

# Projection bias in tender offer valuation

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## Abstract

**Objective:** To examine whether, in tender offer valuation reports that apply the Discounted Cash Flow (DCF) method, five variables related to the issuance context contribute to explaining the overvaluation or undervaluation of projected economic–financial performance relative to the performance actually achieved.

**Method:** Multiple linear regression models were used for the main analysis. Additionally, decision tree and ridge regression models were estimated, although their results did not exceed those presented in this study. A binary model, also estimated as a supplementary procedure, confirmed the findings reported here. Confirmatory results were likewise obtained for the fee model using correspondence analysis.

**Results:** The findings demonstrate that the short-term difference between projected and actual performance is significant, indicating the presence of projection bias. This bias is explained by the tender offer modality and the industry of the firm being valued. The amount paid to the appraiser as fees was not significant in explaining this bias.

**Contributions:** Research on business valuation remains scarce in emerging countries. From a practical standpoint, evidence comparing projected and actual values contributes to users' perceptions of valuation reports and to improving the performance and quality of the valuation process.

**Keywords:** Business Valuation. Projection Bias. Discounted Cash Flow (DCF). Performance. Tender Offer.

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## 1 Introduction

In the first half of 2024, the mergers and acquisitions market in Brazil totaled approximately R\$ 101.5 billion (Valor Econômico, 2024). The effects of these transactions were not limited to the sectors in which the mergers and acquisitions originally occurred (Durnev & Mangen, 2020; Cardoso et al., 2025). In addition to the amounts involved and the externalities generated, some cases show that tender offer procedures have been used to manipulate share prices (Ahern & Sosyura, 2014; Guo, 2020; He et al., 2020). Moreover, the context in which a firm's value is measured, the uncertainty present in the market (Batista, Lamounier, & Mário, 2023), and the effects derived from valuation reports raise questions about the quality of the information disclosed (Souza et al., 2013; Liu et al., 2023; Palladino & Lazonick, 2024).

When a company repurchases shares in the context of a tender offer, it is understood to be signaling to the market that it (i) believes its shares are undervalued, (ii) seeks to adjust its capital structure, or (iii) intends to distribute value to shareholders in a way that serves as an alternative to dividends. In this scenario, performance projections carry important informational content: the market interprets the repurchase as a sign of management's confidence in future prospects. Thus, comparing the projected performance (at the time of the repurchase announcement) with the actual performance subsequently observed makes it possible to assess whether the signal was credible or opportunistic. In line with this, the study aims to (i) identify the bias in the projections contained in tender offer valuation reports and (ii) examine the variables related to the context in which these reports were issued. To identify projection bias, the metric used was the difference between the performance projected in the reports and the actual performance disclosed in corporate accounting statements.

Supported by models validated in the academic literature, firm valuation involves estimating the value of a firm or a portion of it (Palepu & Healy, 2008). In this process, when projection models are used, it is plausible that a random and insignificant margin of error arises between the firm's estimated value and its actual value. However, when the difference between the projected value and the value realized by the firm becomes substantial, a relevant question emerges: is there bias in the information disclosed in valuation reports prepared for tender offers?

Among the different valuation models, CVM Resolution No. 215 of 2024 identifies three reference metrics: (i) the weighted average stock price, (ii) the book value per share, and (iii) the firm's economic value—calculated using the discounted cash flow (DCF) method, the market multiples method, or the comparable transactions multiples method.

The DCF method requires making projections about the future to estimate firm value and, therefore, involves a high degree of subjectivity and complexity (Damodaran, 2004), in addition to being susceptible to evaluation bias (Martinez, 2004). In this context, the first international studies conducted in the 1970s and 1980s examined the relationship between analysts' projections and the results actually observed. In subsequent years, analysts' projections became a variable of growing interest. Later, research shifted toward identifying systematic evidence of bias in these projections (Saito, Villalobos & Benetti, 2008; Sanvicente, 2015; Noda, 2018). In Brazil, some studies on analysts' forecasts in the financial market stand out, including Souza et al. (2023), Sanvicente (2015), Antônio et al. (2017), Gatsios, Lima & Magnani (2018), and Gatsios et al. (2023). However, in the specific context of tender offers in Brazil, there is no consensus on the contextual factors related to the issuance of valuation reports that explain the differences between projections and realized results.

Developed in three stages, this study employed multiple linear regression models and five variables related to the context in which the valuation reports were issued (type of tender offer, fees paid for preparing the reports, relationship between the contracting firm and the valued firm, industry of the valued firm, and appraiser profile), which may help explain the overvaluation or undervaluation of projected economic-financial performance relative to the performance actually achieved. Thus, these variables focus on the context surrounding the issuance of the valuation reports and may generate significant distortions in the projected EBITDA (Souza et al., 2013; Liu et al., 2023; Liu, 2012).

In this study, the data limitation arises from the scope proposed for calculating the difference between the projected short-term value and the actual value. For example, in a report issued in 2023, the performance projections refer to 2024 and subsequent years. The projected performance for 2024 is compared with the performance actually achieved in that year to verify whether a significant difference exists between these values. Given the year in which the study was conducted, it was necessary to restrict data collection to reports issued up to 2023 to allow for the comparison between projected and realized performance. Furthermore, in reports issued for going-private transactions (Bortolon & Silva Jr., 2015), information on actual performance is no longer necessarily disclosed to external stakeholders. Consequently, there is a limitation on the comparison between projected and actual performance in cases of going-private transactions. The other limitations of the study are presented in Section 3.

In summary, the results of this research show that, in the tender offer valuation reports analyzed in Brazil, the difference between projected short-term performance and actual performance is significant for the companies included in the sample. Accordingly, a bias was identified in the short-term projections, which is not random but is explained by the type of tender offer and the industry of the firm being valued. The results also indicate that the amount paid in valuation fees does not significantly explain this bias. In addition to the estimates obtained through multiple linear regression models, decision tree, ridge regression, binary, and correspondence analysis models were also estimated. These models confirmed the regression findings but did not outperform the results presented in this paper. Therefore, their results are not described here.

In tender offers, valuation reports serve as a benchmark for determining the value of a firm's shares; in other words, they are key reference points for both potential and current investors. Moreover, in the DCF method, projected values are essential for estimating the firm's value, and these projections directly affect the final value presented in the reports (Cogliati, Paleari & Vismara, 2011; Mumtaz, Smith & Ahmed, 2016). Therefore, analyzing projections is one way to assess whether the value reported in the valuation is close to the firm's fair value, which serves as an indicator of valuation quality.

## 2 Theoretical Framework

Tender offers are transactions in which a company or investor makes a public offer to buy shares of another company, generally with the aim of taking the company private or acquiring control. In such processes, a valuation report of the target firm must be presented to justify the price offered per share. In this scenario, the manipulation of projected performance in tender offers has been identified as a strategy to maximize the perceived value of shares and facilitate acquisitions, involving earnings management intended to influence market perception and manipulate prices prior to the offer (Souza et al., 2013). These practices can lead to a temporary appreciation of share prices (Liu et al., 2023), but also to long-term underperformance when expectations are not met (Liu, 2012).

In academic research, studies on firm valuation may relate either to valuation reports prepared for Initial Public Offerings (IPOs) or to those prepared for tender offers. Cogliati et al. (2011) and Mumtaz et al. (2016) examined the impact of the difference between projected and realized values on firm value. Both studies compared the growth rates used in DCF models in IPO valuation reports with the growth rates that were actually realized. Their findings indicate that the estimated rates were higher than those observed ex post, suggesting potential overvaluation.

Similarly, Bonaventura & Giudici (2016) observed that IPO analysts' profitability forecasts exhibit a significant optimistic bias, corroborating the findings of Kothari (2001) and Martinez (2004). They identified large average forecast errors, particularly in fast-growing firms with higher leverage and greater issued capital (Bonaventura & Giudici, 2016). Questioning the applicability of forecasting models in the Brazilian market, Sanvicente (2015) examines whether the inclusion of a country risk premium is truly necessary when market risk is measured using a local market index, such as the Ibovespa. He argues that using the local index as a market proxy eliminates the need for an additional country risk premium. According to the author, the Brazilian market is sufficiently developed to incorporate relevant risks into asset prices.

According to Bozos & Nikolopoulos (2011), although econometric models are the most accurate forecasting techniques for stock offering announcements, expert judgment performs better in economic valuation based on simulated earnings. In this sense, few studies address contextual factors of the issuance of valuation reports or the evaluator's profile and link them to projections in the context of tender offers. In the New Zealand case, Firth & Smith (1992) found that the accuracy of earnings forecasts in IPO prospectuses is low, is not related to the share price premium at listing, and cannot be explained by firm-specific characteristics or the choice of auditor.

In Brazil, the characteristics of valuation reports and appraisers involved in the valuation process for tender offers have also received limited attention in the literature (e.g., Santos, Pereira & Lustosa, 2013; Souza et al., 2013), partly due to the restricted volume of historical data for quantitative analysis—between 2010 and 2023, only 78 tender offer valuation reports using the DCF method were issued. Expanding beyond this method, and using a sample of 197 Brazilian firms that went private between 2000 and 2012, Souza et al. (2013) investigated whether going private, mediated through a tender offer, is associated with earnings management, measured by reported profit. Their findings indicated that going private is associated with earnings management, although this effect depends on the composition of the comparative sample. The type of tender offer (voluntary or merger-related) does not directly affect accounting practices, and earnings smoothing is common, but it does not directly determine discretionary accruals.

In line with the body of valuation reports for tender offers in Brazil, and drawing on research that has analyzed projections in valuation reports issued in public stock offerings (e.g., Cogliati et al. 2011; Dechow, Hutton & Sloan, 2000; Mumtaz et al., 2016; Noda, 2018), this study seeks to advance the literature by examining explanatory variables associated with the overvaluation or undervaluation of projected economic-financial performance in valuation reports using the DCF method. To this end, the following research hypotheses were formulated:

**Hypothesis 1:** The projected performance value in the valuation reports is not consistent with the actual value.

The findings of previous research support the development of Hypothesis 1, particularly in showing that projected performance tends to be overvalued relative to actual performance. International studies (Cogliati et al., 2011; Dechow et al., 2000; Mumtaz et al., 2016) have documented a tendency for projected performance—measured through projected growth rates—to be overestimated. In the long-term estimation context, firm value calculated by the DCF method depends on assumptions made at the time of valuation, which may become outdated as uncertainty and economic volatility evolve in the environment in which firms operate, especially in emerging countries such as Brazil. Even in the short-term projection horizon, this volatility supports the formulation of Hypothesis 1, namely that the projected values will not align with realized values. In this study, it is important to emphasize that the difference was measured over a one-year period, that is, within the short term.

Confirmation of Hypothesis 1 enables the analysis of whether variables related to the context in which valuation reports are issued help explain the short-term difference between projected and actual performance, as stated in Hypotheses 1.1 to 1.5. If these variables contribute to explaining this difference, there will be evidence of bias in the performance projections associated with the issuance context. In other

words, random error is inherent to the estimation process and does not imply poor quality or manipulation of the report; bias, however, represents a systematic and significant deviation. In this study, bias is understood to occur when projections consistently overestimate or underestimate firms' performance.

**Hypothesis 1.1:** The type of tender offer helps explain the difference between projected and actual performance.

According to Noda (2018), when delisting, controlling shareholders launching a tender offer may have an incentive to justify a lower price for the target company. Souza et al. (2013) observed that going private is associated with earnings management, although this effect depends on the composition of the comparative sample. Based on these studies, it is expected that tender offer valuation reports related to delisting will exhibit an undervaluation bias. Conversely, voluntary tender offer reports are expected to exhibit an overvaluation bias in projected performance. For the other two modalities present in the sample—participation increase and sale of control—no association with projection bias is expected.

**Hypothesis 1.2:** The fees paid to the appraiser help explain the difference between projected and actual performance.

According to Kothari (2001), the economic incentives received by analysts for their services help explain the optimistic bias in stock valuations. By extension, this rationale is assumed to apply to the fees paid to the professionals responsible for preparing tender offer valuation reports, which are the focus of this study. From an empirical standpoint, Dechow et al. (2000) analyzed 1,179 equity issuances available in international databases between 1981 and 1990 and identified a positive relationship between analyst fees and the magnitude of projected growth. Similarly, it is expected that the fees paid to the appraiser responsible for preparing the tender offer valuation report will be related to projection bias, specifically in the direction of overvaluing projected performance.

**Hypothesis 1.3:** The relationship between the contracting firm and the valued firm helps explain the difference between projected and actual performance.

According to Noda (2018), when the contracting party is the controlling shareholder of the firm being evaluated—in a tender offer related to the sale of control—an undervaluation of the firm's value is expected. Conversely, when the contracting firm is the valued firm itself, an overvaluation of projected performance in the valuation reports is expected. Finally, when the contracting party is an unrelated firm (i.e., neither the valued firm nor its controlling shareholder), an undervaluation of the projected performance is also expected.

**Hypothesis 1.4:** The firm's industry helps explain the difference between projected and actual performance.

This hypothesis was formulated because a firm's industry is a relevant variable in determining its performance (Graves, 1997; Porter, 1981; Ullmann, 1985). Moreover, in a study examining open-market share repurchases carried out by U.S. corporations, Palladino and Lazonick (2024) found that the sectors with the largest share of buybacks were Technology and Information (9.8% of revenue), Finance and Insurance (11.9%), and Retail (10.6%). Thus, the objective is to identify which industries are associated with undervaluation or overvaluation bias in projected performance.

**Hypothesis 1.5:** The evaluator's profile helps explain the difference between projected and actual performance.

Firth & Smith (1992) did not identify a relationship between value and evaluator profile. Despite this, for Hypothesis 1.5, it is expected that the profile of a consulting firm—given its closer relationship with the firm being evaluated—will be associated with overvaluation of projected performance. In contrast, for banking institutions and auditing firms, which are the other evaluator profiles identified in the sample, a more conservative stance is expected, and therefore an association with undervaluation of projected performance.

Beyond the hypotheses, this study contributes to the discussion on share repurchases by Brazilian companies, building on Bortolon & Silva Jr. (2015) and Souza et al. (2013), which examine variables relevant to the issuance of valuation reports in going-private transactions. The analysis in the present study focused exclusively on the short-term horizon (one year). It is also possible to reflect on tender offers for delisting and relate the findings to those of Palladino and Lazonick (2024) and Chavalía and Shemmen (2011), who assess the impact of buybacks on market share prices. Both studies reinforce the understanding that buybacks function as informational signals—whether in emerging markets with higher informational asymmetry, such as India, in Chavalía & Shemmen (2011), or in more transparent markets, such as the United States in Palladino and Lazonick (2024).

### 3 Research Methodology

#### 3.1 Data Collection

Regarding data collection, valuation reports and their corresponding tender offer documents were examined to extract projected data and information on the issuance context (type of tender offer, fees paid to the appraiser, relationship between the contracting firm and the valued firm, appraiser profile, and industry of the valued firm). Realized performance values were obtained from the *Economática* and *Valor 1000* databases.

The economic–financial performance indicator used to compare projected performance with actual performance was the EBITDA margin. This figure was either collected directly from the valuation report or calculated—also using information from the reports—by dividing EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) by Net Operating Revenue (NOR) (Alcalde, Fávero & Takamatsu, 2013). The EBITDA margin facilitates comparison across firms of different sizes and across firms operating in the same or in different industries (Alcalde et al., 2013).

For calculating the difference, a time horizon of only one year (short term) was considered. For example, in a report issued in 2023, the performance projections refer to 2024 and subsequent years. The projected EBITDA for 2024 was compared with the EBITDA actually achieved in that year, in order to assess whether a significant difference exists between these values. In this short-term scenario, exogenous variables—such as aggregate uncertainty—tend to have less impact on the estimates than in medium- or long-term forecasts, because macroeconomic visibility over a one-year period is relatively high (the market has already priced in interest rates, inflation, exchange rates, etc.). Thus, relevant shocks during the period are more likely to be idiosyncratic (sector- or firm-specific) rather than purely macroeconomic.

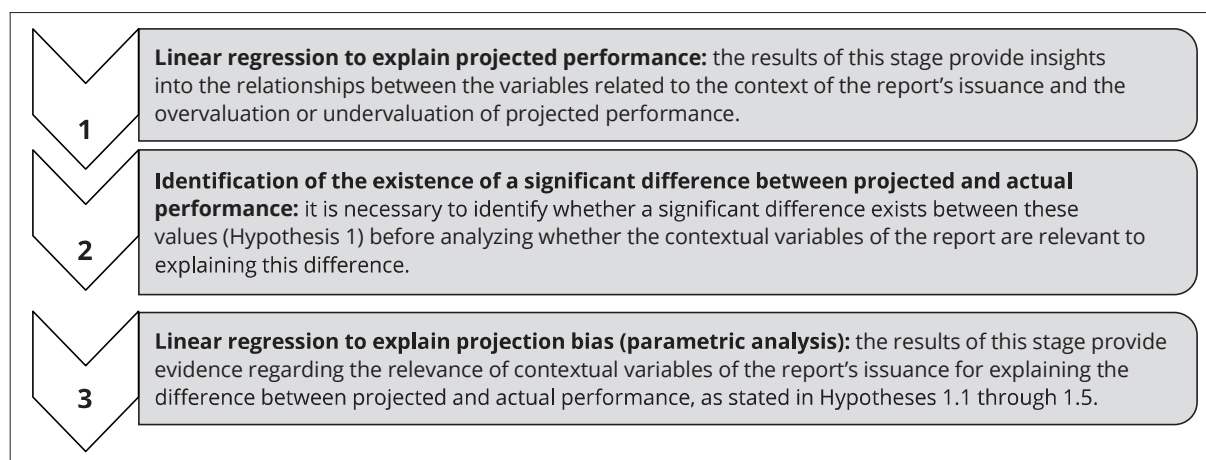
The database for this study comprises 78 valuation reports issued between 2010 and 2023 in the context of tender offers, all available on the CVM website. Only reports that estimated firm value using the DCF method were selected, as this method requires the projection of future performance. The initial year was chosen because it marks the beginning of the adoption of international accounting standards in Brazil, which affected the measurement of the control variables used in the regression model. The final year (2023) corresponds to the most recent period preceding the availability of annual data on firms' actual performance (2024). It is important to note that, although the dataset spans the period from 2010 to 2024, there is only one report issued in 2020 (dated July 20, 2020), and the previous report dates to 2017. Therefore, excluding the COVID-19 pandemic as a control variable in the tested models is justified.

Of the initial 78 valuation reports, 67 explicitly stated the EBITDA and/or EBITDA margin indicators, or it was possible to calculate them by adding the EBIT (Earnings Before Interest and Taxes) to depreciation and amortization, also explicitly stated in the reports. Subsequently, by consulting the Economática and Valor 1000 databases, realized EBITDA margin values were obtained for 28 of the 67 reports; therefore, 28 reports comprise the final dataset for which it was possible to collect all information required for the purposes of this study. It should be emphasized that, because the final set of observations consists of 28 reports, the findings cannot be generalized to all valuation reports issued in the context of tender offers. It should also be noted that, in the models that include valuation fees, the number of observations is reduced to 23 reports, which were the ones that disclosed the amounts paid.

### 3.2 Data analysis

The data analysis was conducted in three stages, as outlined in Figure 1. The first stage consisted of developing multiple linear regression models that incorporated variables related to the context of the report's issuance (type of tender offer, fees paid for preparing the reports, relationship between the contracting firm and the valued firm, industry of the valued firm, and profile of the appraiser) as explanatory variables for short-term projected performance (one year), along with control variables (current liquidity, risk, and firm size).

The variables used in the linear regression models are presented in Table 1, and the models developed correspond to Models 1.1 through 1.5 in Table 2.



Source: developed by the authors

**Figure 1.** Stages of data analysis

The second stage consisted of comparing the projected short-term economic–financial performance (EBITDA margin) with the actual performance. Projected values were obtained directly from the valuation reports, while actual values were collected from the Economática and Valor 1000 databases. In this stage, statistical tests were conducted to identify whether significant differences existed between projected and actual performance. The choice of test depended on the normality of the data distribution, which was assessed by the Shapiro-Wilk (S-W) and Shapiro-Francia (S-F) tests, as recommended by Torman, Coster, and Riboldi (2012).

Once the difference between projected and actual performance was confirmed—i.e., once Hypothesis 1 was supported—the remaining stages of the analysis were conducted to determine whether this difference was related to the contextual variables associated with the report's issuance. Evidence of such a relationship would indicate that the difference between projected and actual performance results from bias in the projection.

Finally, the third stage of the analysis consisted of developing multiple linear regression models in which the dependent variable was the difference between the projected EBITDA margin and the actual EBITDA margin. These models correspond to Models 2.1 to 2.5, presented in Table 2. The results serve to confirm or refute Hypotheses 1.1 to 1.5. Table 1 summarizes the variables used in the multiple linear regression models, along with their respective descriptions, expected signs, categories, and prior research that informed their selection.

Table 1

**Variables for Multiple Linear Regression Models**

Variable	Description	Expected sign	Category	Source
$MebProj_{it+1}$	Projected EBITDA margin for firm $i$ in year $t+1$ (the year following the issuance of the valuation report).	***	Dependent Variables	Exploratory
$Meb_{it+1}$	Difference between projected EBITDA margin for firm $i$ in year $t+1$ (the year following the issuance of the valuation report) and the actual EBITDA margin realized by firm $i$ in year $t+1$ .	***		
$LC_{it}$	Current Liquidity (Current Assets/Current Liabilities) of firm $i$ in year $t$ (year of the valuation report).	+	Control variables	Kanitz (1978), Ullmann (1985), Waddock e Graves (1997), Zhao e Murrell (2016)
$Risco_{it}$	Total Debt/Total Assets of firm $i$ in year $t$ (year of the valuation report).	-		
$Tam_{it}$	Firm Size, measured as the natural logarithm of Total Assets for firm $i$ in year $t$ (year of the valuation report).	+		
$Cancel$	Dummy variable equal to 1 if the tender offer refers to delisting, and 0 otherwise).	-	Tender offer modality	Souza et al. (2013) e Noda (2018)
$Alien$	Dummy variable equal to 1 if the tender offer involves the sale of control, and 0 otherwise).	+/-		
$Aumento$	Dummy variable equal to 1 if the tender offer refers to an increase in ownership participation, and 0 otherwise).	+/-		
$Hon$	Fees paid to the appraiser responsible for preparing the valuation report.	+	Fees paid to the appraiser	Dechow et al. (2000) and Kothari (2001)
$Própria$	Dummy variable equal to 1 if contracting firm is the valued firm, and 0 otherwise).	+	Relationship with contracting firm	Noda (2018)
$Control$	Dummy variable equal to 1 if the contracting firm is the controlling shareholder of the valued firm, and 0 otherwise).	-		
$BensInd$	Dummy variable equal to 1 if the valued firm operates in the industrial goods sector, and 0 otherwise).	+/-	Value firm's industry	Porter (1981); Ullmann (1985); Graves (1997); Oliveira et al. (2017); Palladino & Lazonic (2024)
$ConsCícl$	Dummy variable equal to 1 if the valued firm operates in the Consumer Cyclical sector, and 0 otherwise).	+/-		
$ConsNãoCícl$	Dummy variable equal to 1 if the valued firm operates in the Consumer Non-Cyclical sector, and 0 otherwise).	+/-		
$Financ$	Dummy variable equal to 1 if the valued firm operates in the Financial sector, and 0 otherwise).	+/-		
$MatBás$	Dummy variable equal to 1 if the valued firm operates in the Basic Material sector, and 0 otherwise).	+/-		
$Telecom$	Dummy variable equal to 1 if the valued firm operates in the Telecommunications sector, and 0 otherwise).	+/-		
$UtilidPúb$	Dummy variable equal to 1 if the valued firm operates in the Utilities sector, and 0 otherwise).	+/-	Appraiser profile	Exploratory
$Consult$	Dummy variable equal to 1 if the appraiser is a consulting firm, and 0 otherwise).	+		
$Banco$	Dummy variable equal to 1 if the appraiser is a banking institution, and 0 otherwise).	-		

Source: developed by the authors.



Regarding the type of tender offer, since four types were identified (deregistration, voluntary, sale of control, and increase in participation), three dummy variables were included to avoid perfect multicollinearity. Thus, no dummy variable was created for the voluntary tender offer, which serves as the reference category in the model. With respect to the relationship between the contracting firm and the valued firm, three types of contracting parties were identified: the controlling shareholder of the valued firm, the valued firm itself, and another company. Accordingly, two dummy variables were included in the model, with “another firm” serving as the reference category.

Regarding the industry of the valued firm, the observations in the sample cover 8 of the 11 sectors existing in the B3 (Brasil, Bolsa, Balcão) classification, namely: basic materials, industrial goods, cyclical consumption, non-cyclical consumption, finance, other, telecommunications, and public utilities. Accordingly, seven dummy variables were included in the model, with the “other” sector serving as the reference category. Finally, with respect to the appraiser profile, three types were identified in the sample: banking institution, auditing firm, and consulting firm. Thus, two dummy variables were included, and the auditing firm profile was used as the reference category.

As previously mentioned, the explanatory variables of interest arise from information related to the context of the valuation reports (type of tender offer, fees paid for preparing the reports, relationship between the contracting firm and the valued firm, industry of the valued firm, and appraiser profile). In addition, control variables—current liquidity, risk, and firm size—were included in the model, as these are commonly used in research on firms’ economic and financial performance (Kanitz, 1978; Ullmann, 1985; Waddock & Graves, 1997; Zhao & Murrell, 2016).

This selection of control variables reflects the short-term horizon (one year) between projected and actual performance, in which idiosyncratic and operational shocks have a stronger influence than long-term macroeconomic factors. It is important to note that the results reported here were sensitive to including control variables related to macroeconomic uncertainty, suggesting that part of the initially estimated effect may reflect the omission of such a variable or that its inclusion reduces the already limited degrees of freedom.

Furthermore, due to the number of explanatory variables of interest, it was not possible to develop a robust model that included all of them. The exclusion of some variables introduces the risk of omitted-variable bias, which compromises the causal validity of the estimated coefficients and may lead to misinterpretations regarding their magnitude and/or sign. To mitigate this risk, control strategies were adopted, including the use of proxies (current liquidity, risk, and firm size) and robustness procedures (ordinary least squares with robust standard errors). Even so, the results should be interpreted in light of this limitation, acknowledging that the models capture conditional—and not necessarily causal—relationships between the variables analyzed. It is also important to highlight the limitation imposed by the 28 observations, which does not allow the findings to be extrapolated to future years or to other observational units.

Thus, the development of the models (see Table 2) included control variables (current liquidity, risk, and firm size) and sets of dummy variables of interest related to the context of the valuation report (type of tender offer, fees paid for preparing the reports, relationship between the contracting firm and the valued firm, industry of the valued firm, and appraiser profile). The econometric tests were evaluated at the 10% significance level and included: the F-test for overall model significance, VIF for detecting multicollinearity, White’s test for heteroscedasticity, and Jarque–Bera test for normality of residuals.

Table 2

**Multiple Linear Regression Models**

Dependent variable	Model	Variables of interest	No.	Equations
<i>MebProj<sub>it+1</sub></i>	1.1	Tender offer modality	27	$MebProj_{it+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 Cancel + \beta_6 Alien + \beta_7 Aumento + \varepsilon_i$
	1.2	Fees	22	$MebProj_{it+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 Hon + \varepsilon_i$
	1.3	Relationship with contracting firm	27	$MebProj_{it+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 Própria + \beta_6 Control + \varepsilon_i$
	1.4	Valued firm's industry	27	$MebProj_{it+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 BensInd + \beta_6 ConsCícl + \beta_7 ConsNãoCícl + \beta_8 Financ + \beta_9 MatBás + \beta_{10} Telecom + \beta_{11} UtilidPúb + \varepsilon_i$
	1.5	Appraiser's profile	27	$MebProj_{it+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 Consult + \beta_6 Banco + \varepsilon_i$
<i>Mebi<sub>t+1</sub></i>	2.1	Tender offer modality	27	$Mebi_{t+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 Cancel + \beta_6 Alien + \beta_7 Aumento + \varepsilon_i$
	2.2	Fees	22	$Mebi_{t+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 Hon + \varepsilon_i$
	2.3	Relationship with contracting firm	27	$Mebi_{t+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 Própria + \beta_6 Control + \varepsilon_i$
	2.4	Valued firm's industry	27	$Mebi_{t+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 BensInd + \beta_6 ConsCícl + \beta_7 ConsNãoCícl + \beta_8 Financ + \beta_9 MatBás + \beta_{10} Telecom + \beta_{11} UtilidPúb + \varepsilon_i$
	2.5	Appraiser's profile	27	$Mebi_{t+1} = \beta_0 + \beta_1 LC_{it} + \beta_2 Risco_{it} + \beta_3 Tam_{it} + \beta_4 IncertMacro_t + \beta_5 Consult + \beta_6 Banco + \varepsilon_i$

Source: developed by the authors

## 4 Results

### 4.1 Regression results for projected performance

Among the regression models 1.1 to 1.5 for projected performance (see Table 2, Section 3), the tests performed (overall model significance, multicollinearity, heteroscedasticity, and normality of residuals) indicated robustness only for Models 1.2 (fees paid to the appraiser), 1.4 (industry of the valued firm), and 1.5 (appraiser profile). The results for these models are presented in Table 3.

Regarding the control variables, firm size showed significance in Models 1.2 and 1.5, indicating that the larger the firm in the year of the report's projection, the greater the projected performance for the following year. These results are consistent with previous research (Kanitz, 1978; Ullmann, 1985; Waddock & Graves, 1997; Zhao & Murrell, 2016).

Table 3

#### Results of Regressions for Projected Performance

Modelo	1.2	1.4	1.5
Variáveis	<i>MebProj<sub>it+1</sub></i>	<i>MebPro<sub>jit+1</sub></i>	<i>MebProj<sub>it+1</sub></i>
<i>LC<sub>it</sub></i>	0.038 (0.060)	0.018 (0.059)	0.042 (0.058)
<i>Risco<sub>it</sub></i>	-0.001 (0.004)	0.008 (0.004)*	0.001 (0.003)
<i>Tam<sub>it</sub></i>	0.126*** (0.041)	0.049 (0.043)	0.103*** (0.036)
<i>Hon</i>	-0.000 (0.000)		
<i>BensInd</i>		0.045 (0.303)	
<i>ConsCícl</i>		0.290 (0.370)	
<i>ConsNãoCícl</i>		0.152 (0.312)	
<i>Financ</i>		0.783 (0.482)	
<i>MatBás</i>		0.354 (0.330)	
<i>Telecom</i>		0.406 (0.419)	
<i>UtilidPúb</i>		0.602* (0.342)	
<i>Consult</i>			0.415** (0.191)
<i>Banco</i>			0.222 (0.155)
<i>Constant</i>	-0.835** (0.332)	-0.736* (0.376)	-0.943*** (0.313)
<i>N</i>	23	28	28
<i>R<sup>2</sup></i>	0.362	0.554	0.416

Legend: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard deviations in parentheses

Source: developed by the authors using Stata.

Regarding Model 1.2, no significance was found for the variable of interest (fees). It is noteworthy that an additional model was estimated in which the variable “fees” was replaced by the natural logarithm of the fee amount, in order to scale it. Moreover, given the substantial inflation that occurred in Brazil during the analyzed period, another model was developed in which the fee amount was updated monthly using the National Consumer Price Index (INPC). Across all three specifications, the results were robust and indicated that fees were not significant in explaining the projected performance.

The results of Model 1.2 contradict Kothari’s (2001) finding, according to which the economic incentives received by analysts for their services help explain the optimistic bias in the valuations. The results also diverge from those reported in the international literature (Dechow et al., 2000).

For Model 1.4, only the “other” category (reference category) and the public utilities sector were relevant in explaining the projected performance, indicating that certain industries exhibit bias in short-term performance projections. In Model 1.5, the reference category (audit firm) was significant, showing that audit firms tend to project lower EBITDA margin values in valuation reports. The consulting-firm category was also significant, indicating that, compared to audit firms, consulting firms tend to project higher EBITDA margin values.

In summary, the results of Model 1.2 suggest that Hypothesis 1.2 is not confirmed, whereas the results of Models 1.4 and 1.5 suggest that Hypothesis 1.5 is confirmed. This evidence will be further examined in the following subsections, after conducting tests to determine if there is a significant difference between projected and actual performance values.

## 4.2 Identifying the existence of overestimation or underestimation of projected performance

In this section, an analysis was conducted to determine whether there was overvaluation or undervaluation in the 28 reports under study—in other words, whether the difference between the projected EBITDA margin and actual EBITDA margin is, on average, significant for this dataset. Since the variables do not follow a normal distribution, the non-parametric Wilcoxon test was performed. The results (see Table 4) indicate the rejection of the null hypothesis (H0) at the 10% significance level, meaning the mean values are significantly different.

Table 4

### Wilcoxon Test for Meb P and Meb R

N	Mean Meb P	Mean Meb R	Difference	p-value	Decision
28	0.20246	-0.11593	0.31839	0.0697	Rejeitar H0*

Legend: N (Number of observations), Meb P (Projected EBITDA margin), Meb R (Actual EBITDA margin).

\* Level of significance ( $\alpha$ ) = 10%

Source: developed by the authors

Therefore, this result supports Hypothesis 1 of the present study regarding the discrepancy between projected and actual values. Furthermore, the analysis of the difference between the averages shows that the projected EBITDA margin, on average, was higher than the actual EBITDA margin, indicating an overvaluation of projected performance in the valuation reports analyzed. This result is consistent with international studies (Cogliati et al., 2011; Dechow et al., 2000; Mumtaz et al., 2016).

Thus, for the observations analyzed, the significance of the difference between projected and actual EBITDA margin was confirmed (Hypothesis 1), allowing us to move on to the subsequent subsections, which are dedicated to identifying whether there is a relationship between the variables associated with the issuance of the valuation reports and the difference between projected and actual performance—measured by the EBITDA margin—as proposed in Hypotheses 1.1 to 1.5.

### 4.3 Regression results for bias in projection

Among regression models 2.1 to 2.5 for projection bias (see Table 2, Section 3), the tests performed (overall model significance, presence of multicollinearity, heteroscedasticity, and residual normality) indicated rejection of the null hypothesis of residual normality for all models, except Models 2.2 (fees paid to the appraiser) and 2.4 (industry of the valued firm). Despite this, Models 2.1, 2.2, and 2.4 were significant according to the F-test and met the assumptions of homoscedasticity and absence of multicollinearity.

Therefore, considering that, according to Gujarati and Porter (2011), assessing the significance of the parameters—without the intention of making projections—does not require meeting the assumption of residual normality, Models 2.2 (fees paid to the appraiser) and 2.4 (industry of the valued firm) were considered suitable for analysis, along with Model 2.1 (type of tender offer). The results are presented in Table 5.

Model 2.1 showed significance for all tender offer modalities in the analyzed dataset. The reference category (voluntary tender offer) was significant, indicating that valuation reports issued in the context of a voluntary tender offer tend to overestimate projected performance. The remaining modalities were also significant, showing that, relative to voluntary tender offers, they tend to underestimate projected performance. These results confirm Hypothesis 1.1.

Regarding Model 2.2, based on Kothari's theory (2001) and the findings of Dechow et al. (2000), it was expected that fees would be associated with a tendency to overestimate projected performance. However, the results indicated that the amount paid to appraisers as fees is not significant. It is worth noting that additional specifications were tested: one replacing the fee variable with its natural logarithm, another using the fee value updated by the INPC (National Consumer Price Index), and a third using the natural logarithm of the updated fee value. The results of the three additional models were robust, and the fees were not significant in explaining the difference between projected and actual performance. Thus, Hypothesis 1.2 was not confirmed, corroborating what was observed in the results of Model 1.2 (see subsection 4.1).

Table 5

**Regression results for projection bias**

Model	2.1	2.2	2.4
Variables	Meb <sub>it+1</sub>	Meb <sub>it+1</sub>	Meb <sub>it+1</sub>
<i>LC<sub>it</sub></i>	-0.460 (0.295)	-0.140*** (0.032)	-0.143*** (0.036)
<i>Risco<sub>it</sub></i>	0.018 (0.016)	0.000 (0.002)	-0.001 (0.003)
<i>Tam<sub>it</sub></i>	-0.185 (0.187)	-0.022 (0.022)	0.000 (0.026)
<i>Cancel</i>	-2.095** (0.791)		
<i>Alien</i>	-1,981* (0,982)		
<i>Aumento</i>	-2.033* (1.001)		
<i>Hon</i>		-0.000 (0.000)	
<i>BensInd</i>			-8.058*** (0.183)
<i>ConsCícl</i>			-8.160*** (0.224)
<i>ConsNãoCícl</i>			-8.204*** (0.189)
<i>Financ</i>			-8.229*** (0.292)
<i>MatBás</i>			-8.086*** (0.200)
<i>Telecom</i>			-8.349*** (0.254)
<i>UtilidPúb</i>			-8.269*** (0.207)
<i>Constant</i>	3.704** (1.668)	0.357* (0.175)	8.412*** (0.228)
N	28	23	28
R <sup>2</sup>	0.390	0.536	0.994

Legend: \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Standard deviations in parentheses

Source: developed by the authors using Stata.

Regarding Model 2.4, the reference category (“other” sector) was significant in that companies in this sector tend to overestimate projected performance. The remaining sectors were also significant, showing that, compared to the “other” sector, they tend to underestimate projected performance. These results support Hypothesis 1.4, indicating that the industry of the valued firm is relevant in explaining the difference between projected and actual performance. This hypothesis is corroborated by the established relationship between industry sector and firm performance (Graves, 1997; Porter, 1981; Ullmann, 1985).

Finally, given that regression models 2.3 and 2.5 were not robust, it was not possible to analyze Hypotheses 1.3 and 1.5. In summary, the results corroborate the existence of bias in the performance projections of the analyzed reports, understood as the fact that the difference between the projected and actual performance is significant. The relevance of variables related to (i) the type of tender offer and (ii) the sector of the valued firm was identified—the latter corroborating findings by Palladino and Lazonick (2024)—in explaining this bias, whereas the fees paid to the appraiser were not significant.

In line with the types of tender offers, the one involving delisting stands out, as it typically occurs in a scenario in which the firm repurchases its own shares. In the Brazilian context, Souza et al. (2013) found that going private, mediated by a tender offer, was associated with earnings management; however, this effect depended on the composition of the comparative sample. In the present study, and for the firms evaluated here, the tender offer modality proved to be related to projection bias, suggesting that projected values—whether over- or undervalued—are correlated with the type of tender offer.

Corroborating the findings of Palladino and Lazonick (2024), the industry of the firms evaluated here proved to be explanatory of the projection bias. They identified the following industries as prominent in a scenario of open-market share repurchases carried out by U.S. corporations: technology and information; finance and insurance; and retail. In the observations of Brazilian firms in this study, the representative industries were “other,” public utilities, telecommunications, basic materials, finance, cyclical and non-cyclical consumer goods, and industrial goods.

It is important to highlight that this study analyzed the universe of available data, namely: 78 tender offer reports, of which 67 explicitly presented the EBITDA and/or EBITDA margin indicators, or allowed their calculation based on information disclosed in the reports. Subsequently, by consulting the Economática and Valor 1000 databases, values for the actual EBITDA margin were identified for 28 of the 67 reports; therefore, 28 reports comprise the final dataset from which it was possible to collect the information necessary for the study’s purpose. Thus, because the set of observations consists of 28 reports, it is not possible to generalize the conclusions of this research to all valuation reports issued in the context of tender offers.

## 5 Final Considerations

Regarding the relevance of the topic, research on business valuation remains scarce in emerging countries. Thus, new studies in the Brazilian context contribute to expanding the scientific knowledge in this field. Another contribution is the provision of evidence on the business valuation phenomenon specifically in the national market.

Regarding the practical relevance of the topic, evidence comparing projected and actual values contributes to how valuation reports are perceived by users of valuation information in Brazil and to improvements in the firm valuation process (Pereiro, 2002) and in the quality of valuations. Furthermore, research in this area contributes to the development of legislation on the subject (Palladino & Lazonick, 2024), as well as to the improvement of valuation review practices (Mumtaz et al., 2016).

This study sought to advance in this direction by examining whether, in tender offer valuation reports issued in Brazil that use the Discounted Cash Flow (DCF) method, five variables related to the context of report issuance—the type of tender offer, the fees paid for preparing the reports, the relationship between the contracting firm and the firm being valued, the industry of the firm being valued, and the profile of the appraiser—contribute to explaining the overvaluation or undervaluation of the projected short-term (one-year) economic–financial performance relative to the performance actually achieved.

Limited to the data analyzed, the results of this research demonstrate that, in tender offer valuation reports in Brazil that use the DCF method, the difference between projected and actual short-term (one-year) performance is significant. Among the determining variables tested, emphasis was placed on those that could reveal potential opportunistic objectives or behaviors capable of distorting the actual EBITDA. The findings indicate the presence of projection bias and that this bias is related to the type of tender offer and the industry of the firm being valued. The results also show that the amount paid to the appraiser as fees was not significant in explaining this bias. It is important to highlight that this study considered all publicly available data, therefore analyzing the universe of available observations. This dataset, however, was limited to 28 observations and does not allow the findings to be generalized to future years or to other observational units.

For future research, it is suggested that a similar methodology be applied in different contexts and with broader samples for which data on actual performance—the main limitation of this study—are not required. The inclusion of market context and governance variables, among others, also represents an important avenue for future analyses. It should be noted that, for the present study, decision tree and ridge regression models were additionally estimated, but their results did not surpass those presented in Section 4. In turn, the results of a binary model, also estimated as an additional procedure, confirmed the findings described in this study. Confirmatory results were likewise obtained for the fee model using correspondence analysis. Despite these supplementary results, this study focused on reporting those obtained through multiple linear regression models.

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