VALUATION IN BRAZIL IN THE LAST 20 YEARS: AN ANALYSIS OF THE PREMISES ADOPTED IN THE TAKEOVER BID ASSESSMENT REPORTS

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ABSTRACT

Purpose: An assessment report involves defining and adopting each premise for the valuation method used. In the core of the assessment, solid premises are crucial to ensure that the resulting value is representative of the reality imposed in the evaluation. This research aimed to analyze whether the values adopted in the projection premises align with the actual values over time.

Design/Methodology/Approach: Twelve (12) essential premises commonly used in assessment reports were considered. The unique aspect of this study is its focus on all takeover bid reports available at the Securities and Exchange Commission of Brazil over the last 20 years.

Findings: The main results indicate that 50% of the analyzed premises exhibited some form of bias, predominantly an increase in the projected values compared to the actual values obtained. These findings were statistically proven through hypothesis tests for paired values.

Research, Practical & Social Implications: This research not only aims to contribute to the professional development of those involved in constructing assessment reports but also encourages future studies to focus on analyzing the quality of the premises used and their sources. This will allow for the continuation of such research, considering the growing interest in this type of study within the academic community.

Originality/Value: It was found that the projected premises are more stable than their actual values obtained subsequently.

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AVALIAÇÃO NO BRASIL NOS ÚLTIMOS 20 ANOS: ANÁLISE DAS INSTALAÇÕES ADOTADAS NOS RELATÓRIOS DE AVALIAÇÃO DA OFERTA PÚBLICA DE AQUISIÇÃO

RESUMO

Finalidade: Um relatório de avaliação envolve a definição e a adoção de cada premissa para o método de avaliação usado. No cerne da avaliação, premissas sólidas são cruciais para garantir que o valor resultante seja representativo da realidade imposta na avaliação. Este estudo teve como objetivo analisar se os valores adotados nas instalações de projeção se alinham com os valores reais ao longo do tempo.

Projeto/Metodologia/Abordagem: Foram consideradas doze (12) premissas essenciais comumente usadas em relatórios de avaliação. O aspecto único deste estudo é o seu foco em todos os relatórios de OPA disponíveis na Comissão de Valores Mobiliários do Brasil nos últimos 20 anos.

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Descobertas: Os principais resultados indicam que 50% das premissas analisadas apresentaram algum tipo de viés, predominantemente um aumento nos valores projetados em comparação com os valores reais obtidos. Estes achados foram estatisticamente comprovados através de testes de hipóteses para valores pareados.

Investigação, Implicações Práticas e Sociais: Esta investigação visa não só contribuir para o desenvolvimento profissional das pessoas envolvidas na elaboração de relatórios de avaliação, mas também incentiva os futuros estudos a centrarem-se na análise da qualidade das instalações utilizadas e das suas fontes. Isso permitirá a continuação dessas pesquisas, considerando o crescente interesse por esse tipo de estudo na comunidade acadêmica.

Originalidade/Valor: Apurou-se que as instalações projetadas são mais estáveis do que os valores reais obtidos posteriormente.

Palavras-chave: Precificação de Ativos, Previsão e Simulação Financeira, Escolha de Portfólio, Decisões de Investimento, Precificação de Futuros.

VALORACIÓN EN BRASIL EN LOS ÚLTIMOS 20 AÑOS: UN ANÁLISIS DE LOS LOCALES ADOPTADOS EN LOS INFORMES DE EVALUACIÓN DE LAS OFERTAS PÚBLICAS DE ADQUISICIÓN

RESUMEN

Finalidad: Un informe de evaluación implica definir y adoptar cada premisa para el método de valoración utilizado. En el núcleo de la evaluación, unas premisas sólidas son cruciales para garantizar que el valor resultante sea representativo de la realidad impuesta en la evaluación. Esta investigación tuvo como objetivo analizar si los valores adoptados en las premisas de proyección se alinean con los valores reales a lo largo del tiempo.

Diseño/Metodología/Enfoque: Se consideraron 12) locales esenciales utilizados habitualmente en los informes de evaluación. El aspecto único de este estudio es su enfoque en todos los informes de ofertas públicas de adquisición disponibles en la Comisión de Valores y Bolsa de Brasil en los últimos 20 años.

Conclusiones: Los principales resultados indican que el 50% de las premisas analizadas presentaron algún tipo de sesgo, predominando un incremento en los valores proyectados en comparación con los valores reales obtenidos. Estos hallazgos fueron probados estadísticamente a través de pruebas de hipótesis para valores emparejados.

Investigación, Implicaciones Prácticas y Sociales: Esta investigación no solo tiene como objetivo contribuir al desarrollo profesional de los involucrados en la construcción de informes de evaluación, sino que también alienta a los futuros estudios a centrarse en el análisis de la calidad de las instalaciones utilizadas y sus fuentes. Esto permitirá la continuación de dicha investigación, teniendo en cuenta el creciente interés en este tipo de estudios dentro de la comunidad académica.

Originalidad/Valor: Se encontró que las premisas proyectadas son más estables que sus valores reales obtenidos posteriormente.

Palabras clave: Valoración de Activos, Previsión y Simulación Financiera, Elección de Cartera, Decisiones de Inversión, Valoración de Futuros.

1 INTRODUCTION

The assessment of a business, also called valuation, is built from certain basic parameters, also called premises. According to Assaf Neto (2021), an assessment remains valid while the premises adopted in that assessment are still true. He also states that a great part of a valuation risk is conditioned to the definition of the premises adopted in the projections (p. 309).

The Assessment Report encompasses the definition and the adoption of each one of the premises for the method used in the valuation. There are assessment reports for several

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purposes, some of them are due to the requirement by regulatory agencies, among the most found one are the Initial Public Offering of Stocks – IPO and Takeover Bid/ Public Offering for the Acquisition of Shares (OPAs). Currently, the #85/2022 SEC (CVM) Resolution regulates the Takeover bid processes, which regulates the previous resolutions on those processes.

The literature underscores the importance of valuation studies, widely applied across different countries and themes. Two studies, exemplifying this significance, reveal that Initial Public Offerings (IPOs) in India are undervalued (Nusrathunnisa et al., 2023), emphasizing the precise application of valuation tools. Similarly, an article on intellectual capital in Ecuador's SMEs stresses the crucial valuation of human capital for organizational success (Villa et al., 2023). Both studies contribute to the broader understanding that accurate valuation is essential for guiding financial strategies and ensuring long-term success across diverse sectors and markets.

Several papers in the International Literature seek to remark errors found in valuation reports, and the best known are the works of Broekema et al. (2022), Fernández (2007, 2013, 2015 and 2019), and Dittmann and Maug (2008).

In Brazil, the most recent works, such as Lima et al. (2017), Santos and Cunha (2015), Cunha, Martins & Assaf Neto (2012), have also analyzed the valuation reports in several periods.

The research papers in the valuation field, as mentioned before, have always sought to determine the premises adopted in specific points of the valuation. Such themes hitherto found have not tested whether the premises of the projection variables have correlated or been in accordance with the true values along the years. And, whenever such analyses were carried out, they made use of samples of reports and not their totality. And it was in this line of thought that the motivating question of this research has come out.

Thus, the aim of this paper was to raise the main parameters used by several kinds of companies when making assessment reports and confronting such projected values with the actual values observed along the years. And, as a differential of this research, all the OPA reports available at the SEC, from 2002 to 2021, were used, totaling 263 companies which carried out OPA in these 20 years of analysis, adding up to 296 reports analyzed.

Therefore, it was sought to analyze and summarize the main premises available in the OPA reports in Brazil, in the same research line of Lima et al. (2017); however, it brings the comparative of the mean premises of the projection period and its check with the real values

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obtained a posteriori. It is worth highlighting that analyzing, under no circumstances, whether the premises adopted produced any greater or lower effect on the final valuation values, was not the object of this research. Twelve (12) essential premises were used in financial projections and their values were compared to the real data gathered, attempting to check whether they are representative of future expectations considered along the assessment process.

The very essence of this work sets off the principle of reliability that investors and analysts deposit on the assessment report presented since it gives support to an investment decision. And in the core of the assessment, good premises are crucial conditions for the value found to be representative in the reality imposed in the assessment.

Considering the above, this research not only intends to contribute to the professional improvement of those involved in the construction of assessment reports but also for future studies of assessment reports to focus on the analysis of the quality of the premises used, their sources, so that they can continue this kind of research since there is growing interest for this kind of study in the academic community.

This article is structured in five parts. The first part is the introduction. Next, there is a theoretical benchmark dealing with the analyses of assessment reports. Then, there is the methodology. After that, there is the data analysis. Finally, there are the final considerations obtained after the whole research process.

2 THEORETICAL REFERENTIAL

More recent studies on assessment reports have shown the clear rise of the value theme which has been coming up due to the broad growth of mergers and acquisitions of companies around the world.

The existing papers raise a discussion on the legal needs of assessment reports, such as in Rodrigues and Sallaberry (2013), since they broaden for the important role of taking information to investors, and on possible subjectivity found in the assessment reports, as in Souza et al. (2018).

In one of the first references found on the existence of possible biases in the assessments, Damodaran (2007) states that this possibility of the assessment having premises biased by several reasons is not always taken fully account of.

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Dittmann and Maug's study (2008) investigated the biases of the different assessment methods, which are those of multiple and those of present value, such as discounted cashflow. Positive biases were found for most of the multiples.

Broekema et al. (2022) remarks that the assessment of businesses of the same company, made by different evaluators, can often present divergences, which can lead to process judicialization. The work of the authors adopts a new psychological approach of the cognitive biases to explain the inconsistencies in the assessments. The conclusion of the authors demonstrates that the assessments can be affected both by the anchoring bias and the engagement bias (that is, being affected by a client's interests). It starts a discussion in which having clear and accurate assessments will be essential; however, it is extremely complex due to the high level of uncertainty in the economies and in the activity sectors.

In the same line of works of analysis of assessment reports in Brazil, Lima et al. (2017) brought a valuation of the main descriptive data of the OPA reports from 2004 to 2015 concluding that the projections were carried out in constant currency, with terms of the period specified from 5 to 10-year projection among other descriptions. This proposal will also follow part of this analysis performed by these authors, adding now the period greater than 20 years and focusing mainly on the premises adopted in the projections, though.

In a later study, Araújo, Santos, and Morais (2018), examined an OPA report, in which they aimed to check whether the premises adopted would be able to reflect the economic and market conditions for the company in question. However, they found possible divergences and evidence of a more 'positive' position in the assessment report by the evaluators.

Souza et al. (2018) found the existence of optimistic bias when the assessments are demanded by the hiring company, and even if they are carried out by the discounted cashflow method, they tend to present increased values when compared to other assessment methods. Applying the Wilcoxon hypothesis tests, in the reports generated by external evaluators, no significant differences regarding the values found in the assessments were detected, even making use of objective or subjective methods.

In addition to that, Martinez (2004), in a full international literature review on the behavior of the analysts, states that most of the technical studies on the assessment bias embody the optimistic or pessimistic diagnosis of the evaluator.

Noda (2018) analyzed 125 OPA reports, and his main findings show that there is a diversity of errors in the reports, including conceptual ones regarding valuation and the position bias, which are present in a relevant part of the reports. He also prospects that there is the need

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for having improvements in the technical quality of both the evaluators and possible advancements of the regulatory agencies.

Next, the methodology of analysis of the premises embedded in the reports analyzed is presented with the proper statistical treatment.

3 METHODOLOGY

At first, a survey of assessment reports of companies for OPAs – Takeover Bid, from 2002 to 2021 was carried out, totaling 263 companies which had performed the OPA in those 20-year-analysis period. In all, 296 reports were analyzed since some companies not only had their valuation made, but also that of their subsidiaries. The reports of 27 activity sectors were analyzed according to their ratings at the time of each report.

The research methodology is qualitative and empirical-analytical. The reports were downloaded, and a document search was carried out in each one of them to gather the premises adopted in the projections, the types of assessment methodology used, and the final values obtained from the fair value of the companies.

Although the projections obtained were found in several periods of the Brazilian economy, it was chosen to calculate the average, year after year, for each of the premises collected in the OPA reports. It is worth highlighting that the validated premises were considered appropriate for the respective periods proposed in the assessment.

For a more accurate analysis of the data collected in the OPA reports analyzed in this research, obtaining the more frequent premises in each period was chosen and the mean values of the values used were adopted, as shown hereinafter:

Figure 1

Methodology used for each of the premises in the 296 reports analyzed and retrieval of mean values

Premise A in the projection	Year 1	Year 2	...	Year n of the Projection
Company 1	Value 1	Value 2	...	Value n
Company 2	Value 1	Value 2	...	Value n
...	...	...	...	...
Company n	Value 1	Value 2	...	Value n
Average	**Average 1**	**Average 2**	**...**	**Average n**

Premise A	Year 1	Year 2	...	Year n
Mean Projected Values	Average 1	Average 2	...	Average n
Actual Values	Actual 1	Actual 2	...	Actual n

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Premise A	Year 1	Year 2	...	Year n
Diff: Projected Value – Actual Value	**Dif 1**	**Dif 2**	**...**	**Dif n**

Source: Author's elaboration

The basis of the analysis was the values undertaken by the premises in each of the years of the projection. Since the period covered was from 2001 to 2021, there were companies which projected, for instance, 10 years from 2001, and companies which projected 5 years from 2021. Therefore, the mean values of each one of the premises respected the ordering of the years of the projection period. Thus, even though the reports available are dated from 2002, some reports brought projections since 2001, base year of some reports. Therefore, the base from 2001 was considered for some premises, while others were considered from years ahead, depending on the year of the assessment report.

Thus, since the values were paired, the *t* test of *Student* was applied for the comparison of the population average from the following hypotheses, for a bilateral testing:

H$_0$: $\mu_d = 0$, Mean Projected Value = Mean Actual Value

H$_a$: Mean Projected Value ≠ Mean Actual Value

And, to check a possible bias in the projected values for a unilateral testing, there is:

H$_0$: $\mu_d = 0$, Mean Projected Value = Mean Actual Value

H$_a$: Mean Projected Value > Mean Actual Value

The statistic of the test is, according to Fávero e Belfiore (2017):

$$T_{Calculado} = \frac{\overline{Diff} - \mu_d}{\frac{S_d}{\sqrt{n}}} \sim t_{n-1} \ (1)$$

In which:

$$\overline{Diff} = \frac{\sum_{i=1}^{n} Dif_i}{n} \text{ e } S_d = \sqrt{\frac{\sum_{i=1}^{n} (Dif_i - \overline{Diff})^2}{n-1}} \ (2)$$

All the values were analyzed for a $\alpha\%$ significance level. Next, there is the analysis of the data collected.

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4 RESULTS AND DISCUSSION

The initial data analysis was organized in an electronic spreadsheet a long time after the removal of the data of the 296 reports. Quantitative and qualitative descriptive measures, which are described hereinafter, could be observed.

Regarding the assessment method used in the assessment reports, it is seen that the discounted cashflow method is the most used one in the assessment reports, being mentioned as the one having the utmost technical accuracy. Such a fact is corroborated by several authors, like Assaf Neto (2021) and Damodaran (2012).

Figure 2

Assessment Method and Cash flow Type Used
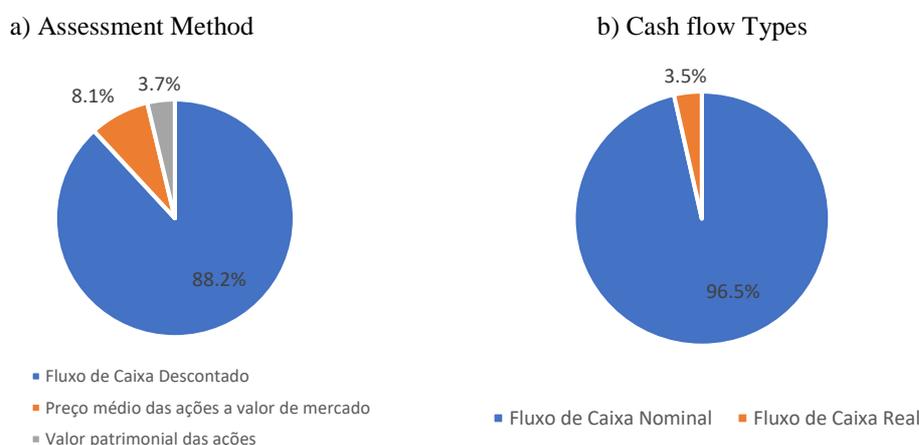
Source: Author's elaboration

Some specific mean premises of several activity sectors can also be summarized, in the same line of Lima *et al*. (2017), but, for this paper, the survey of the premises was carried out for all the available base of the OPAs in the period from 2002 to 2021.

Such premises are used for obtaining the opportunity cost of equity and for the perpetual growth rate of cash flow. Another interesting datum is the mean term of the explicit projection period, obtained as of 10 years, in which the minimum is a four-year period.

Table 1

Descriptive statistics of some projection premises of the cash flows in the period

Premise	Average	Standard Deviation	Median	Minimum	Maximum
Perpetual Growth Rate	2.66%	1.96%	2.60%	0.00%	9.20%
Risk-free rate	4.19%	2.29%	4.39%	0.58%	13.00%

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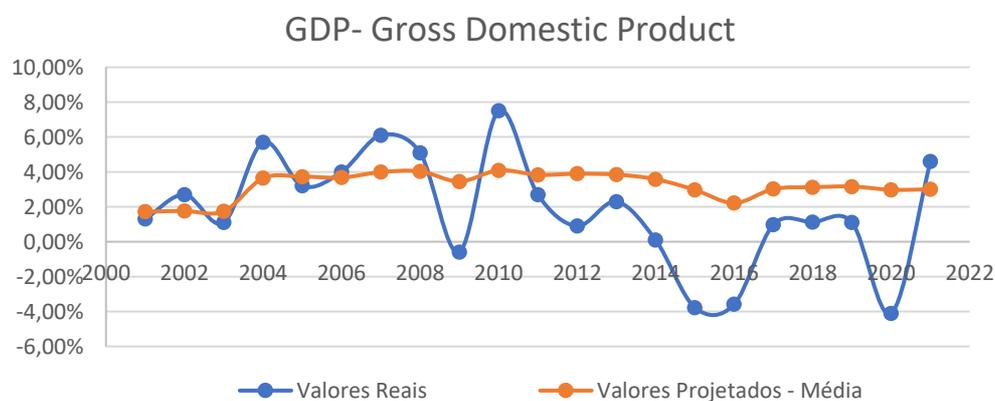|					
Market Risk Premium	6.14%	2.80%	6.08%	1.57%	15.65%
Country Risk Premium	4.02%	2.77%	3.00%	0.09%	11.90%
Size Premium	2.63%	1.04%	2.00%	0.90%	5.40%

Source: Author's elaboration

Next, there is a detailed analysis of each one of the premises adopted in the OPA valuation reports, in which the premises were collected, and the values used in each report were verified for the whole projection period. In the end, the mean value of each premise in each year of adopted projection was calculated and the mean value of every company (reports) was compared to the actual value. That is, we highlighted the mean values of each one of the premises in the 2001 – 2022 period, and the arithmetic average of all the projected measures for each year were checked.

The descriptive statistics of the forecasted and actual values of each premise were analyzed, and a graphical analysis as well of the values obtained. An analysis of the correlation magnitude and its statistical significance was also carried out according to Newbold (1995). The null hypothesis was that its correlation is not significant. Moreover, a hypothesis test for paired data with null hypothesis in which the average of the projected values is the same as the average of the actual values was performed, and the alternative hypothesis takes on a possible bias of the forecasted values being greater than the actual values for the projections.

It should be noticed that, once more, even in case of possible bias of the projected values being greater, no assessment of the impacts of this occurrence in the results of the valuations was carried out since it is out of the scope of this research. All the analyses were carried out in the version 14 STATA.

Figure 3

GDP Premise – Mean Projected and Actual Values

Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

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It is possible to check in Picture 2 that the forecasted values, on average, are steadier along the projection period, while the actual values present greater volatility in the period analyzed.
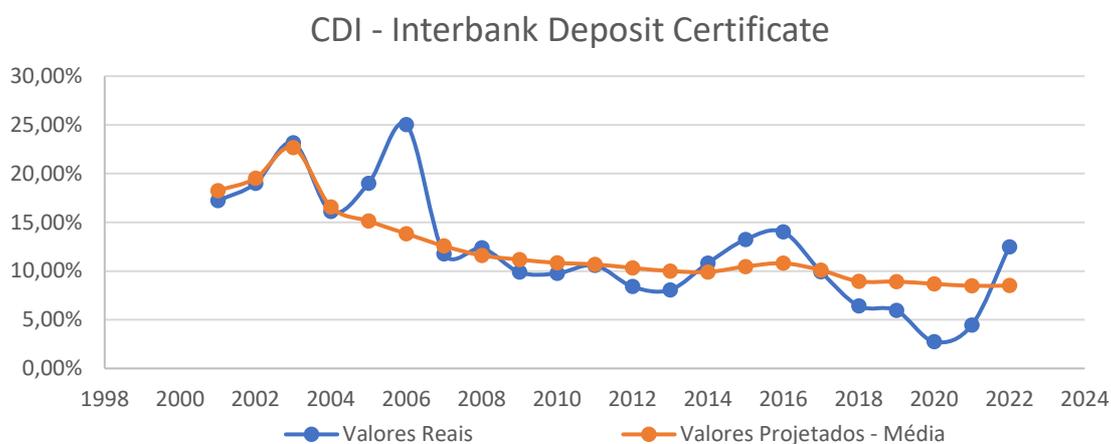
Table 2

GDP: Descriptive Statistics and hypothesis tests, 2001 to 2021 period

Premise: GDP Variation	Projected Values	Actual Values
Mean	3.21%	1.83%
Standard Deviation	0.77%	3.16%
Minimum	1.72%	- 4.10%
Maximum	4.09%	7.50%
Median	3.46%	1.30%
Correlation	0.4463	
p-Value	0.0425	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.0413	
T-test: Ha: Projected Mean > Actual Mean	p-Value = 0.0206	

Source: Author's elaboration

In table 2, it can be seen that the projected values present average higher than the actual values obtained, having greater standard deviation. It is interesting to notice that there were no decrease values in the GDP in the projected period, but only positive values, with the minimum foreseen of 1.72% on average. No positive correlation is observed at 95% of reliability between the forecasted and actual values, and the p-value obtained is 0.0425 demonstrating significance at 95% of reliability, being the correlation regular between the values. The T-test for the paired samples has not obtained statistical significance at the same 95% of reliability, that is, it can be stated that the mean forecasted and actual values are statistically different. Also, it can be seen there is possible evidence that the mean forecasted values are greater than the actual values in the projection period for the premise of the GDP projections.

One of the most used premises in the valuation is the CDI rate - Interbank Deposit Certificate, which is part of the composition of interest in loans taken and even of financial applications.

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Figure 4

Mean Projected Values and Actual Values

Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

Picture 3 illustrates the behavior of this rate which, in the first projection years, follow up the actual values close. Nevertheless, in the other years, there is a little detachment of the data and those tend to stabilize along the years.

Table 3

CDI: Descriptive statistics and hypothesis tests, 2001 – 2022 period

| Premise: CDI rate	Projected Values	Actual Values
Mean	12.18%	12.29%
Standard Deviation	3.91%	5.76%
Minimum	8.48%	2.75%
Maximum	22.68%	25.03%
Median	10.74%	11.29%
Correlation	0.8068	
p-Value	0.0000	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.8827	
Teste - T: Ha: Projected Mean > Actual Mean	p-Value = 0.5587	

Source: Author's elaboration

The data of table 3 show values close to the mean between the projected means for the CDI rate and the values actually obtained in the Brazilian economy. This fact is corroborated by a positive, very strong and significant correlation with the 99% reliability level. The same fact takes place with the non-rejection of the null hypothesis of equality between the calculated means and there is no evidence of significant differences with 99% reliability for the T-test.

The LIBOR rate - London InterBank Offered Rate, was also one of the premises used in the reports analyzed, being acknowledged in American dollars which is a reference rate for interests which the financial institutions can grant the clients in the international market.

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Figure 5

LIBOR Premise– Mean Projected Values and Actual Values.
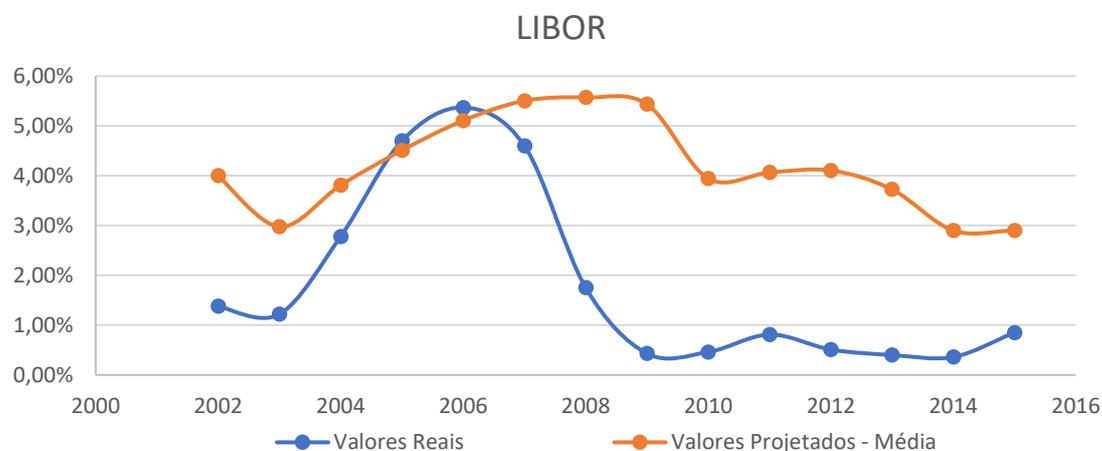
Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

It can be seen in Picture 4 that the projected values follow an increase of the interests of the LIBOR rate, and then a drop along the years. The values analyzed comprise a shorter period, from 2002 to 2015, since the reports from this year on did not have the LIBOR projections.

Table 4

LIBOR: Descriptive Statistics and hypothesis tests, 2002-2015 period.

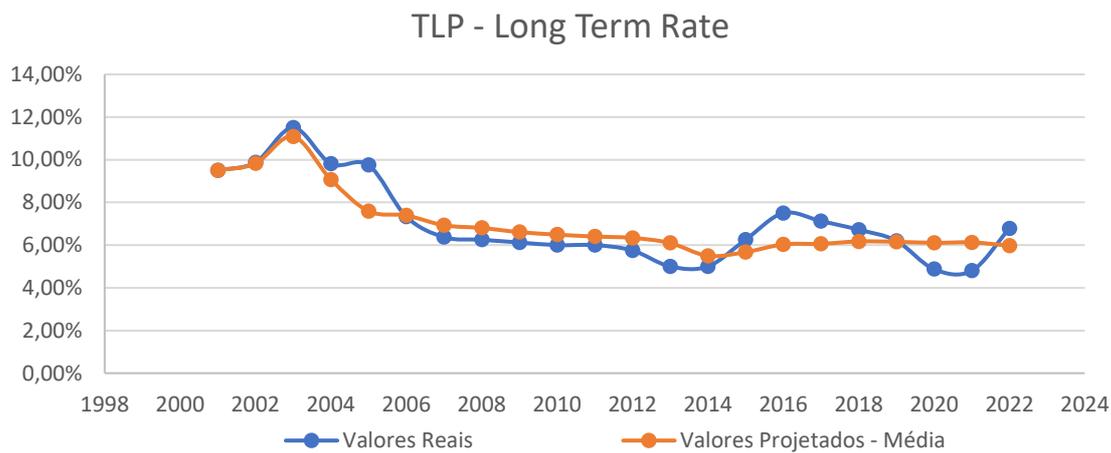| Premise: LIBOR rate	Projected Value	Actual Values
Mean	4.18%	1.83%
Standar Deviation	0.94%	1.79%
Minimum	2.90%	0.36%
Maximum	5.57%	5.37%
Median	4.03%	1.04%
Correlation	0.4959	
p-Value	0.0713	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.0001	
T-test: Ha: Projected Mean > Actual Mean	p-Value = 0.0000	

Source: Author's elaboration

The analysis of the LIBOR rate shows differentiated values between the projected and actual means, being the correlation moderate, but not statistically significant at 95%. On the other hand, the hypothesis tests rejected the null hypotheses of equality between the means and there can be evidence that the projected LIBOR rates were higher than the actual rates with 99% of reliability.

In the same activity line of the companies financing, the Long-Term Interest Rate– TLP, in its more recent nomenclature and TJLP, as it is also known, compose an estimate variable in the projection models for setting the long-term financing costs.

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In picture 5, there is the behavior of the estimated and projected values for the TLP in the period from 2001 to 2022, in which an adherence to the actual mean values is observed with certain stability of values in the time.

Figure 6

TLP Premise – Mean Projected Values and Actual Values

Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.
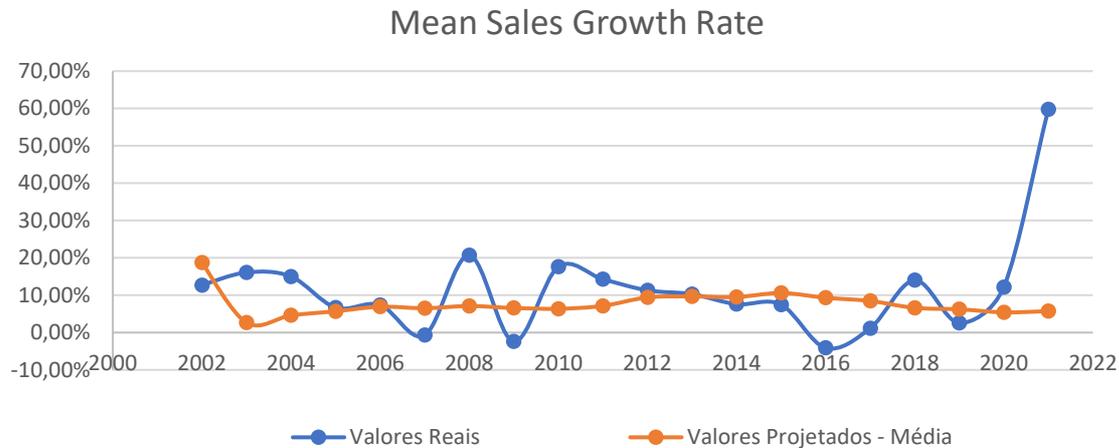
Table 5

TLP: Descriptive Statistics and hypothesis tests, 2001 – 2022 period

Premise: TLP rate	Projected Values	Actual Values
Mean	6.99%	7.02%
Satandard Deviation	1.51%	1.88%
Minimum	5.50%	4.80%
Maximum	11.09%	11.50%
Median	6.37%	6.31%
Correlation	0.8887	
p-Value	0.0000	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.8908	
T-test: Ha: Projected Mean > Actual Mean	p-Value = 0.5546	

Source: Author's elaboration

As mentioned, the TLP projected and actual mean values are very close, with a very strong and significant correlation with 99% of reliability. The T-test for the paired sample data does not reject the null hypothesis since the p-value of both tests are greater than the significance level at 1%.

Another premise of great importance in the assessment reports is the sales growth rate. As it can be observed in Picture 6, the projected sales values present steady behavior along the years. The actual values were obtained from the general mean of the publicly held Brazilian companies. The values analyzed consist of data up to 2021, since the 2022 data had not been available yet.

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Figure 7

Sales Growth Premise – Mean Projected Values and Actual Values

Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

Table 6

Sales Growth: Descriptive Statistics and Hypothesis tests, 2002 – 2021 period

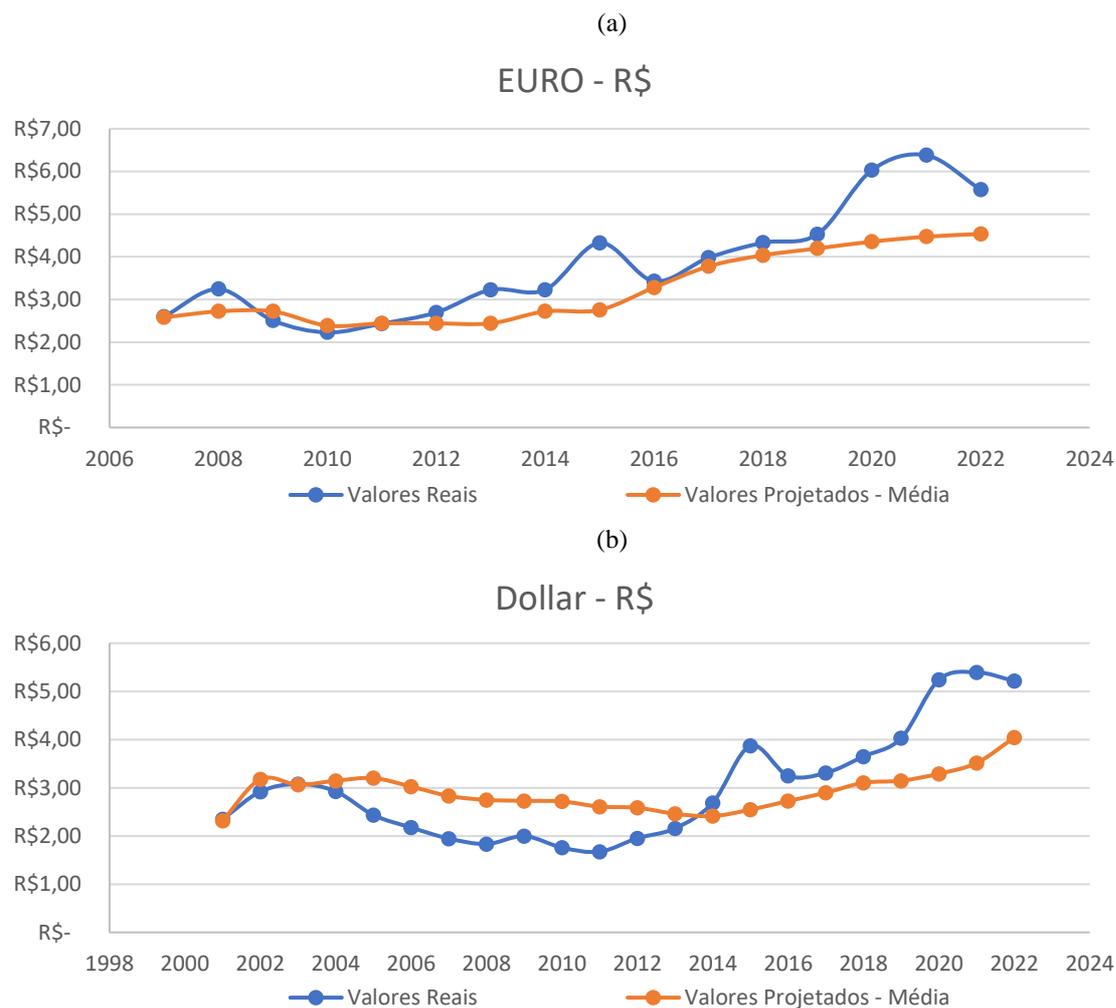| **Premise: Sales Growth**	Projected Values	Actual Values
Mean	7.67%	11.48%
Standard Deviation	3.25%	13.27%
Minimum	2.66%	- 4.10%
Maximum	18.77%	59.76%
Median	6.76%	10.80%
Correlation	- 0.1638	
p-Value	0.4903	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.2435	
T-test: Ha: Projected Mean < Actual Mean	p-Value = 0.8783	

Source: Author's elaboration

For analysis of the sales growth rate, it can be seen that the actual values range more than the forecasted values. The correlation between the values is negative and low; moreover, there is no statistical significance with 99% of reliability. The T-tests point that the projected values are different from the actual values on average and due to the oscillations of the actual values, they are greater than the projected values.

Regarding the currencies, usually necessary in the reports, the behavior analyzed comes next. Euro presented behavior of the projected values closer to the actual values, as seen in Picture 6, item a. On the other hand, dollar had a more volatile behavior, in which the projected values are greater in the first years of the projection and lower in the final years, as seen in item b of the same picture. Nevertheless, the values demonstrate to follow the trend in the movements.

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Figure 8

Currency Premise – Mean Projected Values and Actual Values

(a)

(b)

Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

The following analyses show the differentiated behavior of the Euro and the Dollar with their descriptive statistics and their respective hypothesis tests, in which better adjustment of the Euro and greater dispersion of the American currency will be observed.

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Table 7

Euro and Dollar: Descriptive Statistics and hypothesis tests, 2002 -2022 period

| (a)		
Premise: Euro	**Projected Values**	**Actual Values**
Mean	R$ 3.24	R$ 3.80
Standard Deviation	R$ 0.83	R$ 1.30
Minimum	R$ 2.39	R$ 2.29
Maximum	R$ 4.54	R$ 6.38
Median	R$ 2.74	R$ 3.34
Correlation	0.9016	
p-Value	0.0000	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.0044	
T-test: Ha: Projected Mean < Actual Mean	p-Value = 0.9978	
(b)		
Premise: Dollar	**Projected Values**	**Actual Values**
Mean	R$ 2.92	R$ 2.99
Standard Deviation	R$ 0.40	R$ 1.16
Minimum	R$ 2.31	R$ 1.67
Maximum	R$ 4.04	R$ 5.39
Median	R$ 2.86	R$ 2.80
Correlation	0.7032	
p-Value	0.0003	
Teste - T: Ho: Projected Mean = Actual Mean	p-Value = 0.7203	
Teste - T: Ha: Projected Mean < Actual Mean	p-Value = 0.6399	

Source: Author's elaboration

For both currencies, the actual and forecasted values are strongly correlated and statistically significant at 99% of reliability. However, it can be seen that the forecasted and actual mean values for the Euro are close with 99% of reliability, and there are no conditions to show greater variations of the data. On the other hand, for the dollar, the forecasted values show to be relatively higher than the actual values in the period analyzed, with 99% of reliability.

Next, the premises regarding the Brazilian inflation will be analyzed. Two indices were found in the reports: IPCA – Extended National Consumer Price Index and the IGPM – General Market Price Index.

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Figure 9

Inflation Premise – Mean Projected Values and Actual Values

(a)

IPCA - Extended National Consumer Price Index

(b)

IGPM - General Market Price Index
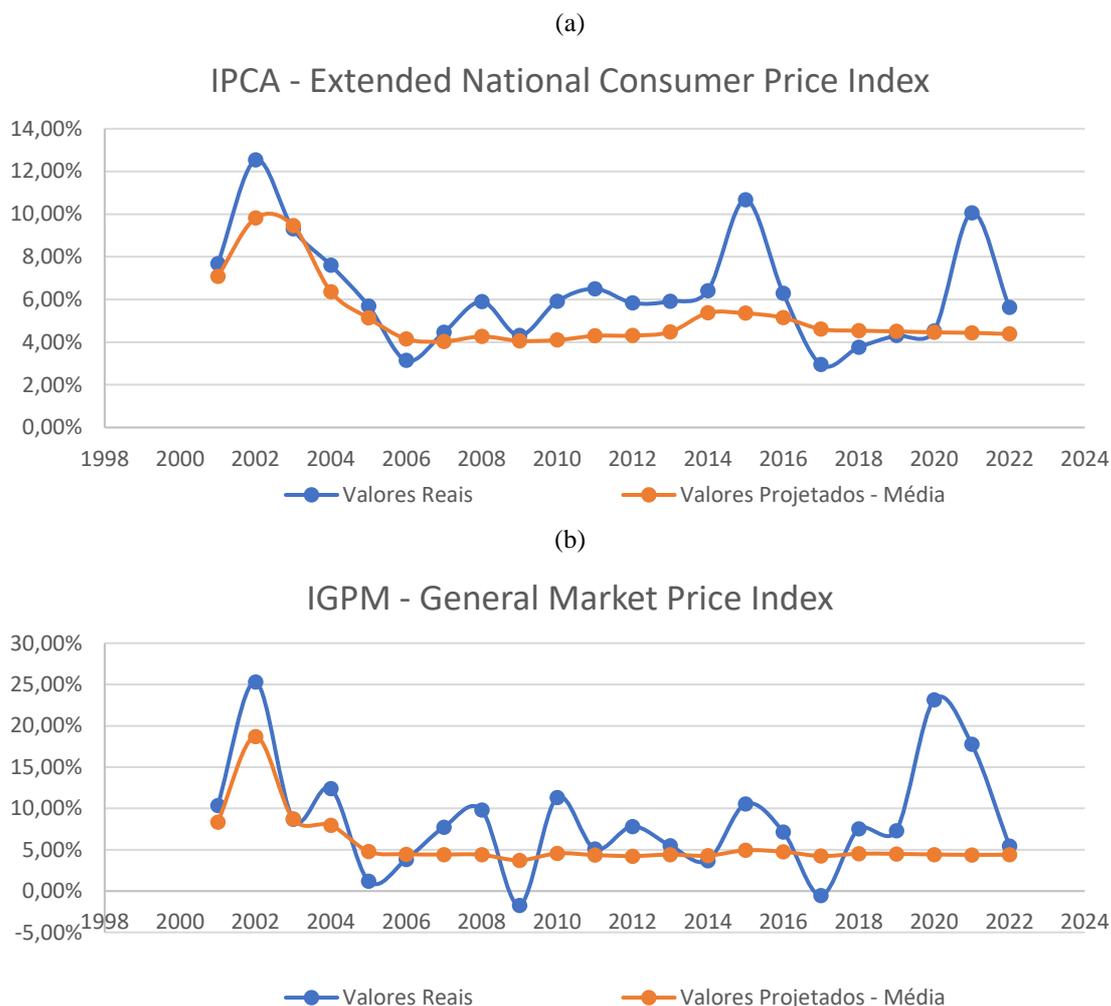
Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

It is seen that the projected values are usually steady for the projection years, both for the IPCA and the IGPM. In the early projection years, according to the most recent information, the values tend to follow the actual ones, and they get steady in the future years of the projection.

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Table 8

IPCA and IGPM: Descriptive Statistics and hypothesis tests, 2002-2022 period

(a)		
Premise: IPCA	Projected Values	Actual Values
Mean	5.20%	6.32%
Standard Deviation	1.62%	2.47%
Minimum	4.03%	2.95%
Maximum	9.80%	12.53%
Median	4.45%	5.91%
Correlation	0.7046	
p-Value	0.0003	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.0063	
T-test: Ha: Projected Mean < Actual Mean	p-Value = 0.9969	
(b)		
Premise: IGPM	Projected Values	Actual Values
Mean	5.62%	8.62%
Standard Deviation	3.24%	6.67%
Minimum	3.72%	- 1.72%
Maximum	18.69%	25.31%
Median	4.45%	7.65%
Correlation	0.5881	
p-Value	0.0040	
T-test: Ho: Projected Mean= Actual Mean	p-Value = 0.0172	
T-test: Ha: Projected Mean < Actual Mean	p-Value = 0.9914	

Source: Author's elaboration

For the IPCA data, the values demonstrate strong and statistically significant correlation with 99% of reliability. The T-tests demonstrate that the mean values of the projected inflation can be considered the same as the actual values in the period analyzed with 99% of reliability. The same behavior of the projected and actual IGPM also presented strong correlation with the same reliability of the IPCA analysis. Nevertheless, with 99% of reliability, the values can not be considered equal, showing that the actual values are higher, on average, than the projected ones.

Another premise commonly used in the assessment reports is the estimate of the SELIC Rate which is a basic interest rate used by the Central Bank to form other market interest rates.

Picture 8 illustrates the behavior of the predicted mean SELIC in each of the years of the period analyzed and it is observed that the values follow, *a priori*, the actual values, at least, on their trend.

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Figure 10

SELIC Premise – Mean Projected Values and Actual Values
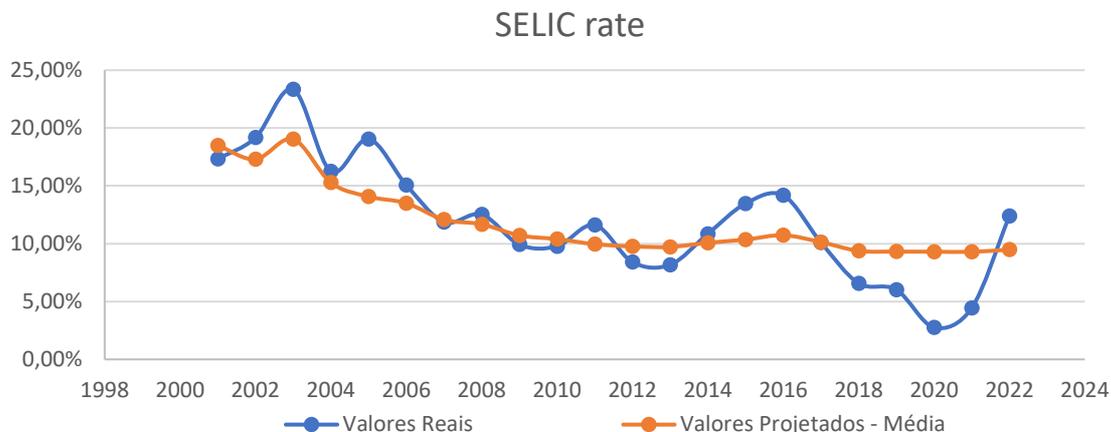
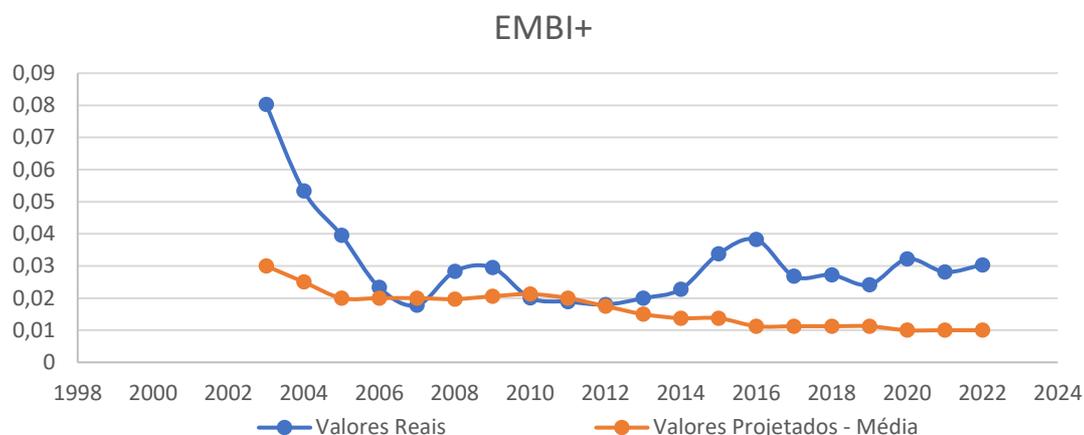Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

Table 9

SELIC rate: Descriptive Statistics and hypothesis tests, 2001-2022 period

Premise: SELIC rate	Projected Values	Actual Periods
Mean	11.82%	11.97%
Standard Deviation	3.10%	5.08%
Minimum	9.29%	2.76%
Maximum	19.04%	23.34%
Median	10.38%	11.75%
Correlation	0.8593	
p-Value	0.0000	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.8143	
T-test: Ha: Projected Mean > Actual Mean	p-Value = 0.5928	

Source: Author's elaboration

For the mean SELIC data, a strong and statistically significant correlation at 99% of reliability is observed, and the T-tests indicate there is no significant differences between the mean projected values and the actual values.

Next, there is the analysis of the country-risk premise, known as EMBI+.

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Figure 11

EMBI+ Premise – Mean Projected Values and Actual Values

Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

The last two premises analyzed were the EMBI+, country risk value and the CPI – Consumer Price Index of the United States, greatly used measures in the composition of equity capital cost calculation when benchmark values of the American market are used, as suggested by Assaf Neto, Lima e Araujo (2008).
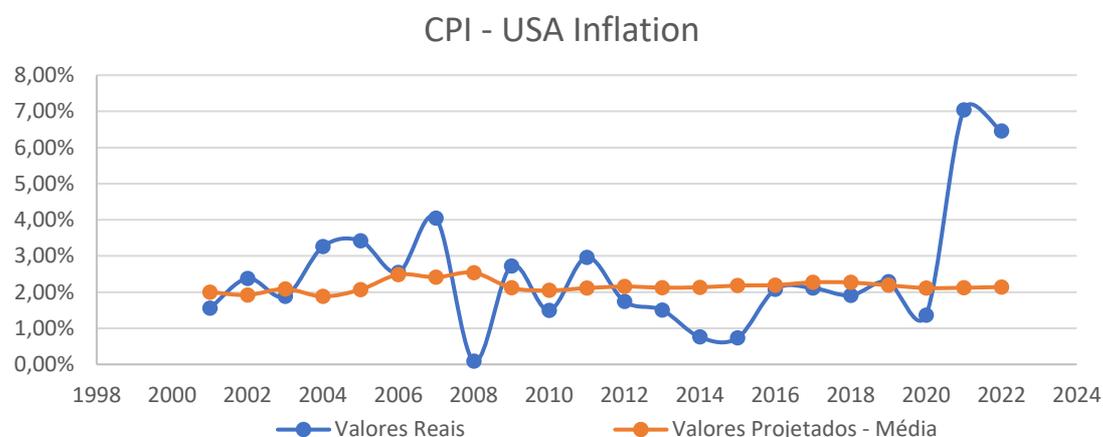
Table 10

EMBI+: Descriptive Statistics and hypothesis tests, 2003-2022 period

Premise: EMBI+	Projected Values	Actual Values
Mean	1.66%	3.06%
Standard Deviation	0.57%	1.45%
Minimum	1.00%	1.78%
Maximum	3.00%	8.03%
Median	1.63%	2.77%
Correlation	0.4974	
p-Value	0.0256	
T- test: Ho: Projected Mean = Actual Mean	p-Value = 0.0001	
T-test: Ha: Projected Mean > Actual Mean	p-Value = 1.0000	

Source: Author's elaboration

In the EMBI+ analyses, there are really different values between the projected and actual ones. There is a moderate, non-significant correlation with 99% of reliability and the T-tests point that the mean values are really different with 99% of reliability considering they can also have mean actual values higher than the projected ones.

And finally, the analysis of the U.S. inflation measured by the CPI – Consumer Price Index - was considered.

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Figure 12

CPI-USA Premise – Mean Projected Values and Actual Values

CPI - USA Inflation

Source: Actual Data: institutoassaf.com.br. Accessed on January 15, 2023.

As observed, the forecasted values are steady and very different from the actual values found in practice.

Table 11

CPI-USA: Descriptive statistics and hypothesis tests, 2001 – 2022 period

Premise: CPI-USA	Projected Values	Actual Values
Mean	2.16%	2.45%
Standard Deviation	0.16%	1.66%
Minimum	1.88%	0.091%
Maximum	2.54%	7.04%
Median	2.13%	2.09%
Correlation	- 0.1374	
p-Value	0.5419	
T-test: Ho: Projected Mean = Actual Mean	p-Value = 0.4043	
T-test: Ha: Projected Mean > Actual Mean	p-Value = 0.7978	

Source: Author's elaboration

A negative, low, and non-significant correlation with 99% of reliability is observed and the T-tests point to the equality of the means presented even with the actual values with greater dispersion than the projected values.

Summing up the analyses of each one of the premises and their respective hypothesis tests, there is a summary of the results:

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Figure 13

Summary of the conclusion of the premise validations

Premise	Significant correlation between the Forecasted Values and the Actual Values	Difference between the mean Forecasted and Actual Values
PIB	Yes, moderate	**Forecasted > Actual**
CDI Rate	Yes, very strong	Forecasted = Actual
LIBOR	No	**Forecasted > Actual**
TLP	Yes, moderate	Forecasted = Actual
Sales Growth	No	**Forecasted > Actual**
Euro	Yes, very strong	Forecasted = Actual
Dollar	Yes, very strong	**Forecasted > Actual**
IPCA	Yes, very strong	Forecasted = Actual
IGPM	Yes, very strong	**Forecasted > Actual**
SELIC	Yes, very strong	Forecasted = Actual
EMBI+	Yes, moderate	**Forecasted > Actual**
CPI	No	Forecasted = Actual

Source: Author's elaboration

It is concluded that half of the premises tested presented positive forecasted values different from the actual values in the period analyzed.

5 CONCLUSION

This research had as the central aim to analyze whether the values adopted of the projection premises are adhered to the actual values of each one of them along the time. Twelve (12) premises were considered essential and commonly adopted in assessment reports. The universe herein researched was the OPA reports available at the Securities and Exchange Commission of Brazil in the last 20 years.

Projected premises are steadier than the actual values obtained *a posteriore*. Moreover, 50% of the premises analyzed presented some kind of bias, mostly of increase of the values projected higher than the actual values obtained.

It is important to highlight that the aim of this research was not to check whether this possible bias of increase of the projected premises had any influence on the final results of the valuations.

Thus, it can be understood that some of the premises in the Brazilian market case tend to have greater stability for forecasting than other more volatile premises. Therefore, premises such as interest rates (CDI, TLP, SELIC), the inflation given by the IPCA in Brazil tends to be steadier, at least in the last 20 years of analyses of the assessment reports.

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On the other hand, premises such as GDP, sales growth, LIBOR, IGPM and EMBI+ were more different regarding the forecasted values when compared to the mean actual values.

An analysis of the difficulty in finding and establishing premises in emerging economies is worth. Performing projections in different time periods reveals a perception of the assessment sector, of the company under analysis, and the consideration of the existence of information asymmetry. The possibility of economy shocks can lead to biases in the assessments due to the period at issue to build up good quality projections.

This research paves the way to continue and improve the mechanisms to obtain good quality premises along the whole assessment process. These results can be relevant for professionals which work with valuation, company managers and regulators.

Future research can continue this approach to investigate the impacts of the premises on the results analyzed, besides carrying out a more refined analysis per activity sector.

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