Board Diversity, IPO Underpricing, Asymmetric Information and Firm Value: a Brazilian Case

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Abstract: We research post-initial public offering (IPO) underpricing in Brazil, using data collected from prospects on the 249 cases since 2004. In order to attract small investors, companies issue shares at a price below fair value, since smaller investors have higher information asymmetry and greater loss aversion. As expected, a higher number of investors in the IPO leads to higher underpricing. In addition, companies with greater (smaller) capital intensity and lower (higher) make IPOs with lower (higher) underpricing. The original owners of capital intense companies invested huge financial resources and are strongly averse to give them away to new shareholder (again, loss aversion). Conversely, the value of highly profitable companies is more abstract and was obtained with less financial sacrifice, making shareholders less averse to lose a part of it (easy come easy go). Also, valuation is usually easier and more precise for value companies (again, asymmetry). Another hypothesis is that more experienced (older) board and with more women yields a lower underpricing. Such boards are less prone to leave money on the table (loss aversion) and purvey more reliable information to investors (asymmetry).

Keywords: IPO pricing, board diversity, corporate governance, underpricing, information asymmetry, gender, Brazil, board age.

Introduction

This paper aims to analyse the impact of firms' corporate governance characteristics, especially diversity, on the degree of first-day returns (i.e., underpricing) in the Brazilian initial public offering (IPO) market. In particular, this work investigates the impacts of the characteristics of boards of directors (age and gender) and total amount of investors on the underpricing of newly offered shares. By studying a sample of 246 Brazilian IPOs between 2003 and 2021, it is concluded that corporate governance characteristics affect the degree of first-day returns following a company's IPO. More specifically, the average age of the board of members negatively affects underpricing as well as, the presence of female directors in the boardroom, while the numbers of investors and board members size has a positive effect on the degree of underpricing. Conversely, no significant evidence is found with regard to board independence, the finance board member and foreigners in the board.

Study Scope and Constraints

This investigation expands theoretical insights into corporate governance within the domain of financial strategy and decision-making. It examines how diversity within boards of directors influences Initial Public Offering (IPO) pricing and the subsequent valuation of companies.

Nonetheless, the study presents certain limitations, particularly due to the incomplete exploration of the relationship between IPO underpricing and governance structures. Future studies are encouraged to incorporate additional explanatory variables, such as the educational background of board members in the Brazilian context, to deepen the analysis and practical relevance.

Contribution and Significance

This research addresses a critical gap in the literature by linking corporate governance practices with IPO underpricing outcomes. Although prior studies have extensively explored the determinants of IPO pricing, few have focused on how board composition affects these processes. The empirical analysis draws upon data from the Brazilian stock exchange, B3, which provides comprehensive records on IPO transactions and investor participation levels. This study specifically evaluates how demographic characteristics, such as the average age and gender of board members, influence IPO performance in Brazil. The findings provide initial evidence that greater board diversity contributes to lower levels of information asymmetry, which in turn is associated with reduced underpricing. The analysis highlights the role of directors' average age in fostering transparency and strengthening investor trust during the IPO process. Additionally, the inclusion of women on boards is considered a meaningful factor. Gender is treated as a binary variable, indicating presence or absence, while average age functions as a continuous independent variable.

Literature Revision

Underpricing is determined by the market, based on investor demand and the assessment of the issuing company and its financial advisors. However, the Securities and Exchange Commission (CVM), which is the entity responsible for regulating the capital markets in Brazil, aims to ensure that the information disclosed by companies is clear, accurate and sufficient for investors to make informed decisions. The CVM seeks to prevent misleading or fraudulent practices related to IPOs and to ensure that the market operates in a fair and transparent manner.

There is no stipulated limit for underpricing. It is up to companies and their financial advisors to comply with the rules and regulations established by the CVM, and to provide investors with pertinent and clear information during the IPO process. This includes disclosing details about the company's valuation, the risks involved and other relevant factors that may impact the price of the shares. These important development factors are included in the final prospectus required by the CVM.

It is important to note that, although underpricing may attract investors in the short term, excessive underpricing may have negative implications for the future performance of the company's shares, as mentioned above. Therefore, it is essential that companies and their advisors carefully consider stock pricing during the IPO process, taking into account both investor demand and long-term appreciation potential. Beatty and Ritter (1986) argue that underpricing should increase ex ante uncertainty of firm value where investor heterogeneity exists. Ritter (1984) and Loughran and Ritter (1985) highlight changes in firm risk as an explanation for the changes in Underpricing over the years. One of this investor heterogeneity is caused by information asymmetry.

What is Information Asymmetry in IPOs?

According to Akerlof (1970), information asymmetry in IPOs refers to the situation in which one of the parties involved in the initial public offering (IPO) process has relevant information that is unknown to the other party. This asymmetry occurs when the company carrying out the IPO holds detailed information about its financial situation, operations, growth prospects and other factors that may affect the value of the shares, while investors have limited access to this information.

Information asymmetry in IPOs can be problematic, as it can lead to distortions in stock pricing and uninformed investment decisions. When investors do not have all the relevant information, they may make decisions based on inaccurate assumptions and estimates, which can result in an unequal allocation of shares and unfair pricing (Auronen, 2003).

To combat information asymmetry in IPOs, there are regulations that require companies to disclose relevant information to investors prior to the public offering (CVM Resolution 160, 2022). This information is usually provided in the prospectus, a detailed document that describes the company, its operations, risks and prospects. In addition, regulatory bodies (the Brazilian Securities and Exchange Commission) oversee the IPO process to ensure that information is disclosed correctly and that there are no deceptive practices. Investors can also seek advice from financial professionals, such as securities brokers and financial advisors, to obtain a more in-depth analysis of the information available. It is important for investors to do their own research and analysis before making investment decisions in IPOs in order to minimize the risks associated with information asymmetry. Studies provide evidence that asymmetry preference leads to abnormal stock returns. Barberis and Huang (2008) examine the implications of asset pricing, and Tversky and Kahneman (1992) cumulative prospect theory and find that, in contrast to the prediction of a standard expected utility model, a positively biased security may be overpriced and may yield a negative average excess return. See below one financial indicator and its relation to IPO Underpricing.

Capital Intensive and IPO Underpricing

Capital intensive industries characterize industries or companies that require significant investment in physical assets, such as machinery, facilities, and technology, to operate and generate revenue. Examples of capital-intensive industries include the energy industry, manufacturing, and telecommunications. These industries typically face higher barriers to entry due to the high cost of capital required to start operations. In capital intensive industries, IPO underpricing can be more pronounced due to the complexity of valuations and uncertainty about the return on investment, which can lead investment banks to underprice shares to ensure a successful launch. These dynamics reflect the interplay between capital costs, risk perception, and pricing strategies in the stock market. Another way that causes IPO Underpricing is loss aversion and the prospect theory.

Loss Aversion and IPO Underpricing

Loss aversion bias is a concept from behavioral psychology (Kahneman and Tversky, 1979) that refers to the tendency of people to prefer avoiding losses rather than acquiring equivalent gains. This means that the pain of losing a certain amount of money is more intense than the joy of gaining the same amount. This bias can influence financial decisions, leading investors to be overly cautious or to hold on to losing assets for too long in the hope of a recovery.

In the context of IPOs (Initial Public Offerings) and underpricing, loss aversion can have a significant impact, according to Ljundqvist (2007). When a company decides to go public, its share prices are often set below what they would be in a perfect market. This underpricing is a strategy that can be seen as a way to mitigate the risk perceived by investors. Investors may fear losing money if the company does not perform as expected. Therefore, by setting a lower initial price, companies can increase demand and investor interest, thereby reducing loss aversion. Furthermore, underpricing can create a positive "first impression effect," as investors who buy shares at a lower price tend to see an immediate gain when the price rises after the IPO.

In short, loss aversion can lead to intentional underpricing in initial public offerings, helping to attract investors and create an environment of greater confidence in the new asset. This relationship between behavioral psychology and finance is an example of how emotional factors can influence investment decisions in the financial market. In order to follow this thought, the Corporate Governance has a lot of connections with IPO Undepricing.

Corporate Governance and IPO Underpricing

Corporate governance and IPO underpricing are two interconnected concepts in the context of the financial market and business. They refer to the system of rules, practices, and processes that guide and control a company. Good corporate governance ensures that the company is managed ethically and responsibly, balancing the demands of multiple stakeholders, including shareholders, managers, customers, suppliers, and the community. Important elements include:

• Transparency: Clear and accurate disclosure of financial and operational information.

• Accountability: Mechanisms to hold the board of directors and senior management accountable for their actions.

• Equity: Fair treatment of all shareholders, including minority shareholders.

• Participation: Involvement of shareholders in important company decisions.

Corporate governance can influence the level of IPO underpricing. Companies with robust governance practices may be seen as more trustworthy and less risky, which could lead to lower underpricing. Conversely, poor governance may increase the perception of risk and, consequently, lead companies to opt for greater underpricing to ensure the success of the IPO. Judge et. al (2015), suggests that the quality of corporate governance can impact the decision on the offering price of shares and investors' perception of the company's value. Inside Corporate Governance, it is important to explain the paper of the women in board member and the age of them that proof the importance of diversity inside de boardroom.

Women and IPO Underpricing

Research conducted by Baysinger and Butler (1985) indicates that a greater number of outside directors improves firm performance, and investors tend to perceive the appointment of an outsider to the board as positive news (Rosenstein and Wyatt, 1990). Additionally, board gender composition is anticipated to positively influence firm performance. Enhanced gender diversity on boards can lead to improved decision-making by allowing for a broader range of perspectives and issues to be considered, as well as a wider array of outcomes (Daily and Dalton, 2003). The inclusion of more female directors may foster participative communication among board members. If female directors are indeed more participative (Eagly and Carli, 2003), democratic (Eagly and Johnson, 1990), and communicative than their male counterparts (Rudman and Glick, 2001), as suggested by research, then increasing the number of women on boards could promote more open discussions among board members. In an analysis of the Hong Kong market, McGuinness (2018) found a correlation between the presence of women on boards and long-term performance, although there was limited evidence regarding the relationship between board gender diversity and IPO underpricing.

Board Member Average Age and IPO Underpricing

Initial Public Offering (IPO) underpricing refers to the phenomenon where newly issued shares are priced below their market value during their debut on a stock exchange. This underpricing is influenced by various factors, prominently including the composition of the board of directors. Studies suggest that both the diversity of the board and the average age of its members can significantly impact IPO underpricing (Campbell & Minguez-Vera, 2008).

Boards that exhibit gender diversity are increasingly viewed as more progressive and socially responsible. Research indicates that such diversity can enhance demand for shares, ultimately resulting in lower levels of underpricing. For instance, Bernardi & Threadgill (2011) highlight how gender-diverse boards enhance the image of a company, making it more attractive to investors. Furthermore, the presence of women on boards has been linked to improved risk assessment capabilities (Carter et al., 2003), which can further reduce uncertainty surrounding the IPO.

The age of board members is another significant factor in the IPO landscape. Older boards are typically associated with greater experience and credibility, which can be pivotal in navigating the complexities of the IPO process (Khlif & Achek, 2017). Conversely, younger boards tend to promote innovation and flexibility, which can be critical in a rapidly changing market environment (Loderer & Waelchli, 2010). The interplay between these age-related characteristics may affect investor behavior and the pricing of newly issued shares.

The combination of gender diversity and a balanced age profile on boards fosters a well-rounded decision-making process. Research suggests that boards which achieve this balance not only enhance their credibility but also improve risk management practices, making them more appealing to potential investors (Carter et al., 2003; Dezso & Ross, 2012). A diversified and age-balanced board can mitigate the typical uncertainties associated with IPOs, thereby influencing the degree of underpricing. And for understanding this paper, it is important to make the correlation between the prospectus of the IPO and its relation to information asymmetry as all the data collection were made from it.

The Prospectus and Information Asymmetry

Although the information content of the IPO prospectus is widely known, the financial information contained in this document only reduces information asymmetries between internal and external parties to a limited extent (Hanley and Hoberg, 2010; Loughran and Mcdonald, 2013). There is still the issue of asymmetric distribution of information among potential investors who have substantially less knowledge about the company's management than the prospectus (Beatty and Ritter, 1986; Cohen and Dean, 2005; Colombo et al, 2019; Hanley and Hoberg, 2010; Loughran and Mcdonald, 2013; Lowry et. al, 2017; Ritter and Welch, 2002; Rock, 1986).

The market may rank firms based on the IPO prospectus regarding the disclosure of non-financial issues (actions and attributes) related to adverse selection and moral hazard. This includes the firm's corporate governance structure (Certo et al, 2001; Certo, Daily, Canella & Dalton, 2003; Chahine & Filayotchev, 2008; Sanders & Boivie, 2004), the status of the founder (Nelson, 2003), the experience and functional background of top executives (Cohen & Dean, 2005; Higgms & Gulati, 2006; Lester et al, 2006; Zimmerman, 2008), prominent affiliation with prestigious institutions (Colombo et al, 2019) and certification by top auditors (Beatty, 1989). Rock (1986) and Beatty and Ritter (1986) offer one of the best-known theories to explain price behavior: the "winner's curse" theory. According to this hypothesis, informed investors will only bid for undervalued securities, while less informed investors will end up bidding for overpriced securities. Thus, IPOs should be sufficiently underpriced to allow even uninformed investors to obtain a risk-adjusted return.

Another implication of the theory is that IPOs that have a higher level of information asymmetry and valuation uncertainty should be more undervalued. Evidence

for the winner's curse explanation has been documented in many studies, including Koh and Walter (1989), Muscarella and Vetsuypens (1989), Keloharju (1993), Michaely and Shaw (1994), Amihud et al. (2003) and Jagannathan and Sherman (2006). Closely related to underpricing is the question of what prompts a firm to revise its offering prices. Benveniste and Spindt (1989) and Hanley (1993) argue that price revisions are the result of underwriters acquiring additional information about the firm's value from informed investors. When the information that investors disclose is positive, underwriters revise the offering price upward from the indicative prices listed in the preliminary prospectus.

A common theme studied involves the situation in which investors assess corporate quality by qualitatively examining the non-accounting information disclosed in the IPO prospectus.

Hypotheses

Below are the hypotheses through which we seek to explain the dynamics and valuations associated with:

i) the number of investors is positively associated with IPO underpricing;

ii) the average age of board members is negatively associated with IPO underpricing;

iii) board membership is negatively associated with IPO underpricing;

iv) board size is positively associated with IPO underpricing;

v) women in board member in first cycle is negatively associated with IPO underpricing; and,

vi) companies with more capital intensity and higher ROA are negatively associated with IPO underpricing.

Data Construction

The methodology adopted was quantitative, as explained by Lakatos and Marconi (2003). We analyzed the 246 IPO cases in Brazil from 2004 to 2021, all listed on the B3 on the IPO date, whether in the form of ON, PN, Unit or BDR shares. Thus, our universe comprises 246 companies between 2004 and 2021, since from 2022 to 2024 we did not have any IPOs in Brazil.

Our data consists of three parts: IPO selection criteria, financial and accounting data, and board of directors data, as well as the ages of the CEO, CFO and average age of the board. We started with the population of IPOs on the B3 between April 1, 2004 and December 31, 2021, which occurred on the B3 Bovespa (São Paulo Stock Exchange), in Brazil. We will analyze all IPO prices, which represents 246 IPOs in Brazil during this period. Underpricing refers to the difference between the issue price of shares during the IPO and the market price on the first day of trading, all taken from Quantum Axis.

We also collected financial and accounting data from the IPO prospectus. Then, using the same database, we collected the board of directors that participated in the IPO process and looked for the number of directors, how many are independent, the average age of the board, whether it is financial, female, or foreign, and the age of the CEO and CFO. The IPO information, such as quantitative data on the number of investors and whether they are retail, institutional, foreign, or other, came from the B3 database. When we did not find the age in the prospectus, we searched the database in the reference form, on LinkedIn, or on Google.

Measures of the variable age of the Board of Directors were made by analyzing the final prospectus and data from the CVM reference form. Individualizing the CEO and CFO, we collected their ages from the prospectus. For example, Custodio et al. (2013) used this technique to measure the ability of the Board of Directors based on work experience (and financial compensation). In this way, we can also include age as an experience factor.

We use the following regression model:

$$\label{eq:underpricing} \begin{split} &Underpricingijk = \alpha + \beta 0 LogNumINvi + \beta 1 Institutionalij + \beta 2 LogVolumeIssueij \\ &+ \beta 3 LogCapitalIntensivei + \beta 4 PriceProfitIbovik + \beta 5 ROAi + \beta 6 GeneralDebti + \\ &\beta 7 BoardAgek + \beta 8 Legislationij + \beta 9 Independentik + \beta 10 Womenik + \beta 11 Financialik + \\ &\beta 12 Foreignersik + \mu \end{split}$$

In addition to the average age of the Board and its size, we analyze some control variables. We also included independence. Older directors have more experience than younger ones and those with longer tenures are more familiar with the company's culture (Cline and Yore, 2016). We understand that overconfidence leads to high levels of underpricing. This can be assessed by the firm's high investment levels (industry-adjusted expenses scaled by fixed assets for two consecutive years).

In relation to the market, we included the price-earnings variable of the Ibovespa calculated daily from 2004 to 2021 in order to understand whether the market is buoyant or not. Thus, we concluded that there are 3 periods of buoyant markets but only 2 that are relevant, 2004 to 2008 and 2019 to 2021.

In relation to the firm, we considered the size of the IPO, debts, ROA and Capital Intensive. Less indebted companies leave less money on the table and generate less underpricing. And more intangible companies have greater underpricing. Regarding corporate governance, we used the independence of the Board of Directors and the percentage of External Directors, which are negatively related to underpricing, and the size of the Board, which is positively related. However, this information is not available for all companies, which led us to look for it in the reference forms. The return value of the share on the first day of trading will be able to show whether or not there was underpricing. Finally, we will include as a dummy a variable measuring the specific factor of Legislation justified by the number of investors in the IPO when made in ICVM 476 (instruction from the regulator Comissão de Valores Mobiliários), which are issues restricted by the number of investors. They represent 14 in the sample.

See below in Table 1 how was made each dependent and independent variables.

Variables	Measurement		
Dependent Variable			
Datum IDO	((first day of negotiation (market price) – price of issue date) / price of issue date) *100		
Return PO	– obtained in Quantum Axis plataform		
Independent Variables			
Log Number of Investors	logarithm of the data obtained in the B3 spreadsheet		
Log Capital Intensive	logarithm of (fixed asset / total asset) – obtained in Prospectus		
ROA	(net profit / total asset) - obtained in Prospectus		
Board Age	average of board members age - obtained in Prospectus/Reference Form		
Women	data obtained in Prospectus/Reference Form – binary variable		
Control Variables			
Institutional	obtained in the B3 spreadsheet data		
Log Volume Issue	logarithm of the data obtained in the B3 spreadsheet		
Price Profit Ibovespa	obtained in Quantum Axis plataform		
General Debt	(total debt / net worth) - obtained in Prospectus		
Legislation	data obtained in the B3 spreadsheet (CVM 476) – binary variable		
Board Size	data obtained in Prospectus/Reference Form		
Independent	data obtained in Prospectus/Reference Form – percentagem of board size		
Financial	data obtained in Prospectus/Reference Form – percentage of board size		

Table 1 – Definition of Variables

Author: own (2025)

Results

Table 2 – Descriptive statistics

Variables	Obs	Mean	Min	Max	Std. dev.
Return IPO	246	0,004	-1,000	1,044	0,149
Number Investors - Period 1	245	3,871	0,000	12,472	4,419
Number Investors - Period 3	245	2,336	0,000	15,941	3,786
Institutional	246	0,315	0,000	1,088	0,235
Legislation	246	0,943	0,000	1,000	0,232
Log Volume Issue	246	20,473	16,588	23,302	0,890
Log Capital Intensive	243	2,075	-0,639	7,453	1,466
Price Profit Ibovespa	246	44,509	-54,064	429,110	103,018
ROA	246	0,088	-1,219	1,378	0,220
General debt	244	0,383	-0,260	0,865	0,126
Board Age	246	52,288	36,330	74,330	6,300
Independent	246	0,319	0,000	0,889	0,151
Women - Period 1	246	0,098	0,000	1,000	0,297
Women - Period 3	246	0,179	0,000	1,000	0,384
Financial	246	0,422	0,000	1,000	0,223
Foreigners	246	0,126	0,000	1,000	0,208
Period 1	249	0,442	0,000	1,000	0,498
Period 3	249	0,297	0,000	1,000	0,458

Author: own (2025)

Table 3 – Linear regression of dependent variable (IPO *Underpricing*) and independent (Average Age of Board Members, Size of Board Members, Foreigners Board Members, Number of Investors e Intensive Capital) with vce(robust)

Variables	P>t		
Number Investors - Period 1	-0,015		
	(1,56)		
Number Investors - Period 3	-0,0304*		
	(2,17)		
Institutional	-0,0086		
	(-0,14)		
Legislation	-0,1188**		
	-1,89		
Log Volume Issue	0,0121		
	1,14		
Log Capital Intensive	0,0159*		
	2,05		
Price Profit Ibovespa	-0,0001		
	-1,18		
ROA	0,1736*		
	2,24		
General debt	0,0215		
	0,31		
Board Age	-0,0029**		
	-1,72		
Independent	0,0386		
	0,72		
Women – Period 1	-0,0504**		
	-1,83		
Women – Period 3	-0,022		
	0,71		
Financial	0,0013		
	0,04		
Foreigners	-0,0966		
	-0,95		
Períod 1	-0,1002		
	-1,26		
Períod 3	-0,2369**		
	-1,91		

Dependent variable: Return IPO

_cons	0,997 0		
R-squared (N=240)	0,1805		

*, ** is significant at 5%, 10%. Parenthesis are T-statistics.

Author: own (2025)

The data show that the number of investors in period 3 is relevant (p-value = 0.031), log of intensive capital (p-value = 0.042), ROA (p-value = 0.026), board age (p-value = 0.086), legislation (p-value = 0.061) and women in period 1 (p-value = 0.086).

Our results are shown in the regression below, as shown in Table 3. Significance was found in the independent variable average age of the Board. To prepare the results, we performed logarithmic linear regression, taking care to transform variables with very asymmetric values and with large variance into logarithms (such as Capital Intensive, Number of Investors and Volume Issue). In this table, we present the statistics with the average, minimum and maximum values and the standard deviation of each variable. The CEO and CFO Age variable was omitted because it was not statistically relevant. The Capital Intensive variable discarded 3 observations and the number of investors discarded 1 observation.

Table 3 above presents the results of the regression performed to analyze the influence of the average age of the Board on IPO underpricing. The data were prepared, and the variables were adjusted according to the above description. For the dependent variable "share price on the day after the IPO", the price on the day after the IPO was calculated in relation to the day before trading. The results show that the average age of the Board is statistically significant (p-value = 0.086), indicating that the average age of the Board has a significant impact on IPO underpricing. The presence of women in the boardroom is also statistically significant (p-value = 0.069), indicating that more experienced and diverse boards in this sample have a significant impact on IPO underpricing, in a context in which governance has more diversity, since information is distributed equally.

Furthermore, the ROA, number of investors and Capital Intensive variables show statistical significance, which indicates that these variables have a significant impact on IPO underpricing. Capital intensive companies leave less money on the table. It is difficult to give up the money actually invested (loss aversion again). Valuation is also easier to do (asymmetry). It is easier to give up a more abstract value than a more concrete value. This applies to Capital Intensive (Fixed Asset/Total Asset) and ROA (Return on Assets). Therefore, they are less risky companies to invest in. This assesses lower risk and signals a higher price at IPO. Thus, underpricing attracts investors, where ROA is volatile or difficult to predict.

However, the number of investors variable shows statistical significance more in period 3 (p-value = 0.031), leading to the identification that period 3 was strong because there was a massive influx of investors into B3. In period 1, however, the issue of the New Market segment (transparency and arbitration) was responsible for the flow of capital to IPOs (in addition to the factors discussed in the theoretical framework).

The Bovespa New Market (currently called B3) was launched in 2000. It was created with the aim of increasing the corporate governance standards of listed companies, promoting greater transparency and protection for shareholders. The New Market establishes stricter rules regarding the disclosure of information and the structure of share capital, attracting companies seeking a more reliable investment environment. This clearly defines Period 1 of the booming IPO market in Brazil. Between 2004 and 2008, the number of IPOs increased due to the creation of the New Market, the Adoption of Laws and Regulations by the Brazilian government and CVM, Financial Education among investors and companies, Tax Incentives, the Promotion of IPOs by B3 and Support for Small and Medium-sized Companies (Bovespa Mais). In Period 3, the increase in the number of investors in B3 was responsible for Underpricing (greater number of investors in IPOs) and also increased the profit price of the Stock Exchange in this period.

Robustness Test

Using the Breusch-Pagan/Cook-Weisberg heteroskedasticity test, we noted that the sample does not have homoskedasticity, a necessary condition to justify the usual t and F tests, as well as the confidence intervals of the OLS estimation of the linear regression model, according to Wooldridge (2007).

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity

Assumption: Normal error terms

Variable: Fitted values of RETIPO

H0: Constant variance

chi2(1) = 42.96

Prob > chi2 = 0.0000

The way to use robust OLS is using vce(robust), which is exactly the same as the initial regression where only robust appears. Thus, we performed the robustness test to test whether there are significant differences in the variables selected in the final scores.

Conclusion

For a new period of IPOs in Brazil, it is necessary that we have a control in waste (Fiscal Policy), in order to see the entrance of foreigner's capital. Because, it has a huge quantity of firms that want to make open capital in the capital market. If the capital flows to emerging markets and the external scenario is well, it is possible to have new investments in companies of Brazilian markets. Another interesting thing is that the number of new investors in B3 increased in Covid Period. If the SELIC rate becomes lower, there is a possibility of better GDP and so the country will have power to lower the public debt and probably becoming investment grade again. These will attract new capital from other countries and probably start a new period of IPOs in Brazil. For instance, this new wave will be different from the other ones because of the technology (Artificial Intelligence).

In the past, the new market in Bovespa, and the investment grade was responsible for the first wave in the 2003-2007 year. The wave of Covid Period occurred because the number of new investors in the capital market growth a lot. The entrance of new digital players like XP and BTG were responsible for this growth. In these two periods, there were growth in the multiples of the companies in the Index. The two periods have an increase in the points of the Index, and became a excellent time for news IPOs. The investors were buying stocks in order to have huge amounts of gains. The diversity (women and board age) was responsible in the new market for less IPO Underpricing because of less asymmetric information (older board age gave responsibility and confidence). And the number of new investors and the diversity in board age turns the third period as well as the Covid a propitious IPO wave.

This study was made with past data but it is suggested that new future waves were studied in order to define what is the principal factor for it. Besides the diversity that has study in Korea market (Park and Byun, 2022), this is the first study in Brazil for diversity. Maybe it is possible to find as well that the education of board member is another interesting point to study. Gounopoulos et al. (2021) study in Europe for education in IPO Underpricing.

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