference for evaluating the performance of analysts (Bradshaw et al., 2013; Bradshaw et al., 2019).

Another aspect that makes this research important is the fact that Bradshaw et al. (2019) have pointed out that some countries with strong institutional infrastructure moderate the behavior of market agents for their own benefit. This article brings evidence of a country that does

not have a strong institutional environment according to Almeida and Dalmacio (2015). For the Brazilian market, such research is important given the relevance of the institutional investor in Brazil in view of the importance of the target price forecasts issued by the sell-side analysts for decision-making in the allocation of resources by the individual Brazilian investors.

This article is structured in five parts. The second part contains the theoretical framework and research hypotheses. The third part contains the data - the variables, how they were found, and the data collection. The fourth part brings the results and their analysis - analysis of bias, accuracy, achievement of target prices, ADR, and regressions. And the fifth part presents the conclusions.

2 Theoretical Framework

2.1 Analyst Overview

Literature identifies analysts as sell-side or buy-side (Schipper, 1991). Fundamentally, both perform the same activities - they study companies to make predictions and recommendations. Among the examples of information produced by them are profit forecasting, cash flow estimates, stock recommendations and target price (Kothari et al., 2016). However, they differ in several ways: scale and scope of coverage, sources of information used, disclosure or confidentiality of the reports produced, target audience and the ways they are encouraged and rewarded (Groysberg et al., 2008).

Another difference in the context of analysts is the place where they carry out their activities. Buy-side analysts usually work for investment firms, such as mutual funds, hedge funds and pension funds, and their analyses are only available to their own company (Brown et al., 2016). On the other hand, examples of employers of sell-side analysts are securities brokers and investment banks, and their analyses are generally disseminated in some medium (Bradshaw, 2011).

2.2 The Optimism of Analysts

Bradshaw (2011) summarized the knowledge acquired by the academy after decades of research on sell-side analysts and highlighted that one of the conclusions is that these analysts' forecasts are optimistic.

Analysts' optimism seriously damaged them in the early 2000's due to their optimistic reports on the shares of dot-com companies and the subsequent collapse of those shares.

They were later censored for failing to detect accounting and valuation problems in the Enron case (Cowen et al., 2006).

Several studies document on analysts' optimistic forecasts. Francis and Philbrick (1993) concluded that analysts' profit forecasts are on average optimistic (and are even more optimistic to sell and hold shares than to buy) and drew attention to how much the optimistic forecasts of analysts influence their good relationship with the management of the companies they cover. Hong and Kubic (2003) pointed out that the optimism of analysts in their recommendations is a factor of promotion in investment banks, with optimism being more important than accuracy.

O'Brien et al. (2005) investigated whether an investment bank's relationship ties influences how fast analysts report bad news, and the findings indicated that such ties increase the reluctance to share bad news. Cowen et al. (2006) investigated whether the analyst's optimism varies according to the type of company that employs him and concluded that analysts of companies that subscribe and negotiate are less optimistic in relation to those employed by companies that exercise only brokerage.

Buy-side analysts are performing the same activities, but for a specific recipient. While reports by sell-side analysts are widely disseminated to institutional investors and retail customers, reports issued by buy-side analysts are private and available only to portfolio managers of the firms they work for. Because they do not suffer the pressures and conflicts of interest of sell-side analysts, buy-side analysts are expected to have their own conclusions, regardless of the conclusions of sell-side analysts (Groysberg et al., 2008).

Another factor that drives the buy-side analyst to produce profitable reports for the firm he works for is his financial compensation. A buy-side analyst's annual bonus is based on two factors: the performance of the analyst's buying recommendations and the impact of his research on portfolio managers (Groysberg et al., 2008).

If on the one hand the sell-side analyst has incentives to issue only positive news and reports, the less likely it is that buy-side analysts will do so, so that they can issue impartial reports (Groysberg et al., 2008). Considering the opposite environments and incentives experienced by these two classes of analysts who develop the same activity, we have the first research hypothesis: H1: Buy-side analysts are less optimistic in relation to their sell-side peers.

2.3 The Performance of Analysts

Some measures can be used to estimate the performance of analysts. One of them is the accuracy in making predictions. Once the superiority of analysts is accepted from the end of the 1980's (Brown & Rozeff, 1978), several academic works turned to research on its accuracy. In his investigation of the possibility of distinguishing among analysts, those with superior skills, O'Brien (1990) found no differences in the accuracy of predictions. However, contrary to previous studies, including that of O'Brien (1990), Sinha et al. (1997), did a review to check if there were differences in the accuracy of analysts' forecasts and documented that there is indeed a difference between analysts.

Accuracy is important to the analyst, as the literature documents that analysts with lower accuracy than their peers are more likely to turnover (Mikhail et al., 1999). The analyst's accuracy is also something very important for investors, after all, Loh and Mian (2006) pointed out that analysts who issue more accurate forecasts also issue more profitable recommendations, thus having great value for investors, both for favorable recommendations and for unfavorable recommendations, generating profitability for both long and short positions.

And how about the accuracy of buy-side analysts? There is little research on the performance of buy-side analysts and the published ones produce mixed results (Hobbs & Singh, 2015).

Groysberg et al. (2008) used a large American firm as the object of analysis of forecasts by buy-side analysts to compare them with the forecasts of sell-side analysts and thus measure their performances. Based on the data used, the conclusion was that the buy-side analysts were more optimistic and obtained less accuracy in relation to their sell-side peers. As a probable explanation for this, it was pointed out the great retention of buy-side analysts of bad performance by the employing firms, and different benchmarks used to evaluate the performance of the analysts.

Groysberg et al. (2013) investigated which types of stocks are selected by buy-side analysts and measured their performance in relation to sell-side analysts. They found that buy-side analysts issue less optimistic recommendations for stocks of large companies and with little volatility compared to their sell-side peers who face conflicts of interest and prefer more liquid stocks.

In the comparison made by Hobbs and Singh (2015) between sell-side and buy-side analysts, it was pointed out that sell-side analysts still outperform the buy-side, despite all the conflict of interest documented in the literature.

Brown et al. (2016) carried out a survey, with more than 300 buy-side analysts (344) and 181 investment companies with the objective of obtaining insights on their activities, the determinants of their compensation, the inputs for their stock recommendations, what they believed to be quality financial reporting, and the role of sell-side analysts in the buy-side work. Some important conclusions were: a) the 10-K or 10-Q reports are more useful than the quarterly results and guidance checks provided; b) the great values generated by sell-side analysts for buy-side analysts are the deep knowledge of the sectors they cover and access to the managers of the covered companies.

This article brought several other insights as to what is important for buy-side analysts. One of the research questions is what is considered a "red flag" for earnings management. The most representative responses were 1) weak internal controls; 2) low corporate governance; 3) large gaps between profit and operating cash flow; 4) large or frequent "special items" in the financial statements; 5) recent republication of financial reports. The survey also presented the valuation models most used by this class of analysts.

Faced with the dilemmas of sell-side analysts, who are one of the information providers for buy-side analysts; considering all the information and the sell-side analyst's own experience used by the buy-side analyst; considering the less conflicting environment where the buy-side analyst performs his work and considering that the same metric and the same data (the target price) were used to measure the performance of the two groups of analysts, the second hypothesis of this research arises: H2: Buy-side analysts are more accurate in setting target prices than sell-side analysts.

Another measure used by Bradshaw et al. (2013) to measure the performance of analysts is the achievement of the stipulated target price. In his work, he checked whether the target price predicted by analysts was reached, both at the end of the forecast horizon and at some point, during the forecast horizon. At the end of a twelve-month horizon, 38% of the stipulated target prices were equal to or greater than the forecast prices, while 64% of the stipulated target prices were reached at some point during the twelve-month forecast horizon.

Thus, for the reasons already mentioned that favor the impartiality and work of buy-side analysts, the third research hypothesis is: H3: Buy-side analysts have a higher level of reaching the target prices they stipulate.

2.4 American Depositary Receipt (ADR)

There are several reasons that lead companies to trade their shares outside their country of origin, thus performing the cross-listing. Among these reasons are abnormal returns in the share price, improvement in the company's risk rating, reduction in the cost of capital, liquidity, formation of share prices and increase in the company's market value (Karolyi, 2006). Also, according to Lang et al. (2003), non-American companies listed on American exchanges have greater coverage by analysts and greater accuracy in forecasts when compared with other non-American companies.

Bradshaw et al. (2019) concluded that countries with strong institutional infrastructure moderate the behavior of market agents in the search for their own benefit. Using target prices, they examined the institutional determinants of analyst optimism and concluded that analysts domiciled in countries with strong institutional infrastructure showed well-attenuated optimism in stipulating target prices as well as more relevant target prices.

This research has in its sample companies that issue ADR. According to the literature, such companies would have coverage of more analysts, among them, analysts of the American market, being these companies also subject to the legislation of the American capital market. In view of that and considering the fact that Almeida and Dalmacio (2015) considered Brazil as having a poor institutional environment, the fourth research hypothesis is that: H4: The accuracy of buy-side analysts is better for Brazilian companies issuing ADR levels II or III. The reason of using only companies that issue ADR levels II or III is because that companies are under the same strict governance standards and disclosure requirements to which United State companies are subject (Alhaj-Yaseen & Ladd, 2019).

3 Data

To carry out this work, forecasts from buy-side analysts provided by an important Brazilian institutional investor with more than $10 billion under management and great relevance in its segment were used. The sample data comprised the years 2013 to 2018. The institutional investor provided the dates of the target prices for companies covered by its analysts in that period. Target price forecasts from sell-side analysts were obtained one by one at a Bloomberg terminal. 63 historical consensus series of analysts were extracted individually at the Bloomberg terminal on the ANRD screen (historical consensus of analysts). The Stata software was used to calculate the research results and carry out the necessary analyses.

We applied the approach of Bradshaw et. al. (2013) for metrics as optimism, accuracy and meet target prices. The

analyst's bias was determined by the following formula:

$$PFE_{jt} = \frac{LP_{j(t+h)} - FP_{jt}}{LP_{jt}}$$

The percentage error of the forecast (PFE - Percentage Forecast Error) is due to the difference between the closing price (LP - Last Price) for asset j at time t + h and the estimated price for asset j at time t (FP - Forecast Price), divided by the price of asset j at time t, where the time horizon used to calculate the PEF. In this work, the time horizons used were 5 months and 12 months. Therefore, in the data file there are two PFE variables for buy-side analysts and two PFE variables for sell-side analysts. The optimistic bias appears when the forecast error (PEF) is negative. The second measure for comparing the performance of the two groups of analysts was the accuracy they presented. The calculated values are in the variable PAFE (Percentage Absolute Forecast Error) and followed the same procedures used for the variable PFE, described in the previous topic. The following formula was used:

$$PAFE_{jt} = \left| \frac{LP_{j(t+h)} - FP_{jt}}{LP_{jt}} \right|$$

The variable PAFE is, therefore, the module of the variable PFE, that is, it is the absolute prediction error. For the variable PAFE, the closer the averages are to zero, the greater the accuracy.

Two variables were used to measure the percentage of achievement of the target prices stipulated by the analysts. The first one, the variable TPMETEND (target price met at the end), checks if the predicted target price was reached at the end of the stipulated time horizon, that is, if the closing price of the stock was equal to or greater than the target price. The second variable, TPMETANY (target price met anytime), checks whether the predicted target price was reached during the forecast horizon, that is, if at some point during that time the closing price was equal to or exceeded the expected target price. Also, according to Bradshaw et al. (2013), to mitigate the effects of extreme observations, the ratio between the stipulated target price and the share price was calculated. Such measure is in the variable TPRATIO. Observations with TPRATIO greater than 4 were excluded. In the end, 50 shares and 49 companies remained. After generating the variables PFE and PAFE, 596 observations remained.

The search for indicators for the difference in performance between buy-side and sell-side analysts was made based on the analysis of the difference in the target prices of the forecasts.

The first regression used was as follows:

$$BUYSIDE\_TP_{jt} = \beta_0 + \beta_1 SELLSIDE\_TP_{jt} + \beta_2 LPA_{jt} + \beta_3 VPA_{jt} + \varepsilon \quad (1)$$

BUYSIDE_TP is the target price predicted by the buy-side analyst. Sell-side analysts do not have access to buy-side analysts' forecasts. However, buy-side analysts know the target prices set by sell-side analysts and use them in their work (Williams et al., 1996; Brown et al., 2016), which is why the target price predicted by sell-side analysts (SELLSIDE_TP). Earnings per share (LPA) and book value (VPA) were also used in view of the relationship presented by Ohlson (1995) between the market value of companies with profit and book value of the share (book value), seeking the relationship of these variables with the formation of the target price of the buy-side analyst.

A second regression was used to verify the existence of a relationship between market factors and the difference in target prices of the buy-side and sell-side analysts.

$$BUYSIDE\_TP_{jt} = \beta_0 + \beta_1 SELLSIDE\_TP_{jt} + \beta_2 LPA_{jt} + \beta_3 VPA_{jt} + \beta_4 ANALYSTS_{jt} + \beta_5 VOLATILITY_j + \varepsilon \quad (2)$$

In this second regression, the variables ANALYSTS and VOLATILITY were added. The ANALYSTS variable contains the total number of analysts covering the company. According to the literature, companies with greater coverage of analysts have greater accuracy in their forecasts (Lang et al., 2003; Alford & Berger, 1999) and, consequently, less dispersion

in the target price projections. VOLATILITY is a variable that contains the standard deviation of the average quotations for each stock in the sample. According to Bradshaw et al. (2013), the variability of the share price makes forecasting the price more difficult (unpredictable).

4 Results

Table 1 presents the descriptive statistics of the variables used to assess the performance of the buy-side and sell-side analysts. The results were presented separated by type of analyst (buy-side and sell-side) in the 5 and 12-month time horizons for verification compliance with the forecast and calculation of the variables.

The means of the PFE and PAFE variables pointed to a more optimistic bias on the part of the buy-side analysts and a better accuracy in the forecasts of the sell-side analysts. Bias results are better for a 12-month horizon, while accuracy increases over a 5-month time horizon. As for the percentage of achievement of forecasts, sell-side analysts achieve better results in any of the time horizons, and the target prices are more likely to occur over the time horizon for the fulfillment of the forecast (TPMETANY) than at the end of the time horizon (TPMETEND) with the two groups of analysts, that is, the target price is reached at some point, but at the end of the time horizon this price may be lower than what was predicted.

Table 1. Summary statistics

Panel A: 5 months horizon													
Group	Buy-Side							Sell-Side						
	Mean	SD	Min.	25%	Median	75%	Max.	Mean	SD	Min.	25%	Median	75%	Max.
PFE	-0,2566	0,4528	-2,4404	-0,4417	-0,1816	0,0109	0,6903	-0,1211	0,4048	-2,1797	-0,3258	-0,1146	0,0784	1,3383
PAFE	0,3646	0,3712	0,0009	0,1113	0,2493	0,4771	2,4405	0,3086	0,2883	0,0005	0,1002	0,2329	0,4337	2,1797
TPMETEND	0,2617	0,4399	0,0000	0,0000	0,0000	1,0000	1,0000	0,3406	0,4743	0,0000	0,0000	0,0000	1,0000	1,0000
TPMETANY	0,4060	0,4915	0,0000	0,0000	0,0000	1,0000	1,0000	0,5050	0,5003	0,0000	0,0000	1,0000	1,0000	1,0000
Panel B: 12 months horizon													
Group	Buy-Side							Sell-Side						
	Mean	SD	Min.	25%	Median	75%	Max.	Mean	SD	Min.	25%	Median	75%	Max.
PFE	-0,2263	0,5265	-2,4191	-0,4905	-0,1543	0,0737	1,3888	-0,0908	0,4769	-2,1584	-0,3504	-0,0726	0,1499	1,5304
PAFE	0,4190	0,3907	0,0001	0,1259	0,3048	0,5711	2,4191	0,3574	0,3282	0,0020	0,1089	0,2614	0,5109	2,1584
TPMETEND	0,3070	0,4616	0,0000	0,0000	0,0000	1,0000	1,0000	0,4127	0,4927	0,0000	0,0000	0,0000	1,0000	1,0000
TPMETANY	0,5671	0,4958	0,0000	0,0000	1,0000	1,0000	1,0000	0,6795	0,467	0,0000	0,0000	1,0000	1,0000	1,0000
Panel C: TPRatio (value is the same in both horizons)													
Group	Buy-Side							Sell-Side						
	Mean	SD	Min.	25%	Median	75%	Max.	Mean	SD	Min.	25%	Median	75%	Max.
TPRATIO	1,2600	0,3901	0,1218	1,042	1,1697	1,4018	2,9910	1,1247	0,3402	0,1610	0,9878	1,1256	1,2677	3,0097

Note: The sample had 596 observations. **PFE** (Percentage Forecast Error) is the average percentage of forecast error. If the result is negative, it means that, at Mean, the forecast prices were above the closing prices on the forecast verification dates. **PAFE** (Percentage Absolute Forecast Error) is the absolute percentage of forecast error. The closer to zero, the greater the accuracy of the forecast, meaning a greater proximity between the forecast price and the closing price on the verification date. **TPMETEND** (target price met end) is a dummy that indicates whether the price has been reached at the end of the forecast horizon. In this case, the closing price at the end of the forecast horizon was equal to or greater than the target price. **TPMETANY** (target price met anytime) is a dummy that indicates whether the closing

price reached or exceeded the target price over the forecast horizon, that is, if the target price was reached at some point in the forecast horizon. TPRATIO is the ratio between the target price and the quote, showing a multiple between the current price of the asset and the target price. The time horizons used were 5 and 12 months. The time horizon is the time reference for checking whether the forecast has been reached over time (TPMETANY) or at the end of it (TPMETEND). The PFE variables (PAFE) were calculated 5 (12) months after the disclosure of the target price.

The average error of buy-side analysts was -0.26, and -0.12 the error of sell-side analysts for the 5-month horizon. There was a more negative result for the buy-side analyst compared to the sell-side. A difference of means test was performed - tests as performed by Galdi and Lopes (2013), which showed a difference in means. The values found are below that observed by Lima and Almeida (2015) of -0.41 for the Brazilian market. When compared to Bradshaw et al. (2013), whose average forecast error was -0.15, only the average of sell-side analysts was better (-0.12).

The standard deviation of sell-side analysts (0.40) did not show much difference compared to buy-side analysts (0.45), with these values below the 0.93 presented by the work of Lima and Almeida (2015). Nor are the minimum values so far in descriptive statistics, which means that there was not a more optimistic forecast from one group in relation to the other. On the other hand, the maximum value of sell-side analysts is almost twice that of buy-side analysts, pointing to a lower optimism of sell-side analysts even when the asset is confirmed to rise, and the price exceeds the forecast.

As show in Table 2, the results improved for both groups when the averages were calculated and tested with the companies in the sample that are issuing ADR. Using only this group, the average error percentage for buy-side analysts decreased to -0.11, while the error percentage for sell-side analysts decreased to -0.04, with similar standard deviations 0.33 (0.34) for the buy-side analyst (sell-side). The result refers to Bradshaw (2019), who concludes that analysts domiciled in countries with strong institutional infrastructure showed a well-attenuated optimism in the stipulation of target prices and target prices of more relevant value. The difference of results confirms that Brazil has a poor institutional environment, exactly as pointed for Almeida and Dalmacio (2015).

Tests were made with the 2% winsorized variables (1% on each tail). The results did not change, the optimism decreased when using the averages of the ADR issuing companies, however, the forecasts of the buy-side analysts remained more optimistic than those made by their sell-side peers.

For the 12-month horizon, the average percentage of error in the forecasts improved, becoming less negative. The

Table 2. Percentage forecast error (PFE)

Panel A: PFE (5 months horizon)														
Group	All companies							Cross-listed companies (ADR)						
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Mean	SD	Min.	25%	Median	75%	Max.
Buy-side	596	-0,2566	0,4528	-2,4404	-0,4417	-0,1816	0,0109	0,6903	92	-0,1068	0,3336	-1,0625	-0,2342	-0,0614	0,0530	0,6106
Sell-side	596	-0,1211	0,4048	-2,1797	-0,3258	-0,1146	0,0784	1,3383	92	-0,0443	0,3418	-0,8874	-0,2296	-0,0698	0,1281	0,7842
Buy-Sell	-	-0,1355	-	-	-	-0,0670	-	-	-	-0,0625	-	-	-	0,0084	-	-
t-stat/z-stat	-	-10,1783	-	-	-	-8,8560	-	-	-	-2,0573	-	-	-	-1,6200	-	-
(p-value)	-	0,0000	-	-	-	(0,0000)	-	-	-	0,0425	-	-	-	0,1053	-	-
Painel B: PFE para um horizonte de 12 meses														
Grupo	All companies							Cross-listed companies (ADR)						
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Mean	SD	Min.	25%	Median	75%	Max.
Buy-side	596	-0,2263	0,5265	-2,4191	-0,4905	-0,1543	0,0737	1,3888	92	-0,1119	0,3974	-1,1169	-0,2985	-0,0711	0,1268	0,9070
Sell-side	596	-0,0908	0,4769	-2,1584	-0,3504	-0,0726	0,1499	1,5304	92	-0,0493	0,4038	-0,8974	-0,2359	-0,0389	0,1756	1,1287
Buy-Sell	-	-0,1355	-	-	-	-0,0817	-	-	-	-0,0625	-	-	-	-0,0322	-	-
t-stat/z-stat	-	-10,1783	-	-	-	-8,8560	-	-	-	-2,0573	-	-	-	-1,6200	-	-
(p-value)	-	0,0000	-	-	-	(0,0000)	-	-	-	0,0425	-	-	-	0,1053	-	-

Note: PFE (Percentage Forecast Error) is the average percentage of forecast error. If the result is negative, it means that, at Mean, the forecast prices were above the closing prices on the forecast verification dates. The greater the negative, the greater the indicative of optimism on the part of the analyst. ADR (American Depositary Receipts) are receipts for shares of non-American companies. ADR issuing companies generally have greater analyst coverage and are subject to the most stringent American legislation, which is why additional tests have been carried out by segregating ADR issuing companies in order to verify differences in results in relation to the total sample. Brazilian companies that trade ADR in the United States are described in Table 7 (Appendix). The tests were carried out with a 95% confidence level. For the Median test (distribution test), the Wilcoxon signed-rank test was used.

average error of the buy-side analysts was -0.2263 and -0.09 the error of the sell-side analysts. As in the 5-month horizon, the averages test confirmed the difference in the averages, continuing the indicator of greater optimism by buy-side analysts. The standard deviation increases for both groups, but the median decreased, and it was -0.15 (-0.07) for the buy-side analyst (sell-side).

The statistics for the variable PAFE are presented in Table 3. This variable is used as a metric for measuring the accuracy of analysts. The closer to zero the greater the accuracy, meaning that there was no difference between the forecast price and the price reached (closing price) in a given time horizon, or that such difference was very small.

Considering the average difference tests carried out for the total group of companies, in all time horizons a better accuracy was verified by sell-side analysts. However, considering only ADR issuing companies, the accuracy of the two groups of analysts is similar.

For the 5-month horizon, using all the companies in the sample, the average PAFE of buy-side analysts was 0.36 and the average of sell-side analysts was 0.30. Such results were better than those found by Lima and Almeida (2015) and Bradshaw et al. (2013). For the Brazilian market, Lima and Almeida (2015) found an accuracy of 0.53, while the accuracy determined by Bradshaw et al. (2013) was 0.45. The standard deviation of the sell-side analysts (0.28) was lower compared to the buy-side (0.37), and both were

lower than the value of 0.86 verified by Lima and Almeida (2015).

In the mean difference test, the p-value was 0.00, making it possible to say that the averages are not equal to a 1% significance level and that, therefore, sell-side analysts were more accurate than buy-side analysts. The result is maintained when the 12-month time horizon is used, albeit with a worsening accuracy in both groups of analysts. For the 12-month horizon, the accuracy is 0.42 (0.36) for the buy-side analyst (sell-side), but below the averages found by Bradshaw et al. (2013) and Lima and Almeida (2015).

For the two time horizons (5 and 12 months), using only ADR issuing companies, the accuracy of the two groups of analysts improves and is similar after the mean difference tests. The average for the 5-month horizon was 0.24 (0.26) for the buy-side analyst (sell-side). For the 12-month horizon, the average was 0.31 (0.31) for the buy-side analyst (sell-side). Similarities were also verified in the distribution, with the median tests not indicating differences in the samples of the two groups - buy-side and sell-side (see Table 3). These results were shown to be in line with the literature, which points to greater coverage by analysts and greater accuracy in forecasts (Lang et al., 2003) when companies are listed on the American market.As tabelas 4 e 5 mostram as porcentagens dos preços-alvo atingidos pelos analistas *buy-side* e *sell-side* nos horizontes de previsão de 5 e 12 meses.

Table 3. Percentage absolute forecast error (PAFE)

Panel A: PAFE (5 months horizon)														
Grupo	All companies							Cross-listed companies (ADR)						
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Mean	SD	Min.	25%	Median	75%	Max.
Buy-side	596	0,3646	0,3712	0,0009	0,1113	0,2493	0,4771	2,4405	92	0,2422	0,2520	0,0009	0,0592	0,1525	0,3684	1,0625
Sell-side	596	0,3086	0,2883	0,0005	0,1002	0,2329	0,4337	2,1797	92	0,2628	0,2212	0,0006	0,0801	0,2113	0,4257	0,8874
Buy-Sell	-	0,0559	-	-	-	0,0164	-	-	-	-0,0206	-	-	-	-0,0588	-	-
t-stat/z-stat	-	4,5074	-	-	-	4,3680	-	-	-	-0,8117	-	-	-	-0,8180	-	-
(p-value)	-	0,0000	-	-	-	(0,0000)	-	-	-	0,4191	-	-	-	0,4135	-	-
Panel B: PAFE (12 months horizon)														
	All companies							Cross-listed companies (ADR)						
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Mean	SD	Min.	25%	Median	75%	Max.
	596	0,4190	0,3907	0,0001	0,1259	0,3048	0,5711	2,4191	92	0,3066	0,2749	0,0001	0,1012	0,2128	0,4535	1,1169
	596	0,3574	0,3282	0,0020	0,1089	0,2614	0,5109	2,1584	92	0,3083	0,2634	0,0042	0,1043	0,2146	0,4858	1,1287
	-	0,0616	-	-	-	0,0434	-	-	-	-0,0016	-	-	-	-0,0018	-	-
	-	5,0141	-	-	-	4,7950	-	-	-	-0,0614	-	-	-	0,0930	-	-
	-	0,0000	-	-	-	(0,0000)	-	-	-	0,9511	-	-	-	0,9255	-	-

Note: PAFE (Percentage Absolute Forecast Error) is the absolute percentage of forecast error. The closer to zero, the greater the accuracy of the forecast, meaning a greater proximity between the forecast price and the closing price on the verification date. ADR (American Depositary Receipts) are receipts for shares of non-American companies. ADR issuing companies generally have greater analyst coverage and are subject to the most stringent American legislation, which is why additional tests have been carried out by segregating ADR issuing companies in order to verify differences in results in relation to the total sample. Brazilian companies that trade ADR in the United States are described in Table 7 (Appendix). The tests were carried out with a 95% confidence level. For the Median test (distribution test), the Wilcoxon signed-rank test was used.

Tables 4 and 5 show the percentages of target prices met for the buy-side and sell-side analysts in the 5-month and 12-month forecast horizons.

There is a better performance of the result of the variable TPMETANY in relation to the variable TPMETEND in the two forecast horizons used (5 months and 12 months). In all the results presented, the variable TPMETANY obtained better averages than the variable TPMETEND. Such results signal that the analysts' forecasts are more successful in being fulfilled over the forecast horizon - and not at the end.

Considering the total sample, whatever the time horizon, the sell-side analysts showed a better percentage of achievement, it should be noted that the achievement of target prices occurs in greater quantity over a 12-month horizon.

The TPMETEND variable obtained an average of 0.26 (0.34) for the buy-side (sell-side) analysts in the 5-month horizon, while the results rise to 0.30 (buy-side) and 0.41 (sell-side) over the 12-month horizon. The mean difference test performed indicated a difference in means. The numbers obtained by sell-side analysts (0.34 and 0.41) are closer to the 0.38 calculated by Bradshaw et al. (2013), while the percentage of attainment of buy-side analysts (0.26 and 0.30) in the two time horizons is below Bradshaw et al. (2013).

As for the variable TPMETANY, the average obtained was 0.40 (0.50) for buy-side analysts (sell-side) in the 5-month horizon and 0.56 (0.67) for buy-side analysts (sell -side) over the 12-month time horizon, with the difference in means test indicating difference in means. Only the average obtained by sell-side analysts, 0.67 over the 12-month horizon, is close to 0.64 by Bradshaw et al. (2013), overcoming it.

Table 4. Target Price Met at the End (TPMETEND)

Panel A: TPMETEND (5 months horizon)														
Group	Todas as empresas							Empresas emissoras de ADR						
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Média	DP	Mínimo	25%	Mediana	75%	Máximo
Buy-side	596	0,2617	0,4399	0,0000	0,0000	0,0000	1,0000	1,0000	92	0,3586	0,4822	0,0000	0,0000	0,0000	1,0000	1,0000
Sell-side	596	0,3406	0,4743	0,0000	0,0000	0,0000	1,0000	1,0000	92	0,3913	0,4907	0,0000	0,0000	0,0000	1,0000	1,0000
Buy-Sell	-	-0,0788	-	-	-	0,0000	-	-	-	-0,0326	-	-	-	0,0000	-	-
t-stat/z-stat	-	-4,3361	-	-	-	-4,2730	-	-	-	-0,5979	-	-	-	-0,6000	-	-
(p-value)	-	0,0000	-	-	-	(0,0000)	-	-	-	0,5514	-	-	-	0,5485	-	-
Panel B: TPMETEND (12 months horizon)														
Group	All companies							Cross-listed companies (ADR)						
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Mean	SD	Min.	25%	Median	75%	Max.
Buy-side	596	0,3070	0,4616	0,0000	0,0000	0,0000	1,0000	1,0000	92	0,4130	0,4950	0,0000	0,0000	0,0000	1,0000	1,0000
Sell-side	596	0,4127	0,4927	0,0000	0,0000	0,0000	1,0000	1,0000	92	0,4239	0,4968	0,0000	0,0000	0,0000	1,0000	1,0000
Buy-Sell	-	-0,1057	-	-	-	0,0000	-	-	-	-0,0108	-	-	-	0,0000	-	-
t-stat/z-stat	-	-5,9925	-	-	-	-5,8240	-	-	-	-0,2282	-	-	-	-0,2290	-	-
(p-value)	-	0,0000	-	-	-	(0,0000)	-	-	-	0,8200	-	-	-	0,8185	-	-

Note: TPMETEND (target price met at the end) is a dummy that indicates whether the closing price reached or exceeded the target price at the end of the forecast horizon. ADR (American Depositary Receipts) are receipts for shares of non-American companies. ADR issuing companies are companies listed on the American market and generally have greater coverage by analysts and are subject to the most stringent American legislation, which is why additional tests were carried out segregating the ADR issuing companies in order to verify the differences in results in relation to the total sample. Brazilian companies that trade ADR in the United States are described in Table 7 (Appendix). The tests were carried out with a 99% confidence level. For the Median test (distribution test), the Wilcoxon signed-rank test was used.

Table 5. Target Price Met Anytime (TPMETANY)

Group	All companies								Cross-listed companies (ADR)							
Panel A: TPMETANY (5 months horizon)																
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Mean	SD	Min.	25%	Median	75%	Max.
Buy-side	596	0,4060	0,4915	0,0000	0,0000	0,0000	1,0000	1,0000	92	0,4891	0,5026	0,0000	0,0000	0,0000	1,0000	1,0000
Sell-side	596	0,5050	0,5003	0,0000	0,0000	1,0000	1,0000	1,0000	92	0,4565	0,5008	0,0000	0,0000	0,0000	1,0000	1,0000
Buy-Sell	-	-0,0989	-	-	-	-1,0000	-	-	-	0,0326	-	-	-	0,0000	-	-
t-stat/z-stat	-	-4,3558	-	-	-	-4,2920	-	-	-	0,5202	-	-	-	0,5220	-	-
(p-value)	-	0,0000	-	-	-	(0,0000)	-	-	-	0,6042	-	-	-	0,6015	-	-
Panel B: TPMETANY (12 months horizon)																
	Obs.	Mean	SD	Min.	25%	Median	75%	Max.	Obs.	Mean	SD	Min.	25%	Median	75%	Max.
Buy-side	596	0,5671	0,4958	0,0000	0,0000	1,0000	1,0000	1,0000	92	0,6630	0,4752	0,0000	0,0000	1,0000	1,0000	1,0000
Sell-side	596	0,6795	0,467	0,0000	0,0000	1,0000	1,0000	1,0000	92	0,7173	0,4527	0,0000	0,0000	1,0000	1,0000	1,0000
Buy-Sell	-	-0,1124	-	-	-	0,0000	-	-	-	-0,0543	-	-	-	0,0000	-	-
t-stat/z-stat	-	-5,3347	-	-	-	-5,2160	-	-	-	-0,9278	-	-	-	-0,9280	-	-
(p-value)	-	0,0000	-	-	-	(0,0000)	-	-	-	0,3560	-	-	-	0,3582	-	-

Note: TPMETANY (Target price met anytime) is a dummy that indicates whether the closing price has reached or exceeded the target price at any point over the forecast horizon. ADR (American Depositary Receipts) are receipts for shares of non-American companies. ADR issuing companies are companies listed on the American market and generally have greater coverage by analysts and are subject to the most stringent American legislation, which is why additional tests were carried out segregating the ADR issuing companies in order to verify the differences in results in relation to the total sample. Brazilian companies that trade ADR in the United States are described in Table 7 (Appendix). The tests were carried out with a 99% confidence level. For the Median test (distribution test), the Wilcoxon signed-rank test was used.

When the tests are performed using only ADR issuing companies, the result changes considerably. There is an increase in the percentages of achievement of the two groups of analysts approaching, or even exceeding the averages calculated by Bradshaw et al. (2013). In addition to these two changes, the tests do not support the claim that the averages of sell-side and buy-side analysts are different. In the sample exclusively with ADR issuing companies, the variable TPMETEND obtained an average of 0.35 (0.39) for buy-side analysts (sell-side) in the 5-month horizon, in line with 0.38 for Bradshaw et al. (2013).

For the 12-month horizon, the results rise to 0.41 (buy-side) and 0.42 (sell-side). The mean difference test performed did not indicate any difference in the means. The TPMETANY variable obtained an average of 0.48 (0.45) for the buy-side (sell-side) analysts in the 5-month horizon. For the 12-month horizon the results rise to 0.66 (buy-side) and 0.71 (sell-side). The number determined by Bradshaw et al. (2013) was 0.64. The mean difference test performed did not indicate any difference in the means.

In the mean difference tests, the difference in the percentage of error in the forecasts was evident, with the buy-side analysts being more optimistic in their forecasts. Another result verified was the difference in the accuracy and level of achievement of the target prices between the two groups of analysts when using all the companies in the sample.

In view of the results, all research hypotheses were rejected.

To verify the determinants of the differences in the target prices of the two groups of analysts, a regression was made using the target price of the sell-side analyst, the company's 12-month cumulative earnings per share (LPA) and the book value of the action (VPA).

The first regression used (Table 6), with 3 (three) coefficients with a 99% confidence level and 1 (one) with a 90% confidence level, in addition to showing how much the sell-side analyst's forecast impacts the forecast the buy-side analyst, showed a positive LPA ratio (decreasing the difference in the target price between the two groups of analysts) and a negative VPA ratio (increasing the difference in the target price between the two groups of analysts). The results seem to suggest that the sell-side analyst places great value on the profit the company generates when pricing a stock; on the other hand, the equity value of the share seems to be relevant data for the buy-side analyst. The adjusted R2 of 0.73 shows a considerable explanatory power of the model.

Table 6. Regression Statistics

Panel A: Regression without using market data		
$BuySide\_TP = \beta_0 + \beta_1 SellSide\_TP + \beta_2 LPA + \beta_3 VPA + \varepsilon$		
	Coeficient	t-stat
Constant	6,17	8,87***
SellSide_TP	0,83	28,88***
LPA	1,45	4,94***
VPA	-0,08	-1,86*
Observations	596	
Adjusted R^2	0,73	
Panel B: Regression using market data		

BuySide_TP = $\beta_0 + \beta_1$SellSide_TP + β_2 LPA + B_3VPA + B_4Total + B_5Desvio + ε		
	Coeficient	t-stat
Constant	3,15	2,74***
SellSide_TP	0,78	25,36***
LPA	1,60	5,49***
VPA	-0,07	-1,77*
Total	0,22	2,80***
Desvio	0,21	3,13***
Observations	592	
Adjusted R²	0,74	

Notes: **BuySide_TP** is the target price set by buy-side analysts. **Sell-Side_TP** is the target price for sell-side analysts. **LPA** is the Earnings per Share accumulated in the last 12 months. **VPA** is the equity value of the share. Total is the total number of analysts covering the stock. **Desvio** is the standard deviation in the sample of the closing prices of each asset. Significance Levels: *** 1%; ** 5%; * 10%.

The results found with the use of VPA and LPA variables are in line with the literature showing the importance and the correlation between market behaviors and accounting variables (Ohlson, 1995).

In the case of a β0 coefficient of 6.17 (constant), we sought to add market elements to try to identify determinants for the difference in target prices. In a second regression (Table 6), TOTAL and DEVIATION variables were added that provide, respectively, information on the standard deviation of the closing prices verified in the sample, separated by asset and the number of analysts covering the stock.

The explanatory power of the model was slightly increased to 0.74 (R2), however the added variables allowed a reduction in the value of the constant, bringing it to 3.15, at the 99% confidence level, as well as the other variables, except for the VPA variable, whose confidence level was 90%.

As expected, the variables DEVIATION and TOTAL reduced the value of the constant, in line with the literature, showing that the greater coverage of analysts promotes greater accuracy in forecasts (Lang et al., 2003; Alford & Berger, 1999) and, consequently, less dispersion in the target price projections. The Deviation variable, which contains the standard deviation of the average quotations for each share in the sample, also contributed in an explanatory manner, showing that the variability of the share price makes forecasting the price more difficult (Bradshaw et al., 2013) and, in our case, helping to explain the difference in target prices between the two groups of analysts.

5 Conclusions

Despite its relevance to the capital market, research with buy-side analysts produce mixed results and do not have satisfactory answers about buy-side analyst performance. This study aimed to measure the performance of Brazilian buy-side and sell-side analysts, using the same companies in the sample, and having the target price as the object of study, which is often used by analysts to support their recommendations and because it is becoming the study framework for evaluating performance among analysts.

Research with buy-side analysts has immense difficulty to obtain data for analysis. Based on data provided by a relevant Brazilian institutional investor, it was possible to analyze the accuracy, bias, and level of achievement of the target prices of the two groups of analysts, comparing the results with each other and with national and international literature.

The results showed a more optimistic bias on the part of the buy-side analysts and better accuracy and level of achievement of the target prices by the sell-side analysts, when considering the total number of companies in the sample. When only ADR issuing companies are considered, analysts' bias decrease (the buy-side remains more optimistic). However, the accuracy and levels of achievement of target prices are better, and it is no longer possible to state that they are statistically different. Thus, the results are in line with the literature aimed at companies that negotiate ADR, for which there is evidence of better formation of stock prices, more demanding regulation, and demand for information to which American companies are subject, greater coverage of analysts, greater accuracy in forecasts, and a more moderate behavior aiming at their own benefit by market participants.

In view of the results, all research hypotheses were rejected.

The research sought to identify determinants for the differences between the target prices set by buy-side and sell-side analysts. It was found that accounting data (LPA and VPA) and market data (price volatility and analyst coverage) are explanatory variables for such differences; however, in the regression result there is still a difference to be investigated.

About our research question, whether "Brazilian buy-side analysts perform better in forecasting target prices compared to their sell-side peers?", we did not find evidence to affirm this.

This research expands the literature aimed at buy-side analysts and brings results obtained using the same group of companies and the same reference framework (target price). Its limitation is the sample size and the fact that it uses data from a single institutional investor even though this is relevant, and the results are in line with the literature in several aspects.

We see as a great contribution of this work the evidence that, for larger companies, listed in markets with a stronger institutional environment, the pricing made by the two groups of analysts are similar, calling into question the possibility of superiority of a group of analysts on the other (sell-side vs. buy-side). Another important contribution was

to clearly highlight in which type of company the pricing is more divergent.

Considering the results obtained, we suggested for future research to investigate the differences in target prices set for companies with less analysts' coverage, lower market value and lower trading volume.

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