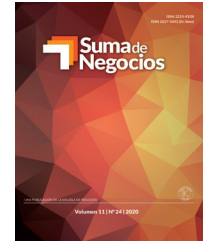## SUMA DE NEGOCIOS

Research article

Valuation of companies in Brazil: a conflict between theory and practice

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ABSTRACT

This paper performs a descriptive analysis of the practices and assumptions adopted in the valuation reports of Brazilian companies. The methodologies and assumptions of the forecast models were analysed using valuation reports available from the Brazilian Securities and Exchange Commission between 2004 - 2018. The results indicate a preference for the discounted cash flow methodology over projection periods of between five and sixteen years that are measured in national currency without adjustment for inflation. Growth rates, both nominal and real, were not homogeneous due to large fluctuations over the years and among the sectors analysed. Moreover, the macroeconomic variable projections were not accurate when compared to actual economic values. The variables used to determine multiples presented in valuation reports were also analysed; the results indicate that the higher the risk, the lower the projected multiple, and the higher the indebtedness and the inflation rate, the higher the multiple value.

Valoración de empresas en Brasil: una discrepancia entre teoría y práctica

RESUMEN

Este artículo presenta un análisis descriptivo de las prácticas y supuestos adoptados en los informes de valoración de las empresas brasileñas. Las metodologías y los supuestos de los modelos de pronóstico se analizaron utilizando informes de valoración aportados por la Comisión de Valores Mobiliarios de Brasil desde 2004 hasta 2018. Los resultados indican una preferencia por el método de flujo de caja descontado sobre períodos de proyección de entre 5 y 16 años, medidos en moneda nacional sin ajustes por inflación. Las tasas de crecimiento, tanto nominales como reales, no fueron homogéneas debido a las grandes fluctuaciones a lo largo de los años y entre los sectores analizados. Además, las proyecciones de las variables macroeconómicas no resultaron precisas en comparación con los valores económicos reales. También se analizaron las variables utilizadas para determinar los múltiplos presentados en los informes de valoración; los resultados indican que cuanto más elevado sea el riesgo, menor será el múltiplo proyectado y cuanto más elevado el endeudamiento y la tasa de inflación, más elevado será el valor del múltiplo.

Introduction

Valuation and value creation have always been addressed in the academic and professional literature. However, these became more important in Brazil after the period of privatization and economic liberalization, especially from the 1980s onwards. In financial spheres, the valuation of a company means seeking its fair value: that is, the value that reflects the present value of its expected future net cash flows, calculated using a discount rate that compensates for its level of risk. This research identifies the established traditional economic evaluation models that aim to project cash flows and discount them to their present value at a rate that, together with the other assumptions used in the projections, form the essence of valuation reports.

The theoretical basis that supports these models and premises is found in modern finance theory, which was initially presented in the works of Modigliani and Miller (1958, 1959, 1963). The recent studies that use alternative assessment methodologies, such as real options, are also noteworthy (Deeney & Cummins, 2019 Kozlova, 2017; Ross, Fisch, & Varga, 2018; Vernimmen, Quiry, Dallocchio, Le Fur, & Salvi, 2018). These works allowed several questions to be formulated about the influence economic and financial variables had on the market value of companies and their sources of financing.

Using this theoretical framework, the valuation reports companies disclosed are important tools to calculate a company's value. However, Fernandez (2006, 2007, 2015) points out errors in valuation reports that range from projection errors to errors in the multiples indicators. Pinto, Robinson, and Stowe (2018) review the use of different analysis methods for company evaluations, including discounted cash flow, multiples, and real options. Moreover, it is important to highlight the use of these tools to evaluate startups. In such cases, the literature indicates adjustments should be made to the traditional methodologies (Berger & Kohn, 2017; Köhn, 2018; Roehm & Kuckertz, 2018; Shimizu, 2017; Spender, Corvello, Grimaldi, & Pierluigi, 2017).

This information, which is disclosed in the market, can be used when making investment decisions. Because of these points of disagreement at the most diverse theoretical levels, when investment decisions are already difficult due to uncertain conditions and market fluctuations, the scenario tends to become even more uncertain in the presence of doubts about the theoretical construction of the valuation models.

Confidence in valuation reports is crucial for investors' decisions about the purchase of shares in IPOs of companies seeking capital market financing. To the extent that the market is aware of mistakes found in previous valuation reports, it is hypothetically possible that a contagious replication effect may negatively influence future valuations.

When correctly sized in cash flow projections and according to the modern theory of finance, assumptions about the cost of equity, the total cost of capital, and basic variables such as beta, leverage, growth rates, and other equally important variables, are worthy of scientific research for some important reasons. The first of these concerns the correct measurement of and confidence in the fair value obtained as the final product of the reports. Correctly valued assets support efficient investment decisions.

Another reason is the potential for expanding knowledge about the behaviour of assumptions adopted over the years in periods of positive or negative economic shocks. Investigating assumptions in varying market conditions may reveal the existence of data asymmetry attributed to the financial variables necessary to construct the evaluated asset's value. This may be stronger in negative shocks than positive ones, and it demonstrates the existence of bias in the valuations caused by the economic environment at the time of valuation.

Thus, this study analyses the practices adopted when making valuation reports of companies in Brazil. To ensure the reliability of the values presented, it assesses whether the variable assumptions made in them correctly follow modern finance theory and that the macroeconomic variable projections used are accurate.

The results show that the discounted cash flow approach appears in 100% of the reports analysed although different methodologies are used. In general, the calculation of the cost of equity follows a methodology established by Hamada (1972), which uses adjustments for emerging countries but makes little use of size premiums. We observed low homogeneity and accuracy in the variables used in the models when compared with real values.

Therefore, it is important to carefully analyse the information disclosed in valuation reports, because, even if they follow a standard methodology, a lack of adjustment in the calculations of the discounted cash flow model variables and low accuracy of the predicted variables may indicate a low quality of the published information.

Theoretical Framework

The main sources of funding in Brazil are bank financing and the issuance of securities in the capital market. However, funds made available through bank financing have high interest rates (Zilber & Pajare, 2009). Even the attractiveness of issuing debt securities such as debentures, which are more interesting from the point of view of the funding cost, is influenced by exogenous factors such as macroeconomic momentum, or even endogenous issues, such as guarantee limits for debt issuance. Given this, organizations have incentives to issue shares as the source of financing for their activities and strategies, either by raising capital through a Public Offering of Shares (POS), or even through a new offering in the market.

According to article 2 of CVM (Securities and Exchange Commission of Brazil) Ruling No. 361/2002, a POS may be carried out for purposes other than collection of company funds. Article 8 states that if a controlling shareholder, the company itself, or a representative of either a controlling shareholder or the company conducts a POS, it is mandatory that a company valuation report be prepared. One of the main objectives of a valuation report is to reduce information asymmetry. Specialized professionals must prepare the report, including the economic value of the company

analysed, and comply with CVM regulations (Almeida, Silva Brito, Bastistella, & Martins, 2012).

These reports have already been studied in some Brazilian literature. Santos, Campos, Felipe, and Anjos (2008) evaluated ninety reports issued from 2003 to 2007 to determine the feasibility of the CVM requirements. Their analysis showed that the reports analysed do not fully comply with the CVM's requirements concerning the duties of evaluators and the companies' valuation criteria. In another study, Izecksohn Neto (2008) evaluated 94 reports presented from 2002 to 2007 to determine which method most companies use to measure their economic value. Of the 94 reports examined, 71 (or about 75%) used discounted cash flow.

Cunha (2011) analysed 58 valuation reports issued between 2002 and 2008 and demonstrated that the differences between the averages projected in the reports and the actual averages are statistically significant for the following variables: change in net revenue, change in net profit, leverage, the investment rate, return on investment, and the weighted average cost of capital.

In the same line of research, Lucena, Silva, Melo, and Gomes (2013) analysed 55 POS valuation reports searching for errors in the determination and use of the weighted average cost of capital (WACC). The authors found errors such as the use of book values to measure capital, marginal rates instead of effective rates, and use of average values in the ratio between debt and equity. In a similar attempt to identify errors in determining the cost of capital, Teixeira, Cunha, and Machado (2013) tested the credibility of the Brazilian risk assumption used in computing the cost of equity in 73 POS valuation reports between 2007 and 2012 and confirmed the accuracy of the assumption.

Consistent with Bade (2009), Sanvicente (2015) analysed the common practice of adding a Brazilian risk premium to valuation reports between 2009 and 2013. He concluded that when the Ibovespa index is used to measure market return in multiple regression models aimed at calculating the cost of equity capital in the traditional CAPM model, the addition of country risk is not relevant since the country's risk is already reflected in the Ibovespa index.

Recent studies present alternative methodologies for companies to make evaluations (Pinto et al., 2018). This is related to the different business models evaluated (Berger & Kohn, 2017; Köhn, 2018; Roehm & Kuckertz, 2018; Shimizu, 2017; Spender et al., 2017). De Oliveira and Zotes (2018) state that traditional methodologies are still used to evaluate startups in Brazil, even though these companies' business models have characteristics that would justify the use of complementary analytical tools.

Still, as shown by Chernavsky (2011), Brazilian analysts are relatively unsuccessful in predicting macroeconomic variables; the author finds that random walk prediction models are more accurate than market analysts.

The inconsistency in determining both the cost of equity and the weighted average cost of capital, as well as the low predictability of macroeconomic variables, has serious implications for a company's final value when these rates are used as the discount rates for projected future cash flows. Potentially, this results in either under or over valuing a business.

Sample and Methodology

Company valuation reports issued for the purpose of publicly offering shares from 2004 to 2018 were collected from the CVM's website. The 110 reports analysed include companies from 26 different sectors of the Brazilian economy.

This study uses both a qualitative and empirical-analytical methodology. Documentary research of the valuation reports was conducted to collect data about the usual assumptions for future projections and other information used to obtain the companies' fair values. These assumptions and the relevant information are presented in Table 1.

Table 1 - Assumptions presented in the valuation reports.

Type of Cash Flow	In constant currency		Nominal
Cash Flow Characteristic	Shareholders' Cash Flow		Company Cash Flow
Projection Currency	Dollar (US$)		Real (R$)
Projection Terms	Average projection time		
Projected Growth Rate of Cash Flows	Nominal		Real
Growth Rate of Cash Flows in Perpetuity	Nominal		Real
Company Value (% of Value)	% Projected		% in Perpetuity
Macroeconomic Assumptions	GDP	Inflation	Exchange
Cost of Capital	Beta	Risk-Free	Market Return
	Country Risk	Debt Cost	Size Premium
Capital Structure	Debt %		Stockholders' Equity %
Multiples	EBITDA multiple		REVENUE multiple
Data Sources	Main sources of information		

Source: Prepared by the author.

The research is also quantitative because statistical analysis was performed using the historical series of projection assumptions presented in the reports to infer whether the mean data of the assumptions are homogeneous for the purpose of evaluating their stability and significance. This was verified by calculating the coefficient of variation (the relationship between the sample's standard deviation and the sample average). According to Fávero, Benfiore, Silva, and Chan (2009), if this measurement is above 30%, the data set can be considered to be heterogeneous. Authors such as Assaf Neto, Lima, and Araújo (2008) and Fernandez (2015) also use this technique. Multiple regression tests, corrected for heteroscedasticity, were conducted to identify the relationships between multiple values identified in the reports and the other assumptions adopted in the projections. The earnings before interest, taxes, depreciation, and amortization (EBITDA) as well as revenue multiples were used as dependent variables in the regression model because these measures were available in a larger number of report periods.

Analysis of Results

After choosing and tabulating the variables described, quantitative analyses such as mean, maximum, and minimum values; dispersion statistics; and statistical significance were performed for each variable. The reports analysed were all prepared using a discounted cash flow methodology. This methodology is well-established in the literature and, according to Assaf Neto (2014), is used by valuation experts.

The analysis shows that in the period from 2004 to 2018, 18% of the reports were prepared using cash flows in constant currency, that is, without considering inflation

projections. However, 82% of the reports used nominal currency, that is, inflation expectations were embedded in their projections, as shown in Figure 1. Ninety percent of the reports used company cash flows to obtain fair values for shareholders and creditors. In 75% of the reports, projections were made in the company's national currency while 25% were made in US dollars. These results agree with those obtained by Cunha (2011).

The explicit period used for the projections ranged between a minimum of five years and a maximum of 16 years (average of 8.3 years). Only one valuation report included 16 years of projections, while the other reports reflected a maximum period of ten years. This can be explained by the low predictability of data in the Brazilian market. The average coefficient of variation for this variable was 30%, which suggests that the valuation data are homogeneous in terms of the length of the projection period; that is, the projection periods used in the reports in the sample are similar. Figure 2 shows the average values obtained, grouped by the 26 sectors in the sample. This premise meets finance theory's expectations, which, according to Copeland, Koller, and Murrin (2000), states that the explicit projection period should be long enough to allow the company to achieve operational stability by the end of the period.

Both real and nominal values, that is, values without and with inflation, respectively, were used to calculate the cash flow growth rates over the projection period. According to the coefficient of variation criterion, the average cash flow growth rates in the projection period were non-homogeneous throughout the period analysed. Table 1 shows the variability of growth rates during the period. When a perpetuity growth rate is found, a more constant pattern is observed among the sectors, even with non-homogeneous
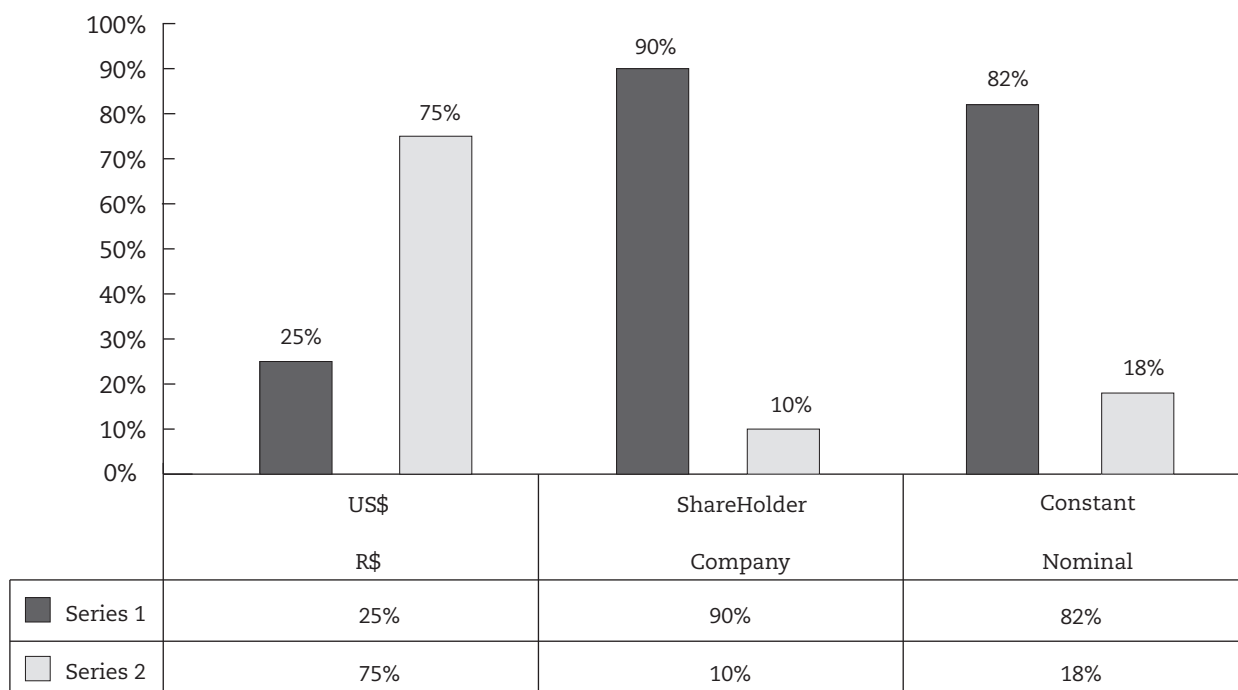
	US$ R$	ShareHolder Company	Constant Nominal
Series 1	25%	90%	82%
Series 2	75%	10%	18%

Figure 1. Methodologies used in the reports from 2004 to 2018.
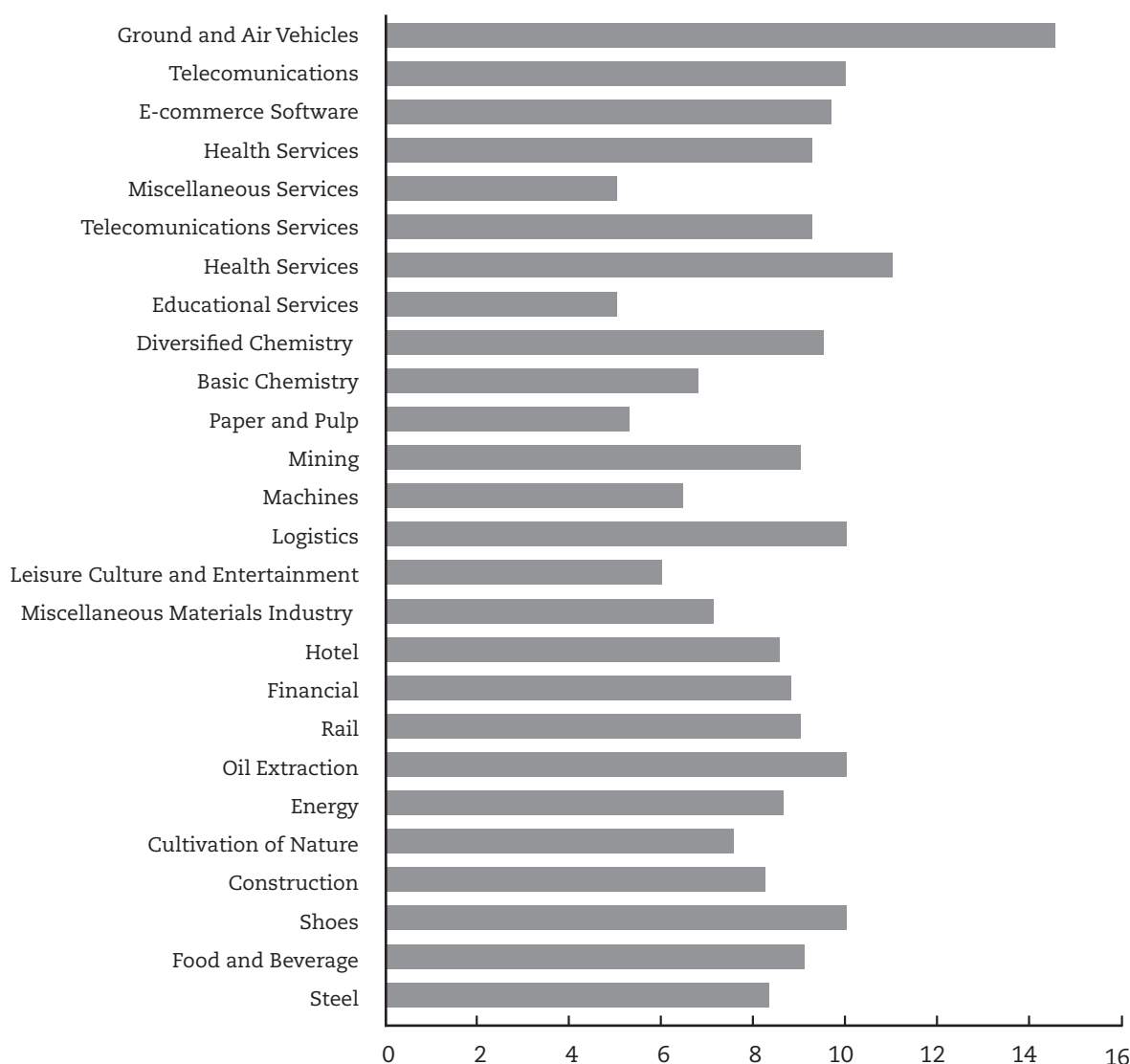
Source: Prepared by the author.

Figure 2. The average projection period from 2004 to 2018 by sector.

Source: Prepared by the author.

behaviour. In Tables 2 and 3, economic variability explains the more diffuse behaviour of the growth rates, projection periods, and perpetuity variables. Growth rates are highly dependent on the current economic environment; in other words, reports issued in years of high economic growth have high rates in perpetuity and the projection period, while in years of low economic growth, the inverse behaviour is observed. In this case, the lack of predictability and the inability to anticipate scenarios in the valuation reports is evident, significantly distorting the values disclosed in these documents.

It can be inferred from the analyses of the macroeconomic assumptions that the country risk premium proved to be consistent with the Brazilian risk during the projection period; the economic scenario has a coefficient of variation of 50%, as observed in Figure 3, a result consistent with Teixeira et al.'s (2013) findings. This variation is due to the Brazilian economic behaviour in the period.

The exchange rate variable also proved to be consistent with the annual average real values and the values predicted in the valuation reports, with a 30% coefficient of variation. Once again, this is a reflection of the economic fluctuations during the period. Conversely, the inflation and average GDP forecasts in the specific projection periods were not consistent with the real values, primarily in the final years of the sample; this is mainly due to the instabilities of the Brazilian market. A low coefficient of variation is noted for these forecasts, indicating they are relatively consistent. This result demonstrates the low predictive ability of the reports since these variables actually demonstrated greater variance during the period, which indicates incorrect standardization of these variables in the models.

To compute the cost of equity, 100% of the reports analysed used the CAPM model, consistent with Cunha (2011), Fernandez (2015), Rodrigues and Sallaberry (2013), and Sanvicente (2015). However, there is less use of adjustments for country risk and size premium, as indicated by Assaf Neto (2014): 12 reports did not include a country risk premium and 88 did not use a size premium adjustment. However, the reports were conservative in their estimation of beta

Table 2 - Cash flow growth rates in the projected period for nominal and real flows grouped by sectors over the period analysed.

| Sector | Perpetuity growth rate | | | | | | | | Explicit Period Growth Rate | | | | | | | |
| | Nominal | | | | Real | | | | Nominal | | | | Real | | | |
	Average	Deviation	Min.	Max.	Average	Deviation	Min.	Max.	Average	Deviation	Min.	Max.	Average	Deviation	Min.	Max.
Steel	3.20%	1.50%	2.20%	5.00%	1.70%	0.60%	1.00%	2.00%	6.10%	0.50%	5.60%	6.60%	1.90%	0.70%	1.20%	2.50%
Food and Beverage	3.70%	1.70%	0.00%	6.50%	0.00%	.	0.00%	0.00%	8.00%	3.00%	1.90%	13.10%	3.00%	.	3.00%	3.00%
Shoes	.	.	.	.	0.00%	.	0.00%	0.00%	.	.	.	.	3.00%	.	3.00%	3.00%
Construction	4.50%	0.60%	4.00%	5.10%	0.50%	.	0.50%	0.50%	8.00%	2.50%	5.10%	9.80%	1.50%	.	1.50%	1.50%
Cultivation of Nature	4.00%	.	4.00%	4.00%	0.00%	.	0.00%	0.00%	12.90%	.	12.90%	12.90%	1.40%	.	1.40%	1.40%
Energy	2.30%	1.80%	1.00%	3.50%	1.30%	1.90%	0.00%	2.60%	8.00%	1.70%	5.70%	9.40%	3.10%	0.70%	2.70%	3.60%
Oil Extraction	5.30%	0.00%	5.30%	5.30%	2.00%	.	2.00%	2.00%	4.70%	1.30%	3.80%	5.70%	.	.	.	.
Rail	4.50%	.	4.50%	4.50%	.	.	.	.	6.20%	.	6.20%	6.20%	.	.	.	.
Financial	4.40%	3.00%	0.00%	9.20%	2.50%	.	2.50%	2.50%	9.20%	1.40%	8.00%	11.20%	2.70%	.	2.70%	2.70%
Hotel	4.40%	3.30%	2.00%	6.70%	.	.	.	.	9.10%	5.20%	5.40%	12.70%	.	.	.	.
Miscellaneous Materials Industry	4.50%	0.70%	3.00%	5.00%	0.50%	1.20%	0.00%	3.00%	8.30%	0.70%	7.60%	9.20%	2.50%	1.10%	1.70%	3.30%
Leisure, Culture, and Entertainment	.	.	.	.	.	.	.	.	9.00%	.	9.00%	9.00%	.	.	.	.
Logistics	4.00%	.	4.00%	4.00%	.	.	.	.	.	.	.	.	.	.	.	.
Machines	2.80%	1.10%	2.00%	3.50%	5.40%	3.30%	3.00%	7.70%	5.50%	2.10%	4.00%	7.00%	3.10%	1.30%	2.20%	4.00%
Mining	6.10%	.	6.10%	6.10%	0.00%	.	0.00%	0.00%	8.60%	.	8.60%	8.60%	4.60%	.	4.60%	4.60%
Paper and Pulp	0.70%	0.60%	0.00%	1.00%	.	.	.	.	5.60%	4.00%	1.30%	9.20%	.	.	.	.
Basic Chemicals	4.20%	1.10%	3.00%	5.20%	2.00%	.	2.00%	2.00%	6.60%	0.40%	6.30%	6.80%	3.50%	.	3.50%	3.50%
Specialty Chemicals	7.10%	.	7.10%	7.10%	1.00%	1.40%	0.00%	2.00%	8.80%	.	8.80%	8.80%	5.30%	0.20%	5.10%	5.40%
Educational Services	2.00%	.	2.00%	2.00%	.	.	.	.	11.00%	.	11.00%	11.00%	.	.	.	.
Health Services	3.00%	.	3.00%	3.00%	.	.	.	.	.	.	.	.	.	.	.	.
Telecommunications Services	2.80%	0.90%	2.20%	3.90%	2.00%	.	2.00%	2.00%	9.60%	4.70%	4.40%	13.50%	3.30%	.	3.30%	3.30%
Miscellaneous Services	2.20%	3.20%	0.00%	4.50%	.	.	.	.	5.50%	0.30%	5.30%	5.70%	.	.	.	.
Health Services	4.00%	.	4.00%	4.00%	.	.	.	.	14.50%	.	14.50%	14.50%	.	.	.	.
E-commerce Software	4.00%	0.50%	3.50%	4.50%	.	.	.	.	7.30%	1.20%	6.00%	8.40%	.	.	.	.
Telecommunications	4.00%	.	4.00%	4.00%	.	.	.	.	13.40%	.	13.40%	13.40%	.	.	.	.
Ground and Air Vehicles	0.00%	.	0.00%	0.00%	2.20%	.	2.20%	2.20%	.	.	.	.	2.30%	.	2.30%	2.30%

(.) indicates no value. Source: Prepared by the author.

Table 3 - Cash flow growth rates in the projection period for nominal and real cash flows (grouped by year).

Year	Perpetuity Growth Rate				Explicit Period Growth Rate			
	Average	Deviation	Min.	Max.	Average	Deviation	Min.	Max.
2004	3.40%	0.20%	3.10%	3.50%	5.59%	3.28%	1.19%	11.03%
2005	1.70%	1.70%	0.00%	4.50%	4.60%	3.14%	1.30%	9.24%
2006	2.50%	0.50%	2.00%	3.00%	5.62%	2.31%	2.21%	8.75%
2007	3.90%	1.60%	2.00%	6.10%	7.34%	3.46%	2.00%	12.92%
2008	5.00%	2.00%	3.00%	9.20%	5.33%	2.79%	1.40%	11.22%
2009	4.80%	2.50%	3.00%	6.50%	8.32%	1.80%	5.67%	9.67%
2010	3.50%	1.10%	2.00%	4.50%	8.39%	3.93%	2.67%	13.40%
2011	4.30%	2.20%	1.00%	7.10%	6.32%	2.41%	3.26%	9.17%
2012	3.70%	1.10%	2.20%	5.00%	9.58%	3.48%	5.56%	14.47%
2013	3.60%	2.40%	0.00%	5.00%	9.32%	3.55%	5.26%	13.10%
2014	5.60%	0.80%	5.00%	6.70%	7.87%	3.04%	5.10%	12.73%
2015	0.50%	0.70%	0.00%	1.00%	5.48%	5.06%	1.90%	9.05%
2016	3.10%	2.40%	0.00%	4.90%	.	.	.	.
2017	5.20%	0.90%	4.50%	5.80%	.	.	.	.
2018	4.00%	.	4.00%	4.00%	.	.	.	.

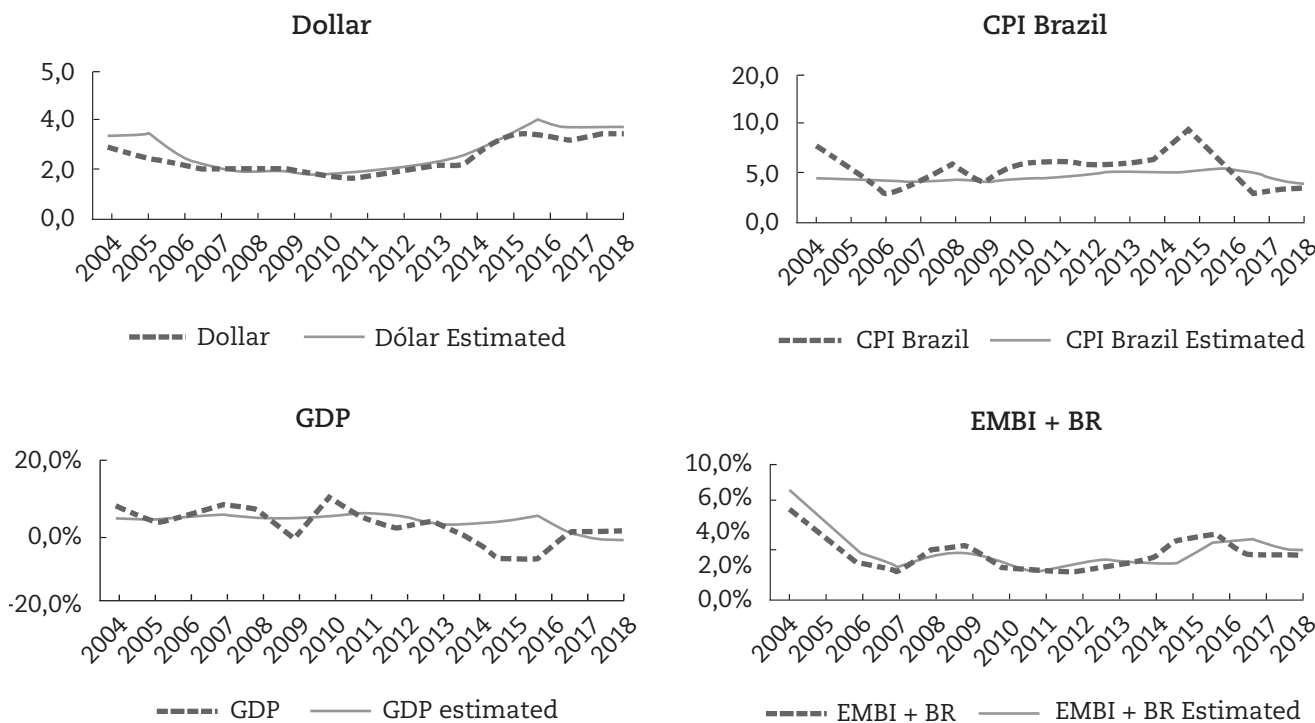(.) indicates no value.

Source: Prepared by the author.

Figure 3. Average annual macroeconomic assumptions from 2004 to 2018.

Source: Prepared by the author.

and most used the methodology defined by Hamada (1972), which relevered the average beta of comparable firms in the market. Several reports used the weighted average of betas, the median beta of a sample collected for the sector being analysed, and arithmetic averages.

Table 4 shows the average values by sector of betas that were levered and rebalanced using Hamada's (1972) methodology, the optimal structures used in this relevering and the risk-free rates, the return on the market portfolio, the cost of capital for third parties, and the size premium used in calculating the total cost of capital.

Beta variations followed the sector differences predicted in the literature, and the risk reference values follow patterns within the sectors, indicating homogeneity within sectors. However, when analysing the coefficient of variation, none of these assumptions had a value below 30%, which indicated the instability of these variables over the years projected. This result is once again associated with the economic changes in the period analysed and once again calls into question the predictive ability of analysts when constructing these valuation reports. Even if the methodology is consistent and the variables are used correctly, it is not possible to establish an accurate projection horizon.

The reports generally used EBITDA and REVENUE multiples to determine the company market values. On average, 45% of the projected company values were based on a specific projection period, and 55% were based on perpetuity. Table 5 presents these results divided by sector of activity.

Table 4 - Average assumptions used in calculating the cost of capital from 2004 to 2018.

Sector	Levered Beta	Unlevered Beta	E/SE	Country Risk	Risk Free	Market Return	Net Third-Party Capital	Size Premium
Steel	1.11	0.88	46.00%	3.00%	5.00%	10.00%	6.00%	2.00%
Food and Beverage	0.89	0.57	61.00%	4.00%	5.00%	10.00%	7.00%	2.00%
Shoes	1.41	1.29	20.00%	2.00%	4.00%	12.00%	.	.
Construction	0.99	0.51	158.00%	3.00%	3.00%	10.00%	10.00%	.
Cultivation of Nature	0.88	0.40	62.00%	2.00%	6.00%	11.00%	6.00%	.
Energy	0.79	0.55	53.00%	3.00%	4.00%	9.00%	7.00%	4.00%
Oil Extraction	0.93	0.73	42.00%	2.00%	5.00%	10.00%	6.00%	.
Rail	1.23	0.85	67.00%	2.00%	3.00%	10.00%	6.00%	.
Financial	0.81	0.86	114.00%	4.00%	5.00%	10.00%	.	2.00%
Hotel	1.48	0.69	86.00%	2.00%	4.00%	10.00%	8.00%	.
Miscellaneous Materials Industry	1.26	0.88	41.00%	3.00%	8.00%	8.00%	8.00%	3.00%
Leisure, Culture, and Entertainment	1.55	0.55	86.00%	4.00%	3.00%	8.00%	.	.
Logistics				3.00%	2.00%	6.00%	.	.
Machines	0.99	0.47	95.00%	3.00%	7.00%	12.00%	6.00%	2.00%
Mining	1.14	0.63	80.00%	2.00%	8.00%	15.00%	6.00%	1.00%
Paper and Pulp	0.93	0.51	33.00%	3.00%	6.00%	13.00%	10.00%	.
Basic Chemicals	1.00	0.79	45.00%	3.00%	3.00%	9.00%	9.00%	4.00%
Specialty Chemicals	1.28	0.98	53.00%	2.00%	3.00%	9.00%	6.00%	1.00%
Educational Services	0.51	0.45		3.00%	4.00%	10.00%	.	1.00%
Health Services	0.88	0.88	0.00%	2.00%	4.00%	10.00%	.	.
Telecommunications Services	1.24	0.88	38.00%	2.00%	4.00%	10.00%	7.00%	.
Miscellaneous Services	1.49	1.15	36.00%	2.00%	4.00%	9.00%	9.00%	4.00%
Health Services	0.85	0.85	0.00%	1.00%	3.00%	9.00%	.	.
E-commerce Software	0.89	0.58	387.00%	2.00%	3.00%	10.00%	6.00%	.
Telecommunications	0.69	0.67	6.00%	3.00%	4.00%	10.00%	8.00%	.
Ground and Air Vehicles	1.22	0.73	114.00%	4.00%	3.00%	9.00%	10.00%	0.00%

(.) indicates no value. Source: Prepared by the author.

Table 5 - Results of the multiples and percentages of values from 2004 to 2018.

Sector	EBITDA Multiple	REVENUE Multiple	% Perpetuity	% Explicit
Steel	3.83	1.77	0.55	0.45
Food and Beverage	8.65	2.37	0.40	0.60
Shoes	.	.	0.79	0.21
Construction	4.00	2.60	0.46	0.54
Cultivation of Nature		3.02	0.23	0.77
Energy	6.64	5.02	0.58	0.42
Oil Extraction	.	1.17	0.61	0.39
Rail	.	3.13		
Financial	4.61	5.19	0.46	0.54
Hotel	9.10	1.63	0.11	0.89
Miscellaneous Materials Industry	6.05	1.33	0.45	0.55
Leisure, Culture, and Entertainment	.	.	.	.
Logistics	.	.	.	.
Machines	7.96	1.80	0.57	0.43
Mining	7.46	2.53	0.44	0.56
Paper and Pulp	3.97		0.36	0.64
Basic Chemicals	6.30	6.20	0.33	0.67
Specialty Chemicals	.	.	0.62	0.38
Educational Services	.	7.20	0.22	0.78
Health Services	8.20	.	.	.
Telecommunications Services	5.13	1.90	0.29	0.71
Miscellaneous Services			0.27	0.73
Health Services	7.00	16.06	0.42	0.58
E-commerce Software	11.75	4.21	0.45	0.55
Telecommunications		2.80	0.33	0.67
Ground and Air Vehicles			0.78	0.22

(.) indicates no value.
Source: Prepared by the author.

On average, company values were approximately seven times their current year's EBITDA and 3.4 times their current year's revenue.

To determine which assumptions best relate to the company market values in the valuation reports, the EBITDA and REVENUE multiples were used as dependent variables, and the other assumptions were used as independent variables in a multiple linear regression model that was corrected for heteroscedasticity. In the models (Tables 6 and 7), the indicators were classified into three groups: risk, cap-

ital structure, and projections. Thus, the variables with the greatest adjustment compared to the variables that were dependent on multiples were levered beta, indebtedness (E/SE), and inflation projection. The models were significant, with an adjusted R-squared of 48.09% for the EBITDA multiple and 22.74% for the REVENUE multiple. The coefficients of the independent variables were significant at the 10% level, indicating that the higher the risk (levered beta), the lower the multiple suggested in the reports. The coefficient of indebtedness was positive, indicating the higher the leverage, the higher the expected multiple. The inflation rate coefficient was also positive, indicating the higher the inflation rate, the higher the multiple. This result can be explained by using the inflation rate as the perpetuity growth rate in most of the reports analysed.

Table 6 - Multiple Data Regression - EBITDA Multiple.

	Multiple Regression - Robust Dependent Variable: EBITDA Multiple	
Independent Variables	Coefficient	p-value
Levered Beta	-3.35563	0.098
Liability/SE	0.648155	0
Inflation Average Rate	178.5612	0.031
Constant	1.797327	0.597
N		23
F-Probability		0.0000
Adjusted R^2		0.4809

Source: Prepared by the author.

Table 7 - Multiple Data Regression - REVENUE Multiple.

	Multiple Regression - Robust Dependent Variable: REVENUE Multiple	
Independent Variables	Coefficient	p-value
Levered Beta	-1.57262	0.058
Liability/SE	0.484483	0.100
Average Inflation Rate	166.8474	0.098
Constant	-3.0638	0.434
N		33
F-Probability		0.0000
Adjusted R^2		0.2274

Source: Prepared by the author.

Finally, the main sources of information used in the valuation reports were Bloomberg, Damodaran, and Economática. Sources such as Ernst Young, Analysis Deloitte, Capital IQ, and others were also used in some reports.

To synthesize the results, it is evident that the valuation reports analysed are consistent in their use of the discounted cash flow methodology, regardless of the non-uniformity of models in relation to the estimation period, in R$ or US$, and

whether they consider cash flow inflation. The cost of capital estimates are also in accordance with the theory of finance, except for country risk and size premium adjustments. Regarding the assumptions, there is limited predictive capacity and high variability, which leads to uncertainty about the information content of the documents analysed.

Conclusion

This study investigated the methodologies and assumptions that are essential for the projections used in company valuation reports. The research is justified because only few academic studies have addressed this subject by combining all the premises of research and data validation. We sought to contribute to the disclosure of how financial projection assumptions in the practice of company valuation are addressed in Brazil.

We analysed 110 valuation reports issued from 2004 to 2018 using information collected from the CVM's website. We performed qualitative data analysis and complementary quantitative analysis that examined the relationship between the multiples and assumptions used in the cash flow models.

The results indicate a preference for the discounted cash flow methodology with projections made in national and constant currency, that is, without inflation. The specific projection periods varied between five and ten years, with the exception of one study, which used projections of 16 years. Neither the nominal or real growth rates were homogeneous; there were large fluctuations over the years and among the sectors analysed. This result can be attributed to Brazilian economic uncertainties.

The macroeconomic variables used were not very accurate; the predicted average values were not in line with the actual values observed. This fact compromises the quality of the information disclosed in the reports. The assumptions used to obtain the cost of equity and the total cost of capital have already been established in the market; however, because they have been tested and are established in the literature, they are highly relevant as the benchmarks used in the methodology according to finance theory. Moreover, not all reports analysed reflected adjustments for country risk premium and size premium.

Thus, this study describes the main methodologies used in valuation reports and shows the conflict between theory and practice in the professional market. It also contributes by showing sector averages that can be used for future reference. This study also enables the development of a series of studies that will contribute to expanding knowledge about the assumptions and their impact on company valuations in the Brazilian capital market. The knowledge obtained will allow academics, analysts, and finance professionals to ascertain whether the assumptions they intend to use in their research, analysis of fundamental data, and financial projections follow the guidance of modern finance theory and whether they are over- or undervalued. Identifying the main data sources, out-of-scale values, and limits adopted for the financial assumptions with adjustments for the Brazilian market will provide results that are much more robust and in line with theoretical reality.

Moreover, we suggest that further studies analyse the issue of the IFRS that became mandatory in Brazil in 2010 and whether these standards influenced the behaviour of the assumptions. Further studies comparing Brazilian markets with other countries may also follow the same line of research. We highlight the importance of considering these results when evaluating startups and suggest that further studies investigate the possibility of evaluating such companies using traditional models as well as the new methodologies proposed in the literature.

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