UNIVERSIDADE FEDERAL DE JUIZ DE FORA
FACULDADE DE ECONOMIA
PROGRAMA DE PÓS-GRADUAÇÃO EM ECONOMIA DA UFJF

Wilson Pereira Pinto Neto

Short-Selling Restrictions and Firm Management Decisions

Juiz de Fora
2022

Wilson Pereira Pinto Neto

Short-Selling Restrictions and Firm Management Decisions

Dissertação apresentada ao Programa de Pós-Graduação em Economia da UFJF da Universidade Federal de Juiz de Fora como requisito parcial à obtenção do título de Mestre em Economia. Área de concentração: Economia

Orientadora: Professora Doutora Flávia Lúcia Chein Feres

Coorientadora: Professora Doutora Fernanda Finotti Cordeiro

Juiz de Fora

2022

Ficha catalográfica elaborada através do programa de geração
automática da Biblioteca Universitária da UFJF,
com os dados fornecidos pelo(a) autor(a)

Pereira Pinto Neto, Wilson.
Short-Selling Restrictions and Firm Management Decisions / Wilson Pereira Pinto Neto. -- 2022.
60 p. : il.

Orientadora: Flávia Lúcia Chein Feres
Coorientadora: Fernanda Finotti Cordeiro
Dissertação (mestrado acadêmico) - Universidade Federal de Juiz de Fora, Faculdade de Economia. Programa de Pós-Graduação em Economia, 2022.

1. Mercado de Aluguel. 2. Gestão de Firmas. 3. Finanças Corporativas. 4. Arbitragem Fiscal. 5. Financiamento. I. Lúcia Chein Feres, Flávia, orient. II. Finotti Cordeiro, Fernanda, coorient. III. Título.

Wilson Pereira Pinto Neto

Short-Selling Restrictions and Firm Management Decisions

Dissertação apresentada ao Programa de Pós-graduação em Economia da Universidade Federal de Juiz de Fora como requisito parcial à obtenção do título de Mestre em Economia Aplicada. Área de concentração: Economia

Aprovada em 12 de julho de 2022.

BANCA EXAMINADORA

Drª. Flávia Lúcia Chein Feres - Orientadora

Universidade Federal de Juiz de Fora

Drª. Fernanda Finotti Cordeiro - Coorientadora

Universidade Federal de Juiz de Fora

Drª. Laura de Carvalho Schiavon

Universidade Federal de Juiz de Fora

Dr. Rafael Almeida da Matta

SKEMA Business School

Juiz de Fora, 27/06/2022.

Documento assinado eletronicamente por **Flavia Lucia Chein Feres**, **Professor(a)**, em 15/07/2022, às 11:08, conforme horário oficial de Brasília, com fundamento no § 3º do art. 4º do Decreto nº 10.543, de 13 de novembro de 2020.

Documento assinado eletronicamente por **Laura de Carvalho Schiavon**, **Professor(a)**, em

15/07/2022, às 14:28, conforme horário oficial de Brasília, com fundamento no § 3º do art. 4º do Decreto nº 10.543, de 13 de novembro de 2020.

Documento assinado eletronicamente por **Fernanda Finotti Cordeiro Perobelli**, **Professor(a)**, em 15/07/2022, às 16:14, conforme horário oficial de Brasília, com fundamento no § 3º do art. 4º do Decreto nº 10.543, de 13 de novembro de 2020.

Documento assinado eletronicamente por **Rafael Almeida da Matta**, **Usuário Externo**, em 17/08/2022, às 16:08, conforme horário oficial de Brasília, com fundamento no § 3º do art. 4º do Decreto nº 10.543, de 13 de novembro de 2020.

A autenticidade deste documento pode ser conferida no Portal do SEI-Ufjf (www2.ufjf.br/SEI) através do ícone Conferência de Documentos, informando o código verificador **0844430** e o código CRC **A198285E**.

ACKNOWLEDGMENTS

I would like to start by thanking God because I would not have been able to write a single page without Him. Moreover, I am grateful that He surrounded me with extremely solicitous people who helped me a lot throughout this process.

I would like to express my gratitude to my advisors Prof. Flávia Chein and Prof. Fernanda Finotti. This work was only possible because they shared with me their immense knowledge and gave me support so that I could develop myself as a researcher. Furthermore, I would like to thank Prof. Laura Schiavon and Prof. Rafael Almeida da Matta for their precious contributions.

A special thanks to my family and friends because they always supported me in my challenges.

Finally, I would like to say that this study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

ABSTRACT

This research seeks to study the effects of short-selling restrictions - caused by high fees in the stock loan market - on corporate financing. Specifically, we analyzed two distinct variables to observe companies' financing decisions: the first was the companies' free shares number; the second was their level of loans and financing. Thus, in the first analysis, we sought to identify whether companies were trying to take advantage of short-selling restrictions to issue new shares or sell those held in treasury. Similarly, our second analysis examined whether companies changed their indebtedness level in response to this market moment. To observe exogenous variations in loan fees, we used a research design based on a tax arbitrage carried out by investment funds in the Brazilian capital market. Such arbitrage increased the demand for stock lending, resulting in inflationary pressures on the fees paid in the loan market. Hence, our empirical strategy employed an instrument correlated with the volume of arbitrage in the loan market to isolate exogenous shocks in loan fees and, thereby, estimate the effect of these fees on corporate financing. However, our estimates did not identify any significant effects, regardless of the outcome variable used to represent corporate financing.

Keywords: Loan Market. Firm Management. Corporate Finance. Tax Arbitration.

RESUMO

Esta pesquisa busca estudar os efeitos de restrições de venda a descoberto, causadas por altas taxas no mercado de aluguel de ações, no financiamento corporativo. Especificamente, analisamos duas variáveis distintas para observar as decisões de financiamento das empresas: a primeira foi o número de ações livres das empresas; a segunda foi o nível de empréstimos e financiamentos. Assim, na primeira análise, buscou-se identificar se as empresas tentavam aproveitar as restrições de venda a descoberto para emitir novas ações ou vender aquelas mantidas em tesouraria. De forma semelhante, nossa segunda análise examinou se as empresas mudavam seu nível de endividamento em resposta a esse momento de mercado. Para observar variações exógenas das taxas de empréstimo, nosso desenho de pesquisa teve como base uma arbitragem fiscal realizada por fundos de investimento no mercado de capitais brasileiro. Tal arbitragem aumentava a demanda por empréstimo de ações, o que acabava resultando em pressões inflacionárias nas taxas pagas no mercado de aluguel. Assim, nossa estratégia empírica empregou um instrumento correlacionado com o volume de arbitragem no mercado de aluguel para isolar os choques exógenos nas taxas de empréstimo e, com isso, estimar o efeito destas taxas no financiamento corporativo. Todavia, nossas estimativas não identificaram nenhum efeito significativo, independente da variável desfecho usada para representar o financiamento corporativo.

Palavras-chave: Mercado de Aluguel. Gestão de Firmas. Finanças Corporativas. Arbitragem Fiscal.

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

IoNE	Interest on Net Equity
VAR	Vector Autoregression
CVM	*Comissão de Valores Mobiliários*
Ibovespa	Bovespa Index
IBOV	Bovespa Index
BTC	*Companhia Brasileira de Liquidação e Custódia*
2SLS	Two-Stage Least Squares
CI	Confidence Interval
CL	Confidence Level
VWAF	Volume-Weighted Average Fee

SUMMARY

1 INTRODUCTION

The study of finance has been increasingly concerned with understanding the process of asset pricing in stock markets, both through theoretical models and empirical estimations. Studying the particular dynamics of each market and their interrelationships has often been a theoretical and empirical challenge. Nevertheless, mastering the understanding of the relationship between the pricing process, through the stock spot markets, and firm management decisions can also be a challenge, at least as great as the first. Thus, our range of research tends to be a complex puzzle as we connect the stock loan market with the spot market and, finally, with the companies' management process. Hence, it was necessary to combine the financial market literature with pieces of knowledge from corporate finance studies.

To understand how the elements listed in the previous paragraph are related to our research, we need to introduce some concepts and ideas, so let us start with the short-selling definition, a crucial element in our study. Short-selling is a trade in which the investors can sell an asset they do not own and profit if its price decreases. It was Miller (1977) who first showed the influence of this trade on the asset market balance. According to him, restrictions on short-selling can lead to overvalued prices of the assets if the investors have different opinions concerning the asset value that incorporates all the information available about it.

However, in most financial markets around the world, for investors to be able to sell an asset that they do not own, they must lease it. Thus, the investors need to resort to the loan market, where they will be able to find traders willing to lend assets at the cost of a fee; in specific, this fee will result from the interaction between the demand and supply of asset loans in the market. Therefore, through short-selling operations, we have the connection between the spot and loan markets of shares. This issue was the object of study in Blocher, Reed and Van Wesep (2013). In this paper, the authors address the idea that a context of high fees in loan markets has the same effect as restrictions on short-selling, as these fees directly interfere with the payoff of this trade. Then, combining the ideas of Miller (1977) and Blocher, Reed and Van Wesep (2013), it is possible to see that the loan fees can influence stock prices in the spot market. For this reason, we will treat high loan fees as a synonym for short-selling restrictions.

Once loan market fees can impact the formation of stock prices, we can ask ourselves if such impact may transcend the markets and reach the firms' business decisions. For instance, whether the stock price is overvalued, the firm could issue new shares to benefit from this market moment (BAKER; WURGLER, 2002); similarly, the manager can react to inflated stock prices by altering the firm's investment level (POLK; SAPIENZA, 2008). Furthermore, short-selling restrictions could initially affect the decisions of other financial

market players connected to the company, affecting its financing capacity. Campello, Matta and Saffi (2020) argues that the costs of short-selling impact the informational power of the firms' stock prices, which would influence the decision-making process of investors who finance the companies. Specifically, the investors could react to the short-selling costs by increasing or decreasing the level of investment in the company. Through this logic, in one of the contexts analyzed by Campello, Matta and Saffi (2020), the authors identified a non-monotonic relationship between short-selling costs and corporate investment: first, low costs lead to low corporate investment; second, moderately high costs result in increased corporate investment; finally, when costs are too high, corporate investment declines.

Inspired by these mentioned pieces of literature, this research aims to study how the stock loan fee can influence corporate financing. Specifically, we will analyze two different financing elements:

First, as seen by Baker and Wurgler (2002), the two intuitive ways a company can react to this market condition are by issuing new shares or decreasing the number of shares held in treasury, which is synonymous with selling its shares.[1] Therefore, we developed a variable that measures the firm's free shares number.[2] Through this variable, we can capture both the issuance of new shares and the change in the number of shares held in treasury; hence, it will be the outcome of our first analysis.

Second, as argued by Albanez and Lima (2014) and Brito, Corrar and Batistella (2007), Brazilian listed companies are characterized by do not often use the issuance of new shares as a form of financing.[3] Therefore, analyzing only the firm's free shares number variation may bring results that do not understand the reality of most companies listed in the Brazilian financial market. Moreover, as seen in Polk and Sapienza (2008) and Campello, Matta and Saffi (2020), the loan fees can interfere with the management process of companies in other ways. For these reasons, our second analysis examines the firms' loans and financing, allowing us to observe whether they change their level of indebtedness due to stock loan fees.

As noted, the crucial explanatory variable of our research is the loan fee. Still, studies investigating the effects of stock loan fees need to be aware of several possible endogenous relationships that it may have with other markets and corporate decisions. Therefore, our empirical strategy is based on the exogenous variations in the loan fees induced by tax arbitrages in the Brazilian financial market.

At this point, we need to make a brief digression to explain some points about

[1] According to CVM (1980), companies listed on the stock exchange may acquire shares of their issue for cancellation or for holding in treasury and, subsequently, dispose of them.

[2] The free shares number of the firm is equal to the total number of existing shares subtracted by the amount it holds in treasury.

[3] Furthermore, in our sample, approximately 57% of companies did not issue new shares between 2013 and 2017.

the earnings distribution of companies listed on the Brazilian stock exchange; this is necessary to understand the tax arbitration and our empirical strategy. In Brazil, the listed companies distribute part of their earnings to shareholders through two types of dividends: Ordinary and Interest on Net Equity (IoNE). The first type of earnings is exempt from taxes, but the investor who receives IoNE dividends must pay 15% of its value as tax. Non-taxable funds took advantage of how this tax was collected to perform the arbitrage. Specifically, the arbitrators borrowed the shares and held them during the IoNE payment process; thus, they earned 15% of the dividend value when it was paid. Consequently, as evidenced in Mota (2013) and Barbosa et al. (2019), the arbitrage funds inflated the loan market fees when seeking shares to borrow; in addition, since the funds did not sell the borrowed shares on the spot market, we can arguer that these increases in loan fees were exogenous.[4]

Therefore, following authors like Barbosa et al. (2019) and Santos and Cordeiro (2020), our empirical strategy exploits the tax arbitration consequences as an exogenous source of variations in loan fees. Specifically, we used the IoNE dividends yields values to build an instrumental variable that isolates the distortions in the loan fees caused by the tax arbitrage. We believe this instrument can perform this task because the tax arbitration net profit is directly proportional to its value, making this likely correlated with arbitrators' demands and, consequently, with fee distortions. Furthermore, assuming that our instrument is related to corporate financing only through arbitrage, we can argue that this is exogenous. We say this because the tax arbitration happened due to some investment funds' tax nature, which is unrelated to the companies' characteristics or decisions.

Synthesizing our empirical strategy: we developed a panel data model where the units of analysis were the companies in our sample, and the periodicity was the quarters of 2013 and 2014. Regarding the endogenous variable of our study, we calculated the volume-weighted quarterly average of the fees for each company to measure its quarterly loan market fees. Afterward, we utilized the sum of the dividend yield values of all IoNE paid by the company in the quarter as the instrumental variable. Our first analysis had the quarterly firm's free shares number variation as its outcome. Then, our second analysis examined the firms' loans and financing.

We estimate our model with the instrumental variable through Two-Stage Least Squares (2SLS). In the estimated results for the first stage, we identified a strong positive correlation of our instrument with the endogenous variable. Specifically, the calculated coefficient had a value greater than 6 in one of our estimations. However, our second-stage estimations did not identify any significant effects of the instrumented variable on the firms' free shares number or indebtedness level. Such results indicate that the loan fees

[4] This arbitration became impossible with the implementation of Law no. 13043/2014.

did not affect the companies' financing.

We can interpret our final result in two ways: First, as evidenced by Barbosa et al. (2019), Mota (2013), and our analyses results, the effects of tax arbitrage on loan fees are significant, but soon (our investigation indicated about four days of effects). Consequently, we can argue that the effect would need to be longer-lasting to transcend the markets and reach corporate financing. This insight allows us to understand the necessary characteristics that a phenomenon must have to its effects "overflow" the markets and hit the corporate decision-makers, representing an essential contribution to the literature. Second, we can hypothesize that firms' managers do not consider the mispricing caused by loan fees. Nevertheless, this finding goes against the evidence brought by Baker and Wurgler (2002) and Polk and Sapienza (2008), which may mean that it results from the particularities of companies listed on the Brazilian stock exchange. Therefore, this outcome contributes to the existing literature by drawing attention to the importance of studying the differences between financial markets around the world, allowing us to add to the theoretical model features that better fit each case.

Indeed, short-selling is an essential element in the efficient pricing process of the stock in the markets (THORNOCK, 2013). However, after the 2008 and the European crises, some policy-makers have sought to implement restrictions on short-selling to different degrees. For that reason, this has become an increasingly discussed topic (MOTA, 2013). Hence, we believe this research can contribute by bringing new ideas and evidence to the debate. Moreover, we can say that it is crucial to understand the relationship between markets in the financial universe of an economy. Finally, to offer the corporate decision-makers more and more efficient theories about corporate finance, it is vital to understand how the market's phenomena can affect companies' businesses.

This text is divided into seven chapters, including this one: In chapter 2, there is the literature review, which comprises three sections, one containing a more general view of the problem discussed, another that addresses research with the theme of short-selling restrictions and prices, and the last section discusses papers related to overvalued prices and corporate finance. Chapter 3 is subdivided into two sections; in the first, we address the structure of the Brazilian loan market; in the second, we talk about the tax arbitration that existed in the Brazilian market. Chapter 4 seeks to observe how the companies in our sample finance their business; specifically, the first section analyzes the issuance of new shares, and the second examines the companies' indebtedness. Chapter 5 discusses matters concerning our database and empirical strategy. Chapter 6 presents and discusses the results obtained in our estimations. Finally, chapter 7 discusses the conclusions that we can draw from our study.

2 LITERATURE REVIEW

2.1 Overview

To facilitate understanding, we divided our literature review into two steps: The first is the relationship between the loan and the spot markets; the second deals with how prices produced in the spot market can change firms' management decisions. We distinguish them since the finance study generally works on these themes separately.

– Figure 1: The Research Route

Source: Author's own elaboration (2022).

Figure 1 summarizes the theory of how the securities loan market can be related to business management decisions. Additionally, the division mentioned in the previous paragraph is also present in the figure. We will continue to address each of these steps in the following two sections of this chapter.

2.2 Short-Selling Restrictions and Prices (First Step)

As we pointed out in the introduction to this research, Miller (1977) was the first article to study the relationship between short-selling and stock prices. In this paper, the author built a microeconomics model that allowed him to point out that short-selling restrictions, added to disagreements between investors concerning the shares' fair value, tend to lead an overvalued prices in the spot market. In a nutshell, the logic expressed by Miller (1977) demonstrates that when investors with negative expectations regarding the stock price face short-selling restrictions, they cannot turn these expectations into a profit opportunity. As such, prices would not reflect the beliefs of all investors.

Leaving Miller (1977) and moving on to Blocher, Reed and Van Wesep (2013), this paper addresses the loan market's influence on the stock market. Specifically, since the short-selling on security has to be accompanied by its borrowing, the loan fees directly interfere with the payoff of short-selling and may make this unattractive. Consequently, the authors demonstrate that loan fees can be similar to short-selling restrictions. In this way, Blocher, Reed and Van Wesep (2013) sought to build a model that united the equilibrium of the loan markets and equity ownership. According to them, the created

model allows a better understanding of the impact of short-selling constraints and how short-sellers affect the demand for stock in the presence of equilibrium in the loan market. An essential result of this model is that exogenous increases in lending fees cause, *ceteris paribus*, overvalued stock prices.

In the two paragraphs above, we worked on the theoretical ideas that underlie the first step of our research. However, before we move on to some empirical references, we need to address a question that will be fundamental in the empirical analysis of these theoretical hypotheses, namely: Is the indicated logic the unique causal relationship between the securities loan market, particularly its fees, and the stock prices? Indeed, the answer to this question is no. Notably, the finance world has an inexhaustible set of possibilities that could lead to another type of relationship between these two markets.

To illustrate this point, let us highlight one of these scenarios to understand the complexity of these relationships: When we have a considerable number of informed investors carrying out the short-sale of shares, lending fees would likely increase. Nevertheless, if these agents were foreseeing, or to some extent causing,[1] a future downward movement in stock prices, these fee increases would be accompanied by a fall in stock prices, leading to a negative correlation between loan fees and stock prices. However, this connection between the markets is not because of the equilibrium logic demonstrated in Miller (1977) and Blocher, Reed and Van Wesep (2013) but due to the nature of the investors who are part of this process (ASQUITH; PATHAK; RITTER, 2005; COHEN; DIETHER; MALLOY, 2007; BARBOSA et al., 2019).

As an empirical example of the issue indicated above, we have the research of Cohen, Diether and Malloy (2007). This paper investigated how stock prices respond to short-selling activity. Thereunto, the authors used a proprietary database of stock lending levels from a prominent institutional investor that allowed them to build a research design that isolated shifts in the supply and demand for stock loans. Cohen, Diether and Malloy (2007) found that increases in loan demand have economically large and statistically significant adverse effects on future stock returns. Regarding the magnitude of these results, an increase in shorting demand causes a negative abnormal return of approximately 2.98% in the following month. However, they did not find strong enough evidence to claim that shifts in short-selling supply are related to future returns.[2]

Now that we have approached the theoretical content and called attention to issues that may occur during the empirical evaluation of those hypotheses, we will go through

[1] As mentioned, short-selling is a combination of the asset loan with its sale in the spot market. Then, when selling the leased assets in the spot market, investors can "tear down" the asset prices depending on the volume of their positions.

[2] The authors argue that these findings suggest that private information and additional non-price costs of short-selling are essential aspects of the link between the loan market and stock prices, while the short-run effects of relaxing/tightening short-sale constraints are less relevant.

the literature to understand how researchers have dealt with these issues.

Boehme, Danielsen and Sorescu (2006) examine the theoretical model of Miller (1977) empirically. The authors built a proxy variable for short-sale constraints using the cost of this operation and the fact that the stock has got options traded on the market or not.[3] Then, they used the analysts' forecasts as a proxy variable for the dispersion of opinion. Boehme, Danielsen and Sorescu (2006) found evidence suggesting that neither short-sale constraints nor a high diffusion of investor beliefs are independently sufficient to produce overpricing. However, if those two elements are present simultaneously, they argue that a significant overvaluation of stock prices occurs. Subsequently, a similar analysis is developed by De-Losso, De Genaro and Giovannetti (2013). In this paper, the authors used a unique dataset on stock lending activity, which contained direct information on the supply curve of the stock-lending market in Brazil. In this way, for a given security, they tried to determine the effect of a shift of its lending supply curve in predicting its short-run future return. First, their results show that short-run future returns decrease when the lending supply increases, but this effect depends on the opinion's dispersion level. Second, the paper results indicated that shifts in lending supply curves do not affect prices when there is little difference of opinion.

In addition to the theoretical approach presented here, Blocher, Reed and Van Wesep (2013) also have an empirical analysis of their model results. The paper worked on two experiments: The first examined the relationship between stock loan supply and returns around dividend payments,[4] and the second experiment looked into returns around earnings announcements. They found evidence to support the idea that changes in the supply of shares affect spot market prices if, and only if, the supply of shares is already constrained.

The possibility of arbitration in the Brazilian market that we will use in our analysis was also present in Barbosa et al. (2019) and Santos and Cordeiro (2020). In the first paper, the authors estimated the causal impact of short-selling restrictions on stock returns, using the tax arbitrage mentioned before as an exogenous variation in the loan stock market. Then, they found that exogenous increases in lending fees cause stock price increases. Further, this arbitration opportunity in the Brazilian market ended with the implementation of Law no. 13043/2014, and Santos and Cordeiro (2020) discussed this Law's consequences on the loan and spot markets. In specific, one of the Santos and Cordeiro (2020) goals was to identify the effect of short-selling restrictions on stock prices. The arbitration logic allowed the authors to elaborate a natural experiment by creating a set of shares to be the treatment group and another set of shares to be the control group.

[3] They found evidence that the short-selling costs are cheaper when firms have options.

[4] For this experiment, they used a phenomenon identified by Thornock (2013): the supply of lendable shares decreases around the dividend record date. Then, they argued that the dividend record date serves as an exogenous decrease in the supply of shares.

Thus, they used a differences-in-differences model as an empirical strategy to estimate the effect caused by the referenced Law. The main paper results indicated a reduction in fees (0.33% per year) and an increase in loan volumes (the significant average increase in daily volume was R$ 1.97 million) for the stocks in the treatment group. However, they did not find significant changes in daily returns.

In addition to the papers mentioned above, this tax arbitration was also studied in Mota (2013) and Santos (2018). Therefore, this phenomenon has been well documented in the literature since the mentioned research brought in-depth explanations of how it works and empirical evidence of its consequences. Nevertheless, we believe that our research can add relevant contributions through new evidence that can reinforce/expand the knowledge of this phenomenon. The same can be said about its use as a source of exogenous variation in the loan market fees.

2.3 Overvalued Prices and Firm Management Decisions (Second Step)

In the previous section, we considered the theories behind the relationship between short-selling constraints and overpriced stocks; and the empirical evidence about that. When discussing these subjects, we brought studies from the finance field concerned with asset pricing in the financial markets. Nevertheless, in this second step, we will see how overvalued stock prices can impact the firms' management process. Consequently, this section will address corporate finance literature, i.e., the study field that aims to understand how companies raise funds for their activities and invest their capital.

Since corporate finance studies address numerous elements, this research will focus on the component that we believe to be the most direct way for overvalued stock prices to impact the management decisions, namely, the firms' capital structure.[5] The literature on this theme is vast and presents research with the most varied possible results. Thus, this section will seek to bring studies and ideas that can help develop our hypotheses.

In the literature on companies' capital structure, there is a concept called market timing, which refers to the possibility of firms taking advantage of opportunity windows caused by temporary fluctuations in their share prices. Specifically, firms can issue new shares at high prices and repurchase them at low prices; Baker and Wurgler (2002, p. 1) explain that the motivation for this strategy would be "to exploit temporary fluctuations in the cost of equity relative to the cost of other forms of capital." Further, Baker and Wurgler (2002) argue that this type of strategy seems to be an essential aspect of firms' financial decisions in practice. To confirm this, they empirically analyzed whether market timing affects the capital structure of companies in the short and long term, and their results indicated that it has significant and persistent effects on firms' capital structure.

[5] Capital structure means how companies use equity and debt capital to finance their activities.

Still exploring market timing, Albanez and Lima (2014) examine whether listed Brazilian companies issue shares when their stock prices are overvalued and repurchase shares when the prices are considered undervalued. In other words, they analyze the market timing influence on the financing decisions of Brazilian companies. To this end, the authors used an adapted version of Baker and Wurgler (2002) model, and they found evidence of market timing effects. However, this influence was not sufficiently persistent during the entire analysis period to determine the companies' capital structure. When discussing this result, Albanez and Lima (2014) argue that Baker and Wurgler (2002) model may face problems when testing the market timing presence in the Brazilian market because most companies listed in this market are characterized by a low frequency of new shares issuance.

Another valuable reference for us is Gilchrist, Hilmmelberg and Huberman (2005), as this paper employed the same logic of overvaluation as us, that is, the idea brought up by Miller (1977). The authors built a model where the dispersion of investor beliefs under short-selling constraints can create stock price bubbles. Using this model, they aimed to find how inflated prices could influence corporate investment. Their theoretical results showed that the firm issues new equity in response to an increase in dispersion of beliefs, partially offsetting the effect of this increase on the price. It is crucial to emphasize the use of the term partially here since the investment increase will not necessarily follow the increase in dispersion or overpricing. In the authors' words: "the model itself implies that the effect of bubbles on investment will be limited since the firm is unwilling to fully exploit the bubble in equilibrium" (GILCHRIST; HILMMELBERG; HUBERMAN, 2005, p. 25).

Further, Gilchrist, Hilmmelberg and Huberman (2005) also tested the hypotheses of their model empirically. They did it using a Vector Autoregression (VAR) system with three variables: the marginal product of capital, the dispersion of investors' opinions, and investment. The VAR results showed that shocks in the dispersion have positive and statistically significant effects on Tobin's Q,[6] net equity issuance, and real investment. These results, according to them, confirmed the model's key predictions.

Based on the studies discussed up to this point, we can argue that, when faced with an overvalued price of their company's shares, managers can seek to benefit from it by issuing new shares. However, although it is crucial for our research development, the issuance analysis will not be enough to build all our hypotheses for two reasons: First, this does not exhaust all the critical connections between the overvalued stock prices and the firms' financing. Second, there is a fundamental fact that we cannot lose sight of: our analysis is developed in the Brazilian financial market and, as stated by Albanez and Lima (2014) and Brito, Corrar and Batistella (2007), Brazilian listed companies do not usually

[6] "Tobin's Q is defined as the ratio of the market value of equity to the replacement value of capital." (GILCHRIST; HILMMELBERG; HUBERMAN, 2005, p. 16).

issue new shares; thus, an analysis that focuses only on the stock issuances is bound to encounter many difficulties in obtaining empirical results. Consequently, we need to move our discussion to other ways that overvalued stock prices can affect the firms' management process.

Polk and Sapienza (2008) studied whether mispricing in the stock market has consequences for firms' investments; however, instead of analyzing the managers' response through the issuance of new shares, the authors examined the firms' investments. The synthesis of the idea presented in the article is that: when faced with overvalued prices of its shares, the manager can interpret that the market is evaluating the current investments of its company with a positive bias. Therefore, since the current investment is overvalued, the manager increases the firm's investment level to take advantage of this moment of overvaluation, aiming to maximize the share price in the short term. Hence, through this logic, overvalued prices can cause an increase in the company's investments.

The theoretical model used in Polk and Sapienza (2008) allows us to understand how mispricing can influence the firms' investment. Additionally, a critical insight obtained from Polk and Sapienza (2008) model was that the incentive to overinvest increases as the expected duration of mispricing increases and decreases as the horizon of the average shareholder lengthens. About this, they say: "Intuitively, if managers expect the current overvaluation to last, and if investors have short horizons, then managers increase investment to take advantage of the mispricing [...]" (POLK; SAPIENZA, 2008, p. 191).

Moving our discussion to another essential reference, Campello, Matta and Saffi (2020) studied the relationship between the short-selling costs and corporate decisions such as investment and share repurchases. Using a rich mathematical framework, the authors created a theoretical model to analyze an economy where the firm's manager raises funds with investors who learn about the firm's potential through its stock prices. Furthermore, subject to shorting costs, informed and uninformed speculators trade in the stock market, which determines the shares prices and the informational quality of this market.

Unlike Campello, Matta and Saffi (2020), in our study, we do not seek to delve so deeply into the theoretical intricacies of these issues, as well as we do not aim to cover, within our hypotheses, the active role of companies aiming to manipulate stock prices in the markets. However, this paper is an essential reference for us, as it brings relevant results that allow us greater clarity of managers' strategic decisions. Specifically, Campello, Matta and Saffi (2020) have an outcome that can give us a crucial insight, then let us focus on this one. The authors identified a non-monotonic relationship between short-selling costs and investment when companies cannot repurchase shares due to financing restrictions. The main idea behind this result can be explained in three parts: First, when the short-selling cost is low, both informed and uninformed speculators trade in the market, which ends up harming the level of information in the spot market; then, since the investors learn

through the stock price, this low level of information makes them choose to invest less in that company. Second, when the cost of short-selling is moderately high, uninformed speculators do not trade, leaving only informed speculators in the market; as a result, the informational quality of the shares price becomes high, which leads investors to increase their investment in the firm. Finally, when the short-selling cost is too high, both informed and uninformed speculators do not trade in the market, leading the share price to have a low level of information; in response, investors decrease their investment in the firm. In summary, Campello, Matta and Saffi (2020) demonstrate that the final result of the corporate investment will depend both on the informational quality of the markets and the magnitude of the increase in short-selling costs.

As stated in our introduction, we aim to study the effects of stock loan fees on the firms' financing. Thereunto, we will analyze the firms' free shares number, aiming to assess the alteration of the treasury shares number and the issuance of new shares. Furthermore, we will also examine whether the firms react by changing their loans and financing levels, which is synonymous with increasing or decreasing indebtedness. Therefore, the connection between the loan market and these firms' financing decisions occurs by combining the previous section's theories with the ideas addressed here. Hence, we believe that one of the main contributions of our research is to unite these two fields of study.

3 INSTITUTIONAL FRAMEWORK

This chapter aims to approach two subjects: the first is to describe the environment where our research will be developed, namely, the Brazilian loan market; the second is to address the tax arbitration in the Brazilian financial market. This way, we will continue to subdivide this chapter into two sections.

3.1 The Brazilian Loan Market

Empirical research involving the loan market constantly faces problems in obtaining data. Specifically, this happens because, in most countries, information on equity lending transactions that span the entire market is not available, as lending services do not have a central counterparty. However, in the Brazilian financial market, all loan operations are registered on a centralized platform, the B3, thus creating a unique opportunity to empirically study phenomena involving asset lending (BARBOSA et al., 2019).

All shares of companies listed on the Brazilian stock exchange can be borrowed. This way, the investor who wishes to offer their securities to lease, henceforth called lender, must previously deposit them at the B3 Depository Center since, as stated, B3 plays the role of a central counterparty providing guarantees of the operations. The lender decides the characteristics of the loan contract they will offer, such as the duration, the amount of the shares, and the loan fee. Therefore, the lender's intermediary institution is responsible for inserting the offer in the Securities Banking System Brazilian Settlement and Custody Company (BTC).[1] On the other hand, the investor who demands to borrow the asset, henceforth called the borrower, will seek the one that interests him among the contracts offered in the market (SANTOS, 2018).

Summing up what we have explained so far, five players are involved in this operation: the lender, the borrower, the lender's broker, the borrower's broker, and the B3. Trade carried out in this market will be characterized by the number of securities borrowed, the date when the borrower must return them,[2] and the fee paid by the borrower to the lender. It is worth saying that this transaction involves other payments in addition to the fee, such as the lender's broker commission, the borrower's broker commission, and the fees charged by B3.

When lending their shares, the lender loses the right to vote at the firm's meeting. However, they maintain the other shareholder benefits. Furthermore, due to the guarantees that B3 requires from the borrower, we can say that the risk of default in this transaction is practically non-existent (SANTOS, 2018; MOTA, 2013).

[1] Brazilian Settlement and Custody Company translates the term in Portuguese *Companhia Brasileira de Liquidação e Custódia* whose acronym is BTC.

[2] The borrower can return the leased assets before this date but never after.

3.2 Tax Arbitration

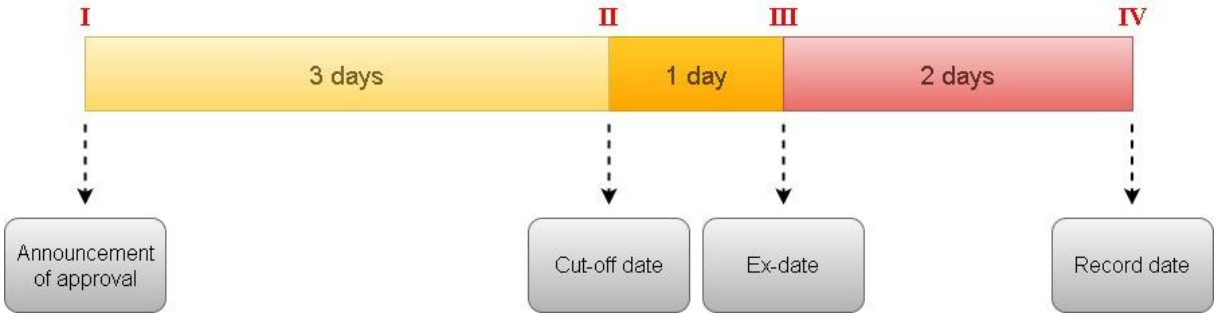
Now, we will address a fundamental point of our research: the tax arbitration that existed in the Brazilian financial market before 2015. So, this section will be divided into three subsections to facilitate the explanations. First, we will address some aspects of the dividend distribution process in the Brazilian financial market, as those played a crucial role in the functioning of tax arbitration. Subsequently, the second subsection will talk about how arbitration worked. Finally, the last subsection statistically analyzes the effects of this arbitrage on the spot and loan markets.

3.2.1 Dividend Payments

As we mentioned in the introduction of this dissertation, companies that have shares on the Brazilian stock exchange distribute part of their earnings to investors through two types of dividends: Ordinary and Interest on Net Equity (IoNE). For our purposes, it suffices to say that the main difference between these two types of earnings distributions is the taxation that falls on them. Specifically, investors who receive Ordinary are exempt from paying taxes, whereas those remunerated through IoNE are taxed at 15% of the dividend value. Although this difference between the types of dividends plays an essential role in some analyzes of our research, at this point, we will focus on what is common to them.

The B3 rules set up several important dates in the dividend payment events. Next, we bring a figure (2) to help summarize the dividend payment timeline and highlight the most important dates for our research.

– Figure 2: Timeline for Dividend Payments



Source: Author's own elaboration (2022).

The first relevant date in the dividend payment procedure is the Announcement date, the step I in figure 2. As the name indicates, this is the day when the company announces the approval of the dividends payment, its characteristics, and the date on which stage II of our timeline will occur, namely, the Cut-off date. As we can see in the figure 2, the event known as the Cut-off date must occur at least three days after the

Announcement, and, from this day on, there will be defined the investors who are entitled to receive the amount of the proceeds. In other words, in the days after this date, the one who buys the share will not pocket the dividend payment, as this will be paid to the investor who was the owner of the share on the Cut-off date. The trading day following step II is the ex-dividend day (event III in figure 2). Specifically, following the B3 rules strictly, the stock is labeled as ex-dividend in the next eight trading days after the Cut-off date. However, in our timeline, we are highlighting as Ex-date only the stock's first trading day after the Cut-off date.[3] The last phase of our timeline,[4] event IV, is the Record date. As spot market transactions on the Brazilian stock exchange have settlement D+3, that is, three days after the trade, it is only possible to know who is entitled to receive the dividends after three days from the Cut-off date. Therefore, when the settlements of the trades on the Cut-off day occur, the company can register those entitled to receive the dividend.[5]

3.2.2 How Arbitration Worked

Once the reader understood the dividends distribution dynamics, the following question might have appeared: How do the payments of these proceeds occur if the securities are leased? The answer to this question is the starting point for understanding the tax arbitration that this section will address.

As mentioned in section 3.1, as long as a stock loan contract lasts, the borrower is treated as the one who must receive the dividends paid by the company. However, the lender is still the holder of the right to receive this payment. Therefore, to solve this impasse, the borrower will receive the proceeds, and it will be up to him to collect the taxes (15% of the value), if the dividend is taxable (IoNE-type), and transfer the remainder to the lender (SANTOS; CORDEIRO, 2020).

Therefore, before Law no. 13043/2014 came into effect, the "transferring" process of the proceeds allowed a singularity to occur depending on the tax nature of the agent who borrowed the share. Namely, if the investor was a non-taxable investment fund, they did not need to transfer the tax amount to the government, making it possible for the fund to appropriate 15% of the dividend value. Thus, this peculiarity in the IoNE payment meant an opportunity for tax arbitration for these non-taxable funds. Between the dates of Announcement and Record[6] of the payment of IoNE-type proceeds, the non-taxable

[3] This date is crucial in the spot market, as it is on this day that the value of the dividend is incorporated into share prices.

[4] Note that the term "our" timeline was used not by chance but because there are other dates within this process; however, we only highlight the events that will be useful to us in this research.

[5] The figure 2 elaboration and the explanations in this paragraph were mainly based on Barbosa et al. (2019) and in an official document from B3 (BM&F BOVESPA, 2016).

[6] We said that the arbitration opportunity extends to the Record date and not to the Cut-off

fund could borrow the shares, keep them in its custody, and return the shares to the investor who ceded them after the date of Record. Once this process had been carried out, and the dividends paid, the fund transferred 85% of its value to the investor who assigned the share in the loan agreement.[7] Nevertheless, the other 15% figured as gross profit, and once discounting the costs of this transaction, such as brokerage and the loan fee, the fund made a net profit on a risk-free transaction. However, with Law no. 13043/2014, this arbitration opportunity became no longer possible, as this established that investment funds would become taxable when they received dividends from shares obtained by loan.

Once we have understood the mechanisms of the tax arbitrage in question, we can pay attention to two facts that make it an exogenous shock in demand for loans: first, the decision of the funds to borrow the shares has no relation to the expectations regarding the price behavior on the spot market; second, a subtle and essential point is that the funds must keep the shares in their possession to carry out the arbitrage, that is, they cannot sell them on the spot market. Thus, it seems that the only way this phenomenon affects prices in the spot market is through the vector that we have explained, namely: The demands of funds for stock loans cause fee increases, and, as a result, investors wanting to short-sell will find worse payoff for their operations, which reduces the number of investors willing to carry out this type of trade (synonym of short-selling restrictions); consequently, the stock market finds an overvalued equilibrium price (SANTOS; CORDEIRO, 2020; BARBOSA et al., 2019; MOTA, 2013).

3.2.3 Analyzing the Arbitration Effects

With the explanation given in the previous section, it was possible to understand how tax arbitration worked. In addition, we discuss the possible effects of this on markets. Now, let us see if these effects actually happened in the markets.[8]

3.2.3.1 Loan Fees and Tax Arbitration

As explained in subsection **3.2.2**, before the implementation of Law no. 13043/2014, non-taxable funds had the possibility of carrying out an operation in which, through the stock loan market, they could appropriate the part of the IoNE amount that the taxable investors would pay to the government. So, to carry out the arbitration, the funds had to borrow the shares before the Record date. Therefore, our first analysis will investigate

date since, unlike the spot market, the loan market has a D+0 settlement. Therefore, to be registered as the shareowner on the Record date, the investor can borrow the share one day before this date.

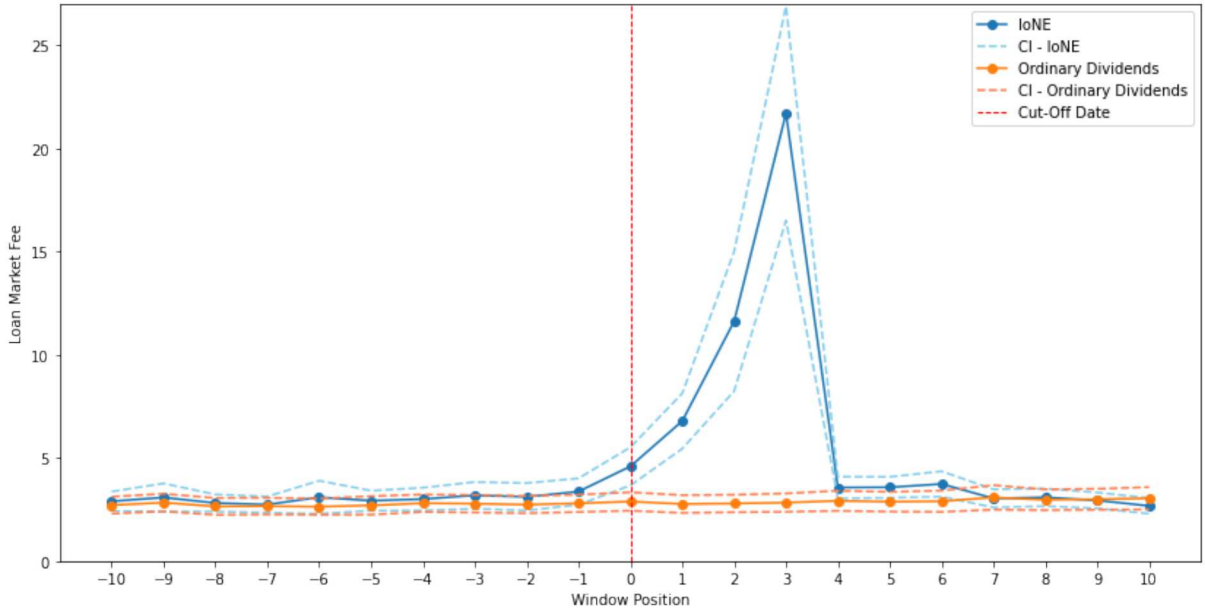
[7] It is relevant to note that this was only possible if the investor who lent the share was not also a non-taxable fund since, in this case, the agent who borrowed the share would have to transfer 100% of the dividend value.

[8] It is vital to say that the investigation carried out in this section was inspired by the analysis of Barbosa et al. (2019).

whether there was any disturbance in the loan market fees when the stock paid dividends before the Law.

First, however, to understand the X-axis of the graphs in this section and the next, it is necessary to briefly introduce the Analysis Windows, namely, the mechanisms that we used to insert the temporal logic expressed in the image 2 into our database. Specifically, the Analysis Window exhibits the position of a day concerning the Cut-off date. For example, position -1 of the Analysis Window informs us that this is the day before the Cut-off date; through the same logic, position +4 indicates that this date is four days after the Cut-off date.[9]

– Figure 3: Mean of Loan Market Fee (2013 and 2014)



Notes: The X-axis displays the day's position concerning the Cut-off date. The solid lines are the averages. The dotted lines are the CI of the estimates.
Source: Author's own elaboration (2022).

The analysis exposed in the graph 3 shows the trajectory of the mean fee of the loan market in each position of the Analysis Window, dividing the distribution events of earnings between IoNE and Ordinary dividends. Additionally, in the graph, the dotted lines show the confidence intervals (CI) of the estimated means for the 95% confidence level (CL).[10] Therefore, it is possible to observe how the mean fee fluctuates in each Window position. Also, we can compare the trajectory behavior of the IoNE distribution events (where it was possible to carry out arbitrage) with the payment of Ordinary dividends (where it was not possible to carry out the arbitration). Finally, we must also say the

[9] In Appendix A of this text, we discuss the process of creating the Analysis Windows in more detail.

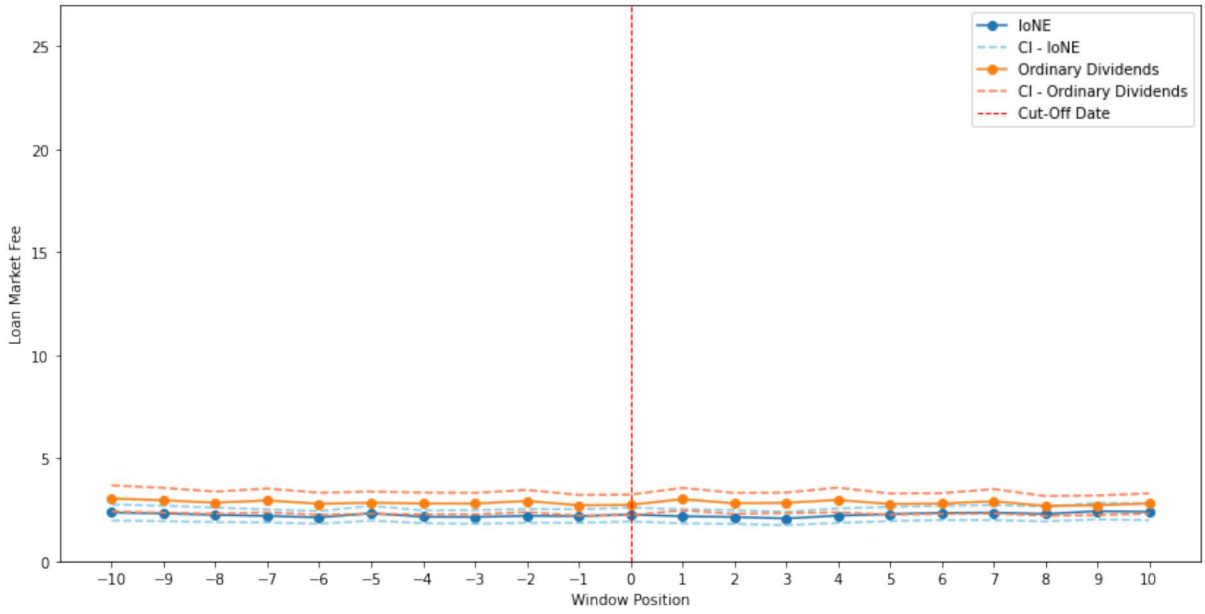
[10] The two dotted blue lines represent the upper and lower limits of the CI for IoNE-type means; similarly, the orange dotted lines indicate the CI of Ordinary dividend cases.

period covered by the analysis in the graph 3 is restricted to 2013 and 2014, i.e. before Law no. 13043/2014 came into effect.

In the graphic 3, from position -10 to -1 of the Analysis Window, we can see that the trajectory of the mean fee in IoNE cases (blue line) follows a similar behavior to the mean for Ordinary dividend events (orange line). Nevertheless, from the Cut-off date, the mean fee of IoNE events increases, while the trajectory of Ordinary dividend events remains unchanged. Next, there seems to be a normalization of this behavior from position +4 onwards, i.e., after the Record date. Finally, through the confidence intervals shown in the graph 3, it is possible to identify that from the 0 to +3 positions, the means for IoNE-type is statistically higher than the means for the Ordinary dividends.

Before moving on to the subsequent analyses, we must say that all the results exposed in this subsection, and the next one, will follow the same presentation logic used in the graphic 3; what will change with each analysis will be the period, and the variable studied.

– Figure 4: Mean of Loan Market Fee (2015, 2016 and 2017)



Notes: The X-axis displays the day's position concerning the Cut-off date. The solid lines are the averages. The dotted lines are the CI of the estimates.

Source: Author's own elaboration (2022).

Now, we follow our study on the loan market fee to the graph 4, which analyzes the period after Law no. 13043/2014 came into effect, that is, the years 2015, 2016, and 2017. Unlike the previous one, in this graph, the means of the Ordinary dividend and the IoNE cases are statistically equal in all the Analysis Window positions - we say this because their confidence intervals intersect in all positions.

In summary, the pieces of evidence presented in the graphs 3 and 4 indicate that the funds increased the loan fees when seeking stocks to borrow to arbitrate. We assert

this based on three points: First, in the graph 3, the mean fees increase when it is possible to carry out the arbitration (before the Record date), and, after this, the mean returns to "normal." Indeed, as stated in the subsection **3.2.2**, it is precisely after the Record that the arbitration becomes no longer possible. Second, the average fee increase behavior is only present in the case of the IoNE since the mean for the Ordinary dividend type does not show significant changes in all of the Analysis Window positions. Recall that the Ordinary dividend type is not taxed, which means it was impossible to carry out tax arbitration on this. Consequently, it was expected that its average fee would remain unchanged even in positions where funds performed tax arbitrage. Third, as shown in the graph 4, the pattern that indicated the presence of arbitrators inflating the loan fees disappeared after Law no. 13043/2014 came into effect.

3.2.3.2 Stock Return and Tax Arbitration

Since the previous section evidenced a significant inflationary pressure from tax arbitrage on loan market fees, it is possible to suppose that this had a restriction effect on short-selling, which impacted prices in the shares spot market. Therefore, this section will study the tax arbitration effect on stock returns. Thereunto, we built a variable to observe the stock accumulated abnormal return in the Analysis Window.[11] To estimate this variable, we first subtract the shares' daily return by the Ibovespa return;[12] then, we calculate the accumulated value of this variable for all positions in the Analysis Window starting from position -10.[13]

The graph 5 brings the accumulated abnormal return means in each Analysis Window position. As in the previous section graphs, we divided the events of IoNE and the Ordinary dividend payments to compare the average trajectories.

In the graph 5, the trajectory of average for the accumulated abnormal return of IoNE-type allows us to observe three essential facts: First, the means for this type of dividend are always greater than zero. Second, the averages increase from the -10 to +1 positions, then, the trend seems to be interrupted, and the means start to move in a "lateral" way. Third, the trajectory of average for the IoNE events is statistically equal to the Ordinary dividends means in the range from -10 to 0. However, in the range from +1 to +8, the means for the IoNE-type stay above the means for Ordinary dividends. Next, the means are again statistically equal at positions +9 and +10.

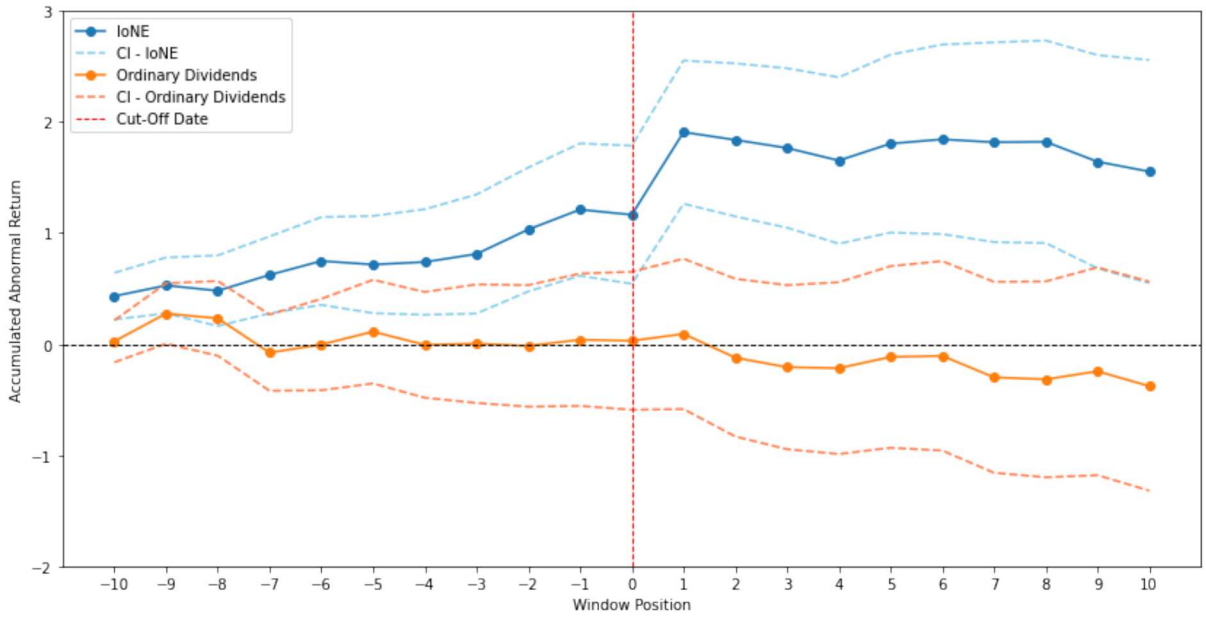
In the graph 6, we made the same analysis process for 2015, 2016, and 2017, i.e., the period in which Law no. 13043/2014 had already ended the tax arbitration. As a

[11] It is worth mentioning that we based the creation of this variable on Barbosa et al. (2019).

[12] We exclude shares that have undergone grouping, splitting, and bonus events. We did this to prevent variations due to these events from distorting our analyses.

[13] As an example, we have that the value of this variable for position -7 is the result of the accumulation of abnormal returns for days: -7, -8, -9, and -10.

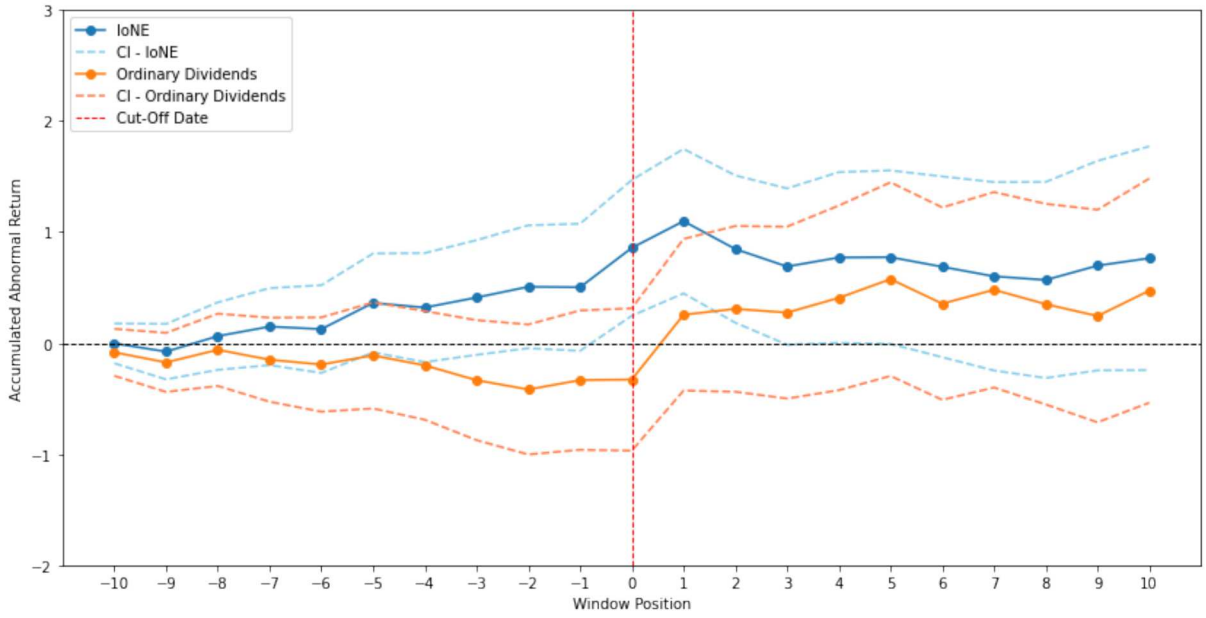
– Figure 5: Mean of Stock Accumulated Abnormal Returns (2013 and 2014)



Notes: The X-axis displays the day's position concerning the Cut-off date. The solid lines are the averages. The dotted lines are the CI of the estimates.

Source: Author's own elaboration (2022).

– Figure 6: Mean of Stock Accumulated Abnormal Returns (2015, 2016 and 2017)



Notes: The X-axis displays the day's position concerning the Cut-off date. The solid lines are the averages. The dotted lines are the CI of the estimates.

Source: Author's own elaboration (2022).

result, in the graph 6, the trajectory of average for the IoNE-type has no significant level variation across the Window positions, and the averages have a value statistically equal to zero in most positions. In addition, we can detect that the means of IoNE and Ordinary dividends are statistically equal in all positions.

The results presented in this subsection advocate for the price overvaluation hypothesis that we have been working on, i.e., the short-selling restrictions - caused by high loan fees - can lead to overvalued shares. Similar to the previous section, the logic behind this statement lies in the fact that it is possible to observe a pattern of overvaluation only in IoNE events means; further, this pattern disappeared in the period when arbitration became impossible by Law no. 13043/2014.[14]

[14] The results obtained here and in the previous section are similar to those found in Barbosa et al. (2019).

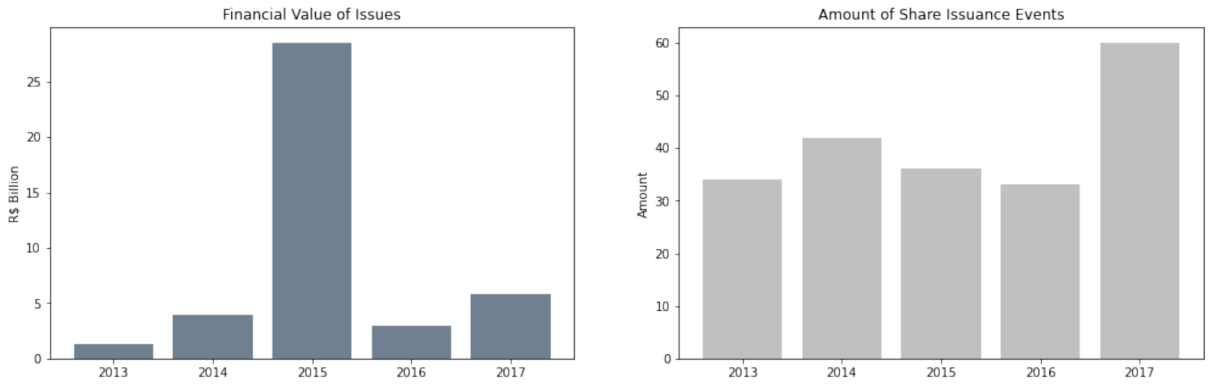
4 HOW DO THE COMPANIES FINANCE THEIR BUSINESS?

As pointed out, we aim to analyze how short-selling constrained by expensive loan fees impacts the firm's financing decisions. However, to avoid endogeneity issues, it was necessary to find a source of exogenous variation in loan fees. Thus, in the previous chapter, we addressed a tax arbitrage used to perform this task in our empirical analysis. So, imagining our universe of study as a regression, until now, it is as if we had only discussed what concerns its "explanatory variables." Nevertheless, the "outcome" of our regression still needs to be addressed, namely, the firms' financing decisions. Therefore, this chapter will focus on this element by answering the following question: How do our sample companies finance their business?

4.1 Issuance of New Shares

This section describes the behavior of the companies in our sample regarding the issuance of new shares.[1] Thereunto, we bring the figure 7 containing two graphs: In the one on the left, for each year from 2013 to 2017, we brought the total financial value raised by companies through share issuance. Through this, we can see that more than R$ 25 billion in shares were issuance by companies in 2015; however, the values were below R$ 6 billion in the other years. Given our sample size (106 firms), we can consider these financial volumes low, which is the first indication that the companies in our sample do not make much use of this financing instrument.

– Figure 7: Analysis of the Issuance of New Shares



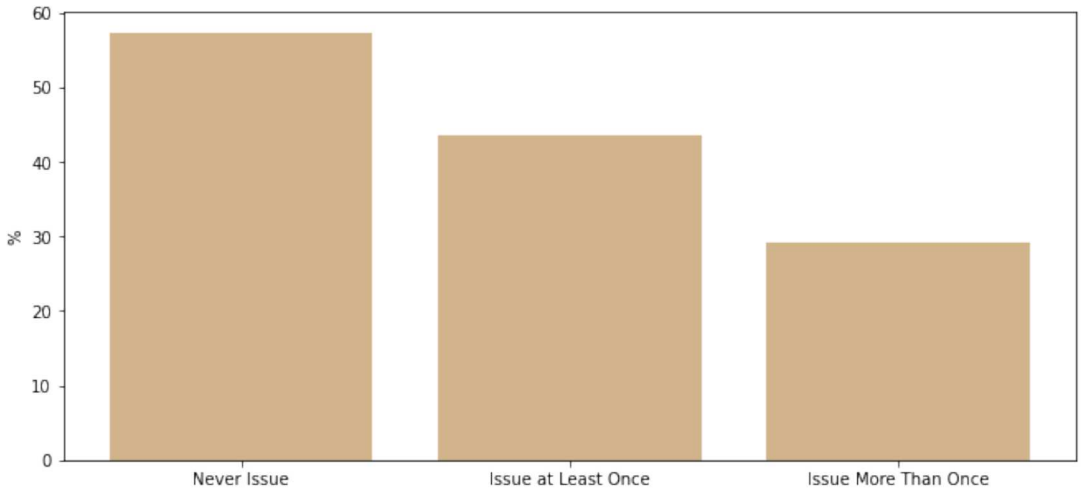
Source: Author's own elaboration (2022).

Next, the graph on the right shows the number of new shares issuance events per

[1] It is worth mentioning that we are not considering the issuance of shares for the bonus payment. Therefore, we are only examining the issuance that seeks to raise funds for the company.

year.[2] As can be seen, there were more than 30 share issuances events every year, and this number reached more than 60 in 2015. This information goes in a slightly opposite direction to what we conclude about the previous graph. Since there are 106 companies in our sample, more than 30 share issuance events per year represent a relatively high number of events.

– Figure 8: Percentage of Companies Issuing New Shares



Source: Author's own elaboration (2022).

In our last analysis on the issuance of new shares, we divided the companies in our sample into three groups: those that never issued new shares, those that issued at least once, and, finally, the firms that issued new shares more than once. So, the graph 8 shows each group's percentages. As we can see, about 57% of the companies did not issue new shares. This result demonstrates that the companies in our sample rarely use financing via the issuance of new shares. In addition, we can observe that most companies that issue new shares do so again. We say this because the percentage of the companies that issued new shares at least once (approximately 44%) is not much higher than the percentage of those that issued new shares more than once (approximately 29%). Hence, this fact explains the considerable number of issuance events per year observed in the previous analysis.

In summary, the results presented in this section align with the statements of Albanez and Lima (2014) and Brito, Corrar and Batistella (2007), namely, companies listed in the Brazilian financial market are characterized by infrequently using the issuance of new shares as a form of financing.

[2] Excluding those for shareholder bonuses, we consider every stock issuance disclosed by the companies to be an issuance event.

4.2 The Liability Profile of Companies

Since the previous section found that the companies in our sample do not use much issuance of shares to raise funds, we need to look for the main forms of indebtedness that these companies use. Therefore, in this section, we will "enter" into the accounts of companies' short and long-term liabilities to identify their most frequently used financing instruments.

Starting with short-term liabilities, called current liabilities, the table 1 presents the results of our investigation for this one. Nonetheless, to understand this information, we have to explain how our examination process took place: First, through the balance sheets, we observed the current liabilities of each company and captured the account with the highest value. Second, we estimated the percentage value of this account about the sum of the values of all current liabilities; let us call this by account percentage to simplify future mentions. Third, it is essential to say that we carried out this process for the balance sheet data of 2013 and then repeated it for 2014. The statistics on these pieces of information are in the table 1; its structure is: In the Quantity column, for each account, it is reported how many companies had this as the highest value account of its current liabilities. Further, in the % Account column are the account percentage averages.[3]

Table 1 – Analysis of Current Liabilities Profile

	31/12/13		31/12/14	
Account	Quantity	% Account	Quantity	% Account (%)
Open Market Financing	2	42.09	0	0
Deposits	15	63.95	13	64.27
Loans and Financing	31	51.21	36	58.99
Providers	22	47.86	24	46.75
Social and Labor Obligations	4	35.87	0	0
Others	33	68.78	35	66.38

Notes: The Quantity column reports, for each account, how many companies had this one as the highest value account of its current liabilities. The % Account column reports the account percentage averages.

Source: Author's own elaboration (2022).

As we can see in the table 1, there is a kind of "diversification" in the short-term financing instruments used by companies in both years. Specifically, such diversification can be in two ways: First, with an "external" meaning, that is, when we compare the companies in our sample, we did not observe a consensus between them on the financing

[3] Since this process may not be simple to understand, we will try to illustrate it through an example. Suppose that three companies had the "Credit Card" account as the highest value in current liabilities. Also, imagine that the account percentages were 40% for the first company, 50% for the second, and 60% for the third. Therefore, for the "Credit Card" account, the Quantity column of the table will be equal to 3, and the % Account column value will be 50% (that is, the average of the three values).

instruments. We say this because there is no account with a much higher number than the others in the Quantity column. Regardless, it is worth calling attention to the "Loans and Financing" account numbers that stand out from the others. Second, the term diversification has an "internal" meaning, i.e., the companies do not seem to choose only a single type of debt. This statement is based on the values analysis of the % Account column, where it is possible to see that no values are more than 80%; however, it is essential to mention that this kind of diversification has a limit since the values in the % Account column are close/above than 50%.

Subsequently, we repeated the same process for non-current liabilities (long-term liability), and the results are in the table 2. This analysis shows that the account "Loans and Financing" assumes a prominent position, demonstrating that most companies in our sample prefer this type of long-term financing instrument. As a result, we can say that the "external" diversification, observed in the case of current liabilities, does not seem to exist here. Furthermore, when looking at the % Account column, we see that the values have increased, demonstrating a reduction in the "internal" diversification of the companies.

Table 2 – Analysis of Non-Current Liabilities Profile

	31/12/13		31/12/14	
Account	Quantity	% Account	Quantity	% Account (%)
Deposits	12	60.58	10	65.76
Loans and Financing	60	77.05	57	78.09
Provisions	8	79.85	11	82.78
Acceptance and Securities Issuance	3	51.34	4	43.10
Deferred Taxes	7	84.47	8	82.09
Others	17	74.79	18	68.49

Notes: The Quantity column reports, for each account, how many companies had this one as the highest value account of its non-current liabilities. The % Account column reports the account percentage averages.

Source: Author's own elaboration (2022).

In short, the table 2 results show that, for long-term debt, most companies choose to raise funds through "Loans and Financing." Moreover, companies seem to diversify their long-term funding sources less than in the short-term case. However, we are not saying that companies choose "only" one way to raise funds. Such a claim cannot be made because there is still diversification in their non-current liabilities as to the most % Account column values are less than 80%.

In conclusion, seeking the answer to the central question of this chapter, this section sought to delve deeper into the companies in our sample to provide information on their liabilities. Then, in the analysis of current liabilities, we observe that companies do not seem to prefer a specific type of financing instrument when seeking to raise short-term capital. However, the conclusions are different when we investigate non-current liabilities, as companies in our sample indicate a preference for raising long-term resources via "Loans

and Financing." Nonetheless, although our results point to a diversification in the financing instruments chosen by the companies, it is necessary to limit the components from liability that we will analyze. We say this because, otherwise, it would be observing elements such as labor charges, taxes, and production costs; as a result, our investigations would be outside the scope of this dissertation. Therefore, given the prominence that the account "Loans and Financing" presented, one of our analyses has an indicator that measures companies' level of Loans and Financing as the explained variable.

5 METHODOLOGY

Once it has performed all the preliminary analyses necessary to understand the intricacies of our research problem, we can address the strategy adopted to empirically evaluate the effects of loan fee increases on corporate decisions. Then, this chapter will continue to subdivide into four sections: First, we will talk about the database. Second, we will deal with some issues that concern the construction of the variables that play a fundamental role in our research. Third, we will discuss the instrument used in our analysis to observe exogenous variations in loan market fees. Finally, we will bring our model based on an instrumental variable framework employed to obtain our main results.

5.1 Database

Information concerning the loan and spot markets were obtained from files made available by B3. In addition, the historical series of Ibovespa[1] was sourced from the *Yahoo Finance* website. These pieces of information period are from 2013 to 2017, and their frequency is daily. To obtain data on earning payments was necessary to develop a program (*web scraping*) that automatically accessed the B3 website to import the information. Similarly, the data about the composition of the company's share capital (the firm's stock number and the amount held in the treasury) was also collected through a *web scraping* program designed to import the information from the CVM website.[2] Otherwise, we obtained data on the firms' accounting, issuance of new shares, and corporate events through files available on the CVM website.

Table 3 – Database Summary

Information	Frequency	
	Before the Law	After the Law
Quarters	8	12
Ordinary Dividends	484	600
IoNE Dividends	429	603
Total Firms	106	
Total Stocks	330	

Source: Author's own elaboration (2022).

Also, it is worth mentioning that the firms' accounting data and the information on the composition of their capital share are in the quarterly period. Finally, we excluded

[1] Bovespa Index, popularly known as Ibovespa or IBOV, is the main benchmark index of the Brazilian stock exchange.

[2] CVM is an acronym for the Portuguese term *Comissão de Valores Mobiliários*, which the free translation could be "Securities Commission." According to information on the website of the Brazilian Federal Government, the CVM is a government agency to inspects, regulates, disciplines, and develops the securities market in Brazil.

companies from our database using two criteria: first, if they did not distribute earnings; second, we exclude companies whose shares have never been traded on the loan market. The table 3 displays the frequency of essential information in our database.

5.2 The Variables

We will discuss three subjects in this section: First, how we created a variable to represent the quarterly loan fee. Second, how we developed a variable to express the quarterly dividend yield value. Third, we will address the accounting indicators used in our analyses.

5.2.1 The Loan Fees

Until now, when working with the loan fees, we deal with daily market information. However, since the companies' accounting data are released quarterly, our principal analysis is through panel data that examines the firms' financing quarterly. So, it was necessary to build a variable to represent the average fees paid in the loan markets of the firm's shares for each quarter. Therefore, we estimate the quarterly average of the loan fee through a technique frequently used in finance, namely, the volume-weighted average.[3] Below, there is a demonstration of how this average is estimated:

$$VWAF = \frac{Fee_{1^{st}} * Volume_{1^{st}} + Fee_{2^{nd}} * Volume_{2^{nd}} + ... + Fee_{Last} * Volume_{Last}}{Volume_{1^{st}} + Volume_{2^{nd}} + ... + Volume_{Last}} \quad (5.1)$$

As we can see, the way of calculating this average is simple. First, for each day, the fee value is multiplied by the financial volume of loan contracts traded on that day. Then, we sum all of these values. Lastly, the final result is divided by the sum of the financial volume of all days. In order to facilitate future mentions, we will call the volume-weighted average fee by VWAF. Next, when the company has more than one share, we calculate the quarterly VWAF for each of its shares, and then we estimate the average value to represent the company's VWAF. However, when the company has only one share, the company's VWAF is the value of this variable for its stock.

5.2.2 Dividend Yield

A crucial variable in our analysis is the dividend yield. Thus, this subsection explains what this variable is, how we estimated it, and the process of creating the firm's quarterly dividend yield.

The dividend yield is the value of the dividend payments expressed as a stock price percentage. For example, suppose that a given firm A announces that investors who own

[3] Barbosa et al. (2019) also used this type of average in their analyzes.

its ordinary shares will receive R$ 1 of dividends per share; further, assume that firm A' ordinary share price is R$ 10. As a result, the dividend yield equals 10% in this example.[4]

Through the calculation indicated in the previous paragraph, we obtained the dividend yield for each earning paid. However, we needed to measure the firm's quarterly dividend yield; therefore, it was necessary to perform some procedures paying attention to certain subtleties. First, to estimate the quarterly dividend yield of the stock, we add up all the dividend yield values for all payments made by the stock in the quarter. Second, to obtain the variable value for the firms, we calculate the average dividend yield of their stocks.[5]

5.2.3 Accounting Variables

We calculate five accounting indicators for companies: Profitability, Investment, Indebtedness, Short-Term Indebtedness, and Long-Term Indebtedness. These variables will play an essential role in our analyses. Therefore, this subsection will seek to explain what they illustrate and how they were calculated.[6] In addition, we will also address the process of calculating the percentage change in the free shares number of the company.

Indebtedness will be the basis for elaborating an essential variable of our research. Specifically, we seek to observe the level of the company's loans and financing through it. The way we calculate this indicator is in the following equation:

$$Indebtedness_t = \frac{ShortLoans\&Financing_t + LongLoans\&Financing_t}{TotalAssets_t} \tag{5.2}$$

Further, we divided the loans and financing of current liabilities from those of non-current liabilities to estimate the indicator 5.2 for the short and long term:

$$ShortTermIndebtedness_t = \frac{ShortLoans\&Financing_t}{TotalAssets_t} \tag{5.3}$$

$$LongTermIndebtedness_t = \frac{LongLoans\&Financing_t}{TotalAssets_t} \tag{5.4}$$

Before we go any further, it is worth mentioning that we estimated the variation in Indebtedness by subtracting its value in the current period from its previous period value.

[4] We used the share's price from the day before the Ex-date to estimate the dividend yield.

[5] At this point, it is essential to say that we solved a specific issue to estimate the dividend yield for the stock. This issue was when the dividend was paid at the end of the quarter, so the Ex-date and Record date were in different quarters. The process to work around this problem is described in Appendix B.

[6] We base these indicators on Brito, Corrar and Batistella (2007).

The Profitability indicator refers to the company's net profit, which we used as a control variable in our regressions. The estimation of this indicator was as follows:

$$Profitability_t = \frac{NetProfit_t}{Equity_t} \tag{5.5}$$

As it will be possible to observe, we changed this variable to its lagged value in one of the estimations. We did this to look for a more lasting effect profit may have on companies' financing decisions.

Through the indicator named Investment, we aim to identify whether the company is in the process of expanding or retracting its business. Therefore, this indicator is a control variable in our estimations, and we calculated it using the following formula:

$$Investment_t = \frac{TotalAssets_t}{Equity_t} \tag{5.6}$$

Finally, we have that the calculation of the percentage change in the firm's free shares number is as follows:

$$\%FreeShares_t = \frac{(\text{Nº}Shares_t - Treasury_t) - (\text{Nº}Shares_{t-1} - Treasury_{t-1})}{\text{Nº}Shares_{t-1} - Treasury_{t-1}} \tag{5.7}$$

As seen in the equation 5.7, first, we calculate the firm's free shares number by subtracting from the total amount of the firm's shares the portion it holds in the treasury. Second, we estimate its percentage change in the current period about its value in the previous period.[7] Specifically, we seek to identify whether the firm issued new shares and whether it sold/purchased its shares through this variable.

5.3 The Instrument

Having addressed issues that will serve as a foundation for our empirical strategy, we can move on to the research design used to investigate the effects of loan fees on corporate financing.

However, as mentioned in several points in this text, we have to identify exogenous variations in loan fees so that it is possible to consistently estimate their effects on our outcome. Therefore, we created a research design that uses the exogenous variations caused by the tax arbitration addressed in the section 3.2. Specifically, we used an exogenous variable correlated with the volume of arbitrage performed on the loan market as the instrumental variable to observe exogenous variations of loan fees. Hence, this section

[7] We adjusted the shares' numbers for corporate events (split and grouping) and stock bonuses so that they do not interfere with the variation in the firm's free shares number.

works on the theoretical reason for choosing this instrument; furthermore, it will empirically assess whether this variable fulfills the requirements to perform the function assigned to it.

5.3.1 The Instrument Variable Approach

Barbosa et al. (2019) uses the volume of arbitrage contracts in the stock loan market as an instrumental variable to perform the same task we desired. Through this strategy, the authors demonstrated that exogenous increases in fees paid in the loan market, resulting from tax arbitrage, lead to overvalued prices in the spot market. Unfortunately, we do not have access to the Barbosa et al. (2019) dataset, which does not allow us to use this same instrument. However, it is possible to use as the instrument a variable strongly correlated with the potential profit from tax arbitrage, namely, the IoNE dividend yield. Hence, once this variable is directly proportional to this profit, it is natural to conclude that it correlates with the arbitrage volume and, consequently, fee distortion.

Let us explain the relationship between our instrument and arbitrage profit through an illustrative arbitration: suppose that the cost to borrow a share is just the fee paid in the loan market (F); further, it will borrow an amount Q of shares to arbitrate; D represents the IoNE dividend value per share, and P is the share price; remember that the arbitrators appropriated the tax whose aliquot is 15%; thus, the net profit from this arbitrage (G) will be:

$$G = 0.15 * D * Q - F * P * Q \tag{5.8}$$

In the equation above, we observe the net profit of this arbitrage as a result of the gross profit - 15% of the IoNE per share value - subtracted by the cost, the loan market fee (F) times the share price (P).[8] Next, it is possible to know this arbitration's return rate (R), i.e., how much percent the profit represents on the invested capital, dividing the net profit (G) by the financial value applied ($P * Q$). Note the result from this:

$$R = \frac{0.15 * D * Q - F * P * Q}{P * Q} = \frac{0.15 * D * Q}{P * Q} - \frac{F * P * Q}{P * Q} = 0.15 * (\frac{D}{P}) - F \tag{5.9}$$

The equation 5.9 shows that the return rate of the arbitrage is directly proportional to $\frac{D}{P}$. Well, $\frac{D}{P}$ is nothing more than the IoNE dividend yield. In this sense, this variable tends to positively correlate with the arbitrage volume and, consequently, with the loan fee distortion caused by this arbitrage.

Let us summarize the main issues we have had up to this point to solidify the idea behind our instrument: We needed to deal with possible sources of endogeneity when

[8] The loan fee is paid on the financial volume of the transaction ($P * Q$).

analyzing the effects of loan fees. For this reason, we used the IoNE dividend yield as the instrument variable to observe exogenous movements in loan fees. Nevertheless, a variable must fulfill two requirements to be used as an instrument: it needs to correlate with the endogenous variable, and it should be exogenous. Hence, through the hypothesis that the IoNE dividend yield enters our research universe only through its relationship with tax arbitrage, we argue that this variable satisfies these two requirements. This argument is based on the fact that this arbitrage resulted from the investment funds' tax condition and not from any firm characteristics. Therefore, we can say that the loan fee movements caused by this arbitration were exogenous, which brings us to the exogeneity argument of the IoNE dividend yield, as we use this variable precisely to capture these movements.

5.3.2 Empirically Evaluating the Instrument

For an instrument to be valid, it must be correlated with the endogenous variable and not with the regression error term (i.e., exogenous). Or in other words, the only channel through which the instrument affects the outcome must be through the endogenous variable. As argued in the previous subsection, the basis for the IoNE dividend yield variable to meet these two requirements lies in its relationship with tax arbitrage. Therefore, this subsection will seek to examine this relationship empirically.

We will start by analyzing the IoNE dividend yield (our instrument) correlation with the endogenous variable. In other words, we will estimate a simpler version of what will be the first stage of our future analyses.

$$VWAF_{i,t} = \alpha + \beta X_{i,t} + T + I + \epsilon_{i,t} \tag{5.10}$$

For 2013 and 2014, we estimated a panel data model 5.10 with fixed effects for the companies (I) and quarters (T): where the outcome was our endogenous variable (volume-weighted average of loan fee, i.e., VWAF), and the explanatory variable (X) was our instrument (IoNE dividend yield). This estimation result is in the table 4.

Table 4 – The Correlation of IoNE Dividend Yield with Loan Fees (2013 and 2014)

	Coefficient	T-statistic	P-value
IoNE Dividend Yield	5.8455	10.550	0.0000

Notes: The estimation includes time and firm fixed effects. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

The table 4 result reveals that the IoNE dividend yield has a positive and significant correlation with the endogenous variable (VWAF), showing that our instrument fulfills the correlation requirement. However, this is not this subsection's purpose, as the first

stage of our model will perform this estimation. Hence, the reason for carrying out this estimation is to compare it with the result of our subsequent investigation.

We estimate the same panel data model 5.10, but now for a period from 2015 until the end of 2017. As seen in the section 3.2, Law no. 13043/2014 came into effect in 2015, making tax arbitration impossible. Therefore, if the correlation of the IoNE dividend yield with the endogenous variable was due to arbitrage, it is expected that the regression coefficient will have a non-significant value when we estimate it for the period after the Law's implementation. The result of this new estimation is in the table 5.

Table 5 – The Correlation of IoNE Dividend Yield with Loan Fees (2015, 2016 and 2017)

	Coefficient	T-statistic	P-value
IoNE Dividend Yield	-0.0998	-0.7541	0.4510

Notes: The estimation includes time and firm fixed effects. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

As observed in the table 5, the estimated coefficient presented a non-significant value, indicating the absence of correlation between the IoNE dividend yield and the endogenous variable (VWAF). This result is in favor of our hypothesis regarding the correlation vector of the instrument (IoNE dividend yield) with the endogenous variable (VWAF).

In addition to this previous examination, we designed one more test to identify whether the correlation is due to arbitrage. Likewise, this test estimates the same regression 5.10 (for 2013 and 2014) but uses the Ordinary dividend yield as the explanatory variable (X). As noted in the section 3.2, it was not possible to make tax arbitration in the Ordinary dividend, as this earning is untaxed. Therefore, the idea in this investigation is essentially the same, i.e., if the observed correlation in 4 is due to tax arbitrage, the estimated coefficient of the Ordinary dividend yield must be non-significant. The result of this estimation is in the table 6.

Table 6 – The Correlation of Ordinary Dividend Yield with Loan Fees (2013 and 2014)

	Coefficient	T-statistic	P-value
Ordinary Dividend Yield	-0.2110	-0.3765	0.7067

Notes: The estimation includes time and firm fixed effects. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

The table 6 shows that the estimated coefficient had no significant value. Thus, this result added to the previous one as evidence in favor of the hypothesis tested in this subsection.

In summary, based on the table 4 result, we can say that the IoNE dividend yield correlates with the loan fees (in the years 2013 and 2014), which means that this variable fulfills the first requirement to be an instrument. Further, we argue that this correlation is due to tax arbitration; such an argument is supported by the absence of correlation present in the post-Law period and the total lack of correlation to the case of Ordinary dividend yield. So, since the connection happens through this means, we can consider the IoNE dividend yield as an exogenous variable, fulfilling the second requisite to be an instrument. Lastly, when using this instrumental variable, we must limit our analysis period to 2013 and 2014 (before Law no. 13043/2014); otherwise, our estimates would comprise a period where the instrument does not have the motivation to correlate with the endogenous variable.

5.4 The Model

Once the IoNE dividend yield can be used as the instrument to isolate exogenous variations in the loan fees, our focus will go to the econometric tools used to unite these ideas to bring the necessary statistical results. The base regression of our econometric models is presented below.

$$\begin{cases} VWAF_{i,t} = \alpha + \gamma IV_{i,t} + C_{i,t} + T + I + \epsilon_{i,t}, & 1^{\text{st}} \text{ Stage} \\ Y_{i,t} = \alpha + \beta VWAF_{i,t} + C_{i,t} + T + I + \epsilon_{i,t}, & 2^{\text{nd}} \text{ Stage} \end{cases} \tag{5.11}$$

In the equations 5.11, we have two-panel data regressions with fixed effects for the quarters T and the companies I. Present in both equations, $C_{i,t}$ is a vector of controls containing firms' information in the quarter. The outcome of the second equation $Y_{i,t}$ will be: in the first analysis, the free shares number variation of a firm i in a quarter t; in the second, the variation of the Indebtedness indicator for a firm i in the period t. $IV_{i,t}$ represents our instrument variable, i.e., the IoNE dividend yield value of the IoNE paid in a quarter t by a company i; as it is possible to see, the instrument is only present in the first equation. The endogenous variable, i.e., the loan fees, is represented in the regressions as $VWAF_{i,t}$, namely, the volume-weighted average fees of the stock loan market of a company i in a quarter t. Still, it is possible to observe that $VWAF_{i,t}$ is the outcome of the first regression while it is an explanatory variable in the second. Specifically, this is how econometrically estimates a model via instrumental variables: the instrument is used to calculate the endogenous variable value in the first stage; next, the calculated value will be an explanatory variable in the second stage.[9]

[9] Roberts and Whited (2013) made a detailed discussion on the use of instruments in finance.

6 THE RESULTS

We estimate the model presented in the section 5.4 through the Two-Stage Least Squares for the quarters of 2013 and 2014. Our first set of results has the variation of the firm's free shares number as the outcome. Next, we estimated models in which the outcome of the second stage was the company's Indebtedness variation. To present and discuss the results of these estimations, we will divide this chapter into four sections. In the first, there are the estimated results for the first stage of the model 5.11; it is worth saying that the first stage is the same regardless of the outcome of the second stage. In the second section, there are the results for the firm's free shares number variation. Next, in the third section, we have the company's Indebtedness variation results. Finally, in the last section, we will discuss all the results.

Before proceeding, to facilitate understanding of the results, it is worth mentioning that the $C_{i,t}$ control vector displayed in the model 5.11 had the following variables: The Trading represents the total volume - for a unit of thousand - of trades carried out in the shares of the company i in the quarter t on the spot market. The Profitability indicator of the company i in the quarter t. The Investment indicator of a firm i for the previous quarter $(t-1)$.[1] In addition, we have also used the variable Ordinary dividend yield as a control. Similarly to our instrument, this variable displays the sum of the dividend yield values paid by the company i in the period t. However, in this variable, the dividends in question are of the Ordinary type, in which it was not possible to carry out tax arbitration.

Furthermore, we computed four[2] versions of the models where we removed and added controls from our regression to check the reaction of the estimated coefficients. Finally, we need to say that in the analysis performed in this section, we excluded from our sample the financial firms that can capt resources via deposits. We did this because this type of company has a very different financing structure from the others, which could interfere with our analysis; as a result, we are left with 86 companies in our sample.

6.1 First Stage

Our estimations results for the first stage of the model 5.11 are in the table 7.

As shown in the table 7, our instrument (IoNE Dividend Yield) strongly correlates with the endogenous variable (VWAF) in all four versions. Also, as expected, the Ordinary Dividend Yield is not significantly correlated with the endogenous variable.[3] Next, we can

[1] Probably, there is a simultaneity relationship between the company's investment and its indebtedness. Therefore, to avoid potential problems in our estimations, we use the value of the lagged Investment indicator.

[2] Roman numerals indicate these versions in the tables' columns that present the results.

[3] As mentioned in the section **5.3.2**, this result is another indication that our instrument is related to the endogenous variable through tax arbitration.

Table 7 – 1st Stage: The Effects of IoNE Dividend Yield on Loan Fees

	(I)	(II)	(III)	(IV)
IoNE Dividend Yield	5.8455***	5.9679***	6.0344***	5.9585***
	(0.5541)	(0.5550)	(0.5560)	(0.5648)
Trading		0.0008	0.0008	0.0001
		(0.0041)	(0.0041)	(0.0041)
Profitability		-0.3830**	-0.4178***	
		(0.1605)	(0.1613)	
$Profitability_{t-1}$				-0.1108
				(0.1726)
$Investment_{t-1}$			0.0493**	0.0414*
			(0.0250)	(0.0250)
Ordinary Dividend Yield			0.2655	0.3290
			(0.5094)	(0.5145)

Notes: *** denotes p < 0.01, ** denotes p < 0.05 and * denotes p < 0.1. All estimates include time and firm fixed effects. Standard errors in parentheses. Roman numerals indicate the versions of the models where we removed and added controls from our regression to check the estimated coefficients reaction. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

consider a surprise that the variable Investment is significant (at 95% CL) because, as far as we know, there is no theoretical explanation that relates the fees paid in the loan market with the lagged level of investment. Furthermore, the same can be said regarding the result of the Profitability variable being significant.

In conclusion, it is possible to say that our estimates show that the IoNE dividend yield, our instrumental variable, has a positive and significant correlation with the endogenous variable of our analysis, i.e., the loan fees (VWAF). Also, this result was robust since its estimation was significant in all four model versions, and the coefficient value was very similar in all cases. Such findings advocate the strength of our instrument, demonstrating that it meets the requirement of correlation with the endogenous variable.

6.2 The Firm's Free Shares Number

Our first analysis estimated the model 5.11 coefficient values with the variable firm's free shares number variation as the second stage outcome. Table 8 brings this estimates.

As it is possible to see in the table 8, no estimations had significant values. We want to emphasize that even the controls coefficients were not significant, which may mean that this outcome does not vary much. According to the section 4.1 analysis, as well as the statements of Albanez and Lima (2014) and Brito, Corrar and Batistella (2007), the listed

Table 8 – 2nd Stage: The Effects of Loan Fees on Free Shares

	(I)	(II)	(III)	(IV)
VWAF	-0.0053	-0.0054	-0.0079	-0.0082
	(0.0172)	(0.0170)	(0.0169)	(0.0172)
Trading		-0.0007	-0.0006	-0.0006
		(0.0007)	(0.0007)	(0.0007)
Profitability		-0.0090	-0.0095	
		(0.0294)	(0.0297)	
$\text{Profitability}_{\text{t-1}}$				-0.0032
				(0.0311)
$\text{Investment}_{\text{t-1}}$			-0.0029	-0.0030
			(0.0046)	(0.0046)
Ordinary Dividend Yield			-0.1506	-0.1489
			(0.0929)	(0.0931)

Notes: *** denotes $p < 0.01$, ** denotes $p < 0.05$ and * denotes $p < 0.1$. All estimates include time and firm fixed effects. Standard errors in parentheses. Roman numerals indicate the versions of the models where we removed and added controls from our regression to check the estimated coefficients reaction. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

Brazilian companies do not usually finance their business through the issuance of new shares. Then, such behavior can lead to a low variance in the firm's free shares number, making estimating significant regression coefficients difficult.

Indeed, the idea presented in the previous paragraph could be one of the motivations for the results observed in the table 8. However, to argue on these questions more accurately, it would be necessary to delve deeper into the analysis of this specific outcome. Therefore, we will only say that our analysis did not identify significant effects of loan fees on the firm's free shares number.

6.3 The Indebtedness of Firms

In the second analysis, 5.11, firm's Indebtedness variation is the second stage outcome. In this analysis, we seek to identify whether the indebtedness level of the firms reacts to loan fees. In addition, we made two other investigations, dividing the loans and financing of current liabilities from non-current liabilities. In summary, we will perform three analyzes in this section: the first for general indebtedness, the second for the short-term, and the third for long-term indebtedness.

6.3.1 General Indebtedness

This subsection will analyze the variation of the Indebtedness indicator without separating loans and financing concerning their terms. Thus, we estimated the regression 5.11 using this variable as its second stage outcome, and the results are in the table 9.

Table 9 – 2nd Stage: The Effects of Loan Fees on Indebtedness

	(I)	(II)	(III)	(IV)
VWAF	-0.031	-0.0211	-0.0196	-0.0196
	(0.0308)	(0.0298)	(0.0296)	(0.0303)
Trading		0.0036***	0.0035***	0.0037***
		(0.0013)	(0.0013)	(0.0013)
Profitability		-0.1142**	-0.1034**	
		(0.0517)	(0.0521)	
$\text{Profitability}_{\text{t-1}}$				-0.0629
				(0.0547)
$\text{Investment}_{\text{t-1}}$			-0.0101	-0.0122
			(0.0081)	(0.0080)
Ordinary Dividend Yield			0.2185	0.2438
			(0.1630)	(0.1638)

Notes: *** denotes p < 0.01, ** denotes p < 0.05 and * denotes p < 0.1. All estimates include time and firm fixed effects. Standard errors in parentheses. Roman numerals indicate the versions of the models where we removed and added controls from our regression to check the estimated coefficients reaction. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

In the table 9, we observed that the estimated coefficients of the Trading are positive and significant at 1% level; further, for the variable Profitability results, its coefficients estimated are significant at 5% level, but their values are negative. However, regarding our variable of interest, i.e., VWAF predicted values from the first stage, the coefficients are not statistically significant. Hence, this result shows no relationship between the loan fees and the variation of the companies' indebtedness.

6.3.2 Short-Term Indebtedness

Since the previous subsection did not identify any relationship between loan fees and the companies' indebtedness, we will focus on the loans and financing of current liabilities. For this, we estimated the model 5.11 having the variation of the Short-Term Indebtedness indicator as to the second stage's outcome. The results are in the table 10.

The table 10 shows us that only the coefficient of the variable Investment is statistically significant. Specifically, we found no statistically significant effect of our variable of interest, i.e., VWAF, on the companies' short-term indebtedness levels.

Table 10 – 2nd Stage: The Effects of Loan Fees on Short-Term Indebtedness

	(I)	(II)	(III)	(IV)
VWAF	-0.0078	-0.0033	-0.0042	-0.0065
	(0.028)	(0.0275)	(0.0273)	(0.0279)
Trading		0.0017	0.0017	0.0017
		(0.0012)	(0.0012)	(0.0012)
Profitability		-0.0505	-0.0389	
		(0.0477)	(0.0480)	
$\text{Profitability}_{\text{t-1}}$				0.0013
				(0.0504)
$\text{Investment}_{\text{t-1}}$			-0.0142*	-0.0148**
			(0.0075)	(0.0074)
Ordinary Dividend Yield			0.0908	0.0943
			(0.1504)	(0.1508)

Notes: *** denotes p < 0.01, ** denotes p < 0.05 and * denotes p < 0.1. All estimates include time and firm fixed effects. Standard errors in parentheses. Roman numerals indicate the versions of the models where we removed and added controls from our regression to check the estimated coefficients reaction. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

6.3.3 Long-Term Indebtedness

The last analysis we performed is similar to the one in the previous subsection; however, now, we are considering only long-term loans and financing. Thus, the outcome of the second stage will be the Long-Term Indebtedness indicator. The estimations are depicted in the table 11.

As seen in the table 11, none of the estimated coefficients are statistically significant. Therefore, as in the previous analyses, we can argue that our results point to a non-relationship between loan fees and firms' long-term indebtedness.

In summary, the results of the two previous subsections, as well as this one, show that firms do not seem to change their debt levels in response to loan fees. Further, this finding is present regardless of the term of the loan and financing analyzed.

Table 11 – 2nd Stage: The Effects of Loan Fees on Long-Term Indebtedness

	(I)	(II)	(III)	(IV)
VWAF	-0.0232	-0.0178	-0.0154	-0.0130
	(0.0365)	(0.0358)	(0.0356)	(0.0364)
Trading		0.0019	0.0019	0.0019
		(0.0016)	(0.0016)	(0.0016)
Profitability		-0.0637	-0.0645	
		(0.0621)	(0.0627)	
$\text{Profitability}_{\text{t-1}}$				-0.0642
				(0.0656)
$\text{Investment}_{\text{t-1}}$			0.0041	0.0026
			(0.0097)	(0.0097)
Ordinary Dividend Yield			0.1277	0.1495
			(0.1962)	(0.1965)

Notes: *** denotes p < 0.01, ** denotes p < 0.05 and * denotes p < 0.1. All estimates include time and firm fixed effects. Standard errors in parentheses. Roman numerals indicate the versions of the models where we removed and added controls from our regression to check the estimated coefficients reaction. The sample is composed of quarterly data from 86 companies.

Source: Author's own elaboration (2022).

6.4 Discussion

The results of the section 6.2 did not identify relationships between the firm's free shares number and the loan fees. Likewise, in the section 6.3, there was no statistically significant effect of the loan fees on the firms' indebtedness level. Hence, this section works on two hypotheses that can explain these results.

First, by observing the analyses in the subsection *3.2.3.1*, it is possible to identify that tax arbitration considerably inflated fees in the loan market. For instance, at position +3 of the Analysis Window in the graph 3, the average fee for IoNE events is approximately 22%, while it is about 3% for Ordinary dividend events. This way, treating Ordinary dividends as a counterfactual to IoNE-type, we can say that tax arbitrage makes the average fee about seven times higher on the day before the Record date. However, still looking at this same graph, we see that this effect lasts for about four days. Similarly, Barbosa et al. (2019) results show that the tax arbitrage effect on the stock price is reverted between 7 and 15 days after the Record date. Therefore, although the observed impact is strong, it is not very long-lasting, making it less likely that this effect transcends the markets and reaches corporate financing. In other words, we are saying that perhaps the duration of the loan fee's effects is as important as its magnitude. Specifically, this idea can find support in Polk and Sapienza (2008), as the authors argue that managers will respond to the overvalued stock prices if they expect the current overvaluation to last.

Second, there is the hypothesis that the economic agents linked to the financing of companies do not respond to this market effect. Namely, even if the short-selling is restricted due to high loan fees, resulting in overvalued shares prices in the spot market, company managers do not consider this when making decisions about the company's capital structure. Since this hypothesis goes in the opposite direction to what was evidenced, for example, in Baker and Wurgler (2002) and Gilchrist, Hilmmelberg and Huberman (2005), we can consider that this lack of effect is from particular characteristics of companies listed on the Brazilian stock exchange. Undoubtedly, the financial markets of each country have their particularities, which can generate different results in articles that analyze similar problems.

7 CONCLUSION

The study of finance has increasingly expanded our knowledge of financial markets and corporate finance. Furthermore, many studies have sought to understand how asset markets influence the firms' management process. However, as the universe of finance is very rich in possibilities, there are still significant gaps in comprehending how the markets affect corporate decisions. In this research, we seek to contribute to filling one of these gaps by producing a study examining how stock loan fees affect the firm's financing.

We consider that loan fees can affect firms' financing decisions through the overvalued stock. Therefore, to rule out possible endogenous relationships between loan fees and stock prices, we developed a research design that uses exogenous variations of the loan fees caused by tax arbitration.

Our investigation found evidence that this arbitrage inflated the loan fees, and the effects spilled over to the spot markets, making the stock prices overvalued. Therefore, using an instrumental variable correlated with the arbitrage volume in the loan market, we were able to observe exogenous variation in the loan fees. Then, our first analysis sought to identify whether companies issued new shares or sold those in treasury due to loan fees. Nevertheless, our estimations did not identify links between these two elements. Next, our second examination investigated whether firms react to the loan fee by changing their debt level. Again, our result did not identify a statistically significant correlation between the firms' indebtedness indicator and loan fees.

We made two hypotheses to interpret our results: First, it is possible to argue that the effect would need to be longer-lasting to transcend the markets and reach the firm's financing. We are saying this since our analysis has shown that the effects of tax arbitrage on loan fees are significant but brief (about four days). Second, we hypothesize that company managers do not consider the mispricing caused by loan fees in their decision-making process.

Hence, although our results differ from some previous studies in the literature, we believe that they represent essential contributions for two reasons: First, our results demonstrate the possibility that a "disturbance" in the markets can not be short to affect the firms' decision-making process. Second, our analyses reveal that we need to comprehend the differences between financial markets around the world to add to the theoretical models features that better fit each case. Specifically, we base this last opinion on the possibility that the singularity of our results comes from the Brazilian financial market's particular aspects.

Finally, future research can analyze more lasting short-selling restrictions; then, it will be possible to compare its results with ours. Moreover, it is worth saying that future research can use explained variables different from those used in our regressions, seeking

to observe if the effects exist for other variables.

BIBLIOGRAPHY

ALBANEZ, T; LIMA, G. A. S. F. Effects of market timing on the capital structure of Brazilian firms. **Emerging Market Firms in the Global Economy**. Bingley: Emerald Group Publishing Limited, p. 307 – 351, 2014.

ALMEIDA, H; CAMPELLO, M. Financial constraints, asset tangibility, and corporate investment. **The Review of Financial Studies**, v. 20, n. 5, p. 1429-1460, 2007.

ASQUITH, P.; PATHAK, P. A.; RITTER, J. R. Short interest, institutional ownership, and stock returns. **Journal of Financial Economics**, v. 78, n. 2, p. 243-276, 2005.

BAKER, M.; WURGLER, J. Market timing and capital structure. **The journal of finance**, v. 57, n. 1, p. 1-32, 2002.

BARBOSA, F.; BONOMO, M.; DE MELLO, J.; MOTA, L. Short-selling restrictions and returns: A natural experiment. **Available at SSRN 2927732**, 2019.

BLOCHER, J.; REED, A. V.; VAN WESEP, E. D. Connecting two markets: An equilibrium framework for shorts, longs, and stock loans. **Journal of Financial Economics**, v. 108, n. 2, p. 302-322, 2013.

BM&F BOVESPA. Regulamento de Emissores Distribuicao de Proventos. **BM&F BOVESPA S.A. – Bolsa de Valores, Mercadorias e Futuros**, 2016. Disponível em: `https://www.b3.com.br/data/files/64/A7/E2/1C/8B41461041179F36790D8AA8/Oficio_198.2016-DRE_Regulamento_de_Emissores_Distribuicao_de_Proventos.pdf` Acesso em: 20 set. 2021

BOEHMER, E; JONES, C. M.; ZHANG, X. Shackling short sellers: The 2008 shorting ban. **The Review of Financial Studies**, v. 26, n. 6, p. 1363-1400, 2013.

BOEHME, R. D.; DANIELSEN, B. R.; SORESCU, S. M. Short-sale constraints, differences of opinion, and overvaluation. **Journal of Financial and Quantitative Analysis**, v. 41, n. 2, p. 455-487, 2006.

BRITO, G. A. S.; CORRAR, L. J.; BATISTELLA, F. D. Fatores determinantes da estrutura de capital das maiores empresas que atuam no Brasil. **Revista Contabilidade & Finanças**, v. 18, n. 43, p. 9-19, 2007.

CAMPELLO, M.; MATTA, R.; SAFFI, P. A. C. Does Stock Manipulation Distort Corporate Investment? The Role of Short Selling Costs and Share Repurchases. **The Role of Short Selling Costs and Share Repurchases (August 7, 2020)**, 2020.

CHAGUE, F; DE-LOSSO, R.; DE GENARO, A.; GIOVANNETI, B. Short-sellers: Informed but restricted. **Journal of International Money and Finance**, v. 47, p. 56-70, 2014.

COHEN, L.; DIETHER, K. B.; MALLOY, C. J. Supply and demand shifts in the shorting market. **The Journal of Finance**, v. 62, n. 5, p. 2061-2096, 2007.

CVM. Instrução CVM Nº 10, de 14 de Feveireiro de 1980. **Comissão de Valores Mobiliários**, 1980. Disponível em: `http://conteudo.cvm.gov.br/export/sites/cvm/legislacao/instrucoes/anexos/001/inst010consolid.pdf` Acesso em: 20 set. 2021

D'AVOLIO, G. The market for borrowing stock. **Journal of financial economics**, v. 66, n. 2-3, p. 271-306, 2002.

DEANGELO, H; DEANGELO, L; STULZ, R. M. Seasoned equity offerings, market timing, and the corporate lifecycle. **Journal of financial economics**, v. 95, n. 3, p. 275-295, 2010.

DE-LOSSO, R.; DE GENARO, A.; GIOVANNETTI, B. C. Testing the effects of short-selling restrictions on asset prices. **Working papers, department of economics, University of Sao Paulo (FEA-USP)**, 2013.

DIAMOND, D. W.; VERRECCHIA, R. E. Constraints on short-selling and asset price adjustment to private information. **Journal of Financial Economics**, v. 18, n. 2, p. 277-311, 1987.

DUFFIE, D.; GARLEANU, N.; PEDERSEN, L. H. Securities lending, shorting, and pricing. **Journal of Financial Economics**, v. 66, n. 2-3, p. 307-339, 2002.

FIGLEWSKI, S.; WEBB, G. P. Options, short sales, and market completeness. **The Journal of Finance**, v. 48, n. 2, p. 761-777, 1993.

FIGLEWSKI, S. The informational effects of restrictions on short sales: Some empirical evidence. **Journal of Financial and Quantitative Analysis**, v. 16, n. 4, p. 463-476, 1981.

GILCHRIST, S.; HIMMELBERG, C. P.; HUBERMAN, G. Do stock price bubbles influence corporate investment?. **Journal of Monetary Economics**, v. 52, n. 4, p. 805-827, 2005.

MILLER, E. M. Risk, uncertainty, and divergence of opinion. **The Journal of finance**, v. 32, n. 4, p. 1151-1168, 1977.

MOTA, Lira Rocha da. **The Market for Borrowing Securities in Brazil**. 2013. Dissertação (Mestrado em Finanças) - Escola de Pós Grauação em Economia, Fundação Getulio Vargas, Rio de Janeiro, 2013.

OFEK, E.; RICHARDSON, M.; WHITELAW, R. F. Limited arbitrage and short sales restrictions: Evidence from the options markets. **Journal of Financial Economics**, v. 74, n. 2, p. 305-342, 2004.

POLK, C.; SAPIENZA, P. The stock market and corporate investment: A test of catering theory. **The Review of Financial Studies**, v. 22, n. 1, p. 187-217, 2008.

RAPACH, D. E.; RINGGENBERG, M. C.; ZHOU, G. Short interest and aggregate stock returns. **Journal of Financial Economics**, v. 121, n. 1, p. 46-65, 2016.

ROBERTS, M. R.; WHITED, T. M. Endogeneity in empirical corporate finance. **Handbook of the Economics of Finance**, v. 2, p. 493-572, 2013.

SANTOS, Aline Barreto dos. **Empréstimo de ações e Juros sobre Capital Próprio: os desdobramentos da Lei no 13.043/2014**. 2018. Doutorado em Economia (Teses) - Programa de Pós-graduação em Economia, Universidade Federal de Juiz de Fora (UFJF), Juiz de Fora, 2018.

SANTOS, A. B.; CORDEIRO, F. F. Uma Nota sobre os Efeitos da Lei n° 13.043/2014 no Mercado de Empréstimo de Ações. **Revista Brasileira de Economia**, v. 74, p. 508-519, 2021.

STEIN, J. 1996. Rational Capital Budgeting in an Irrational World. **Journal of Business**, v. 69, n. 4, p. 429–455.

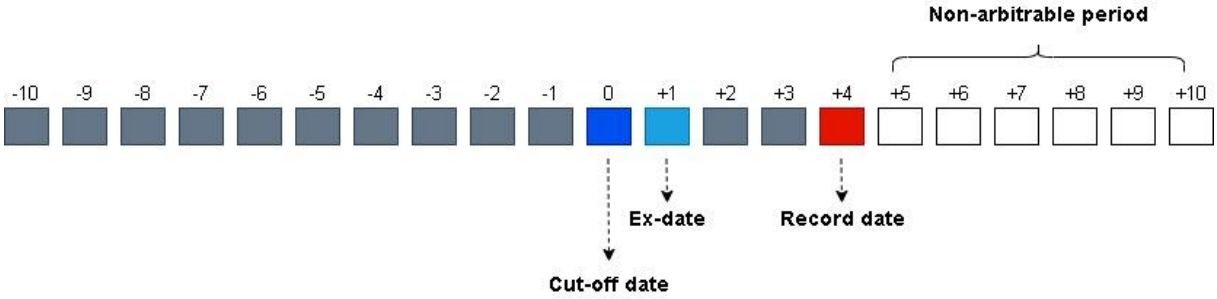
THORNOCK, J. The effects of dividend taxation on short selling and market quality. **The Accounting Review**, v. 88, n. 5, p. 1833-1856, 2013.

WOOLRIDGE, J. R.; DICKINSON, A. Short selling and common stock prices. **Financial Analysts Journal**, v. 50, n. 1, p. 20-28, 1994.

APPENDIX A – The Analysis Window

Figure 2, presented in subsection **3.2.1**, illustrates the entire temporal path of the dividend payments. Thus, we need to explain how this temporal logic was inserted into our database. Image 9 summarizes what we call Analysis Window.

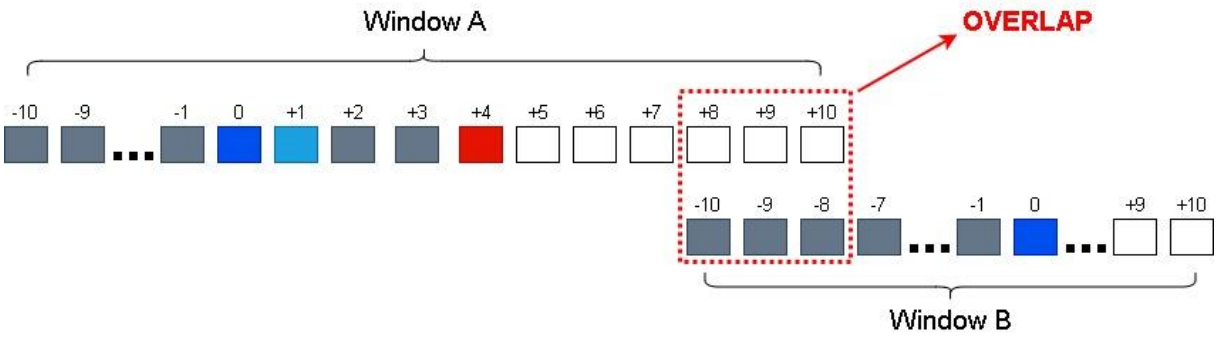
– Figure 9: The Analysis Window



Source: Author's own elaboration (2022).

The Analysis Window logic is simple. First, for each stock present in our database, we identified the distribution of dividends episodes and marked the Cut-off date as the zero position of this event.[1] Then, the ten days before this date was indicated by their temporal distance to it, and the same was carried out for the ten following days. In this way, we can identify, for example, that the day marked as +6 is the sixth day after the Cut-off date, just as the day marked as -3 is the third day before the Cut-off date. So, it is possible to know the date position in this timeline and which moment in figure 2 this day belongs.

– Figure 10: The Windows Overlap



Source: Author's own elaboration (2022).

A vital precaution was necessary to take on the "overlap" of Windows. This phenomenon can occur when we have two events of distribution of dividends not too far

[1] Note that there is a different Window for each distribution of dividends.

apart in such a way that a day belongs to two different Windows; figure 10 illustrates this phenomenon. The treatment we gave the occurrence of episodes of this nature was, initially, to identify them and, later on, in some analyses, to exclude them. Moreover, it is essential to say that there were estimates in which the entire Window had to be discarded to avoid bias in the results.

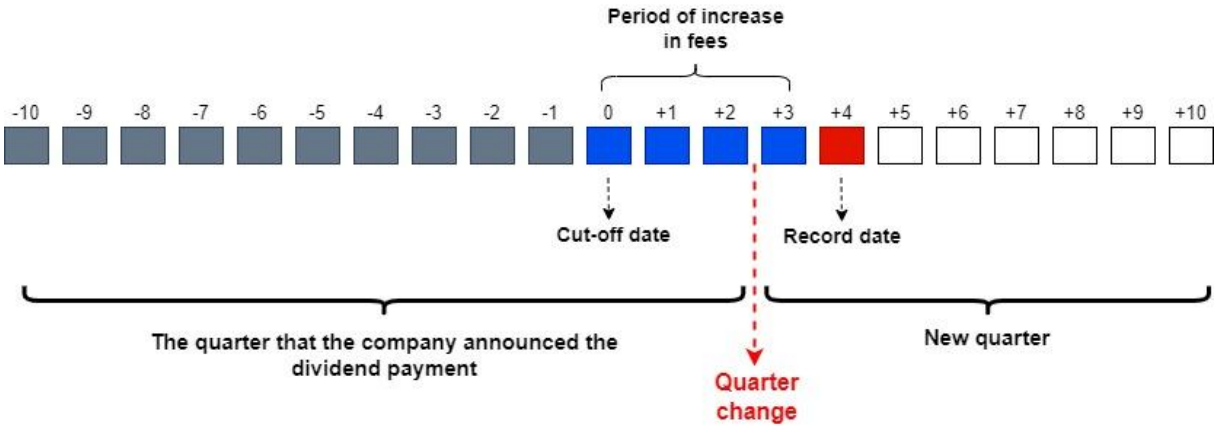
APPENDIX B – Dividend Yield Mensuration Problem

In the section **5.2.2**, we described the measuring process of the quarterly value of the firms' dividend yield. However, during this process, it was necessary to deal with an issue that could bring harm to our analyses. Therefore, this appendix will describe this problem and explain the solution we applied.

Before following, it is essential to remember that, in our investigations, the dividend yield aims to identify the presence of tax arbitrage in the company's shares in a given quarter; especially, as we saw in the section **5.3.1**, its value is directly proportional to the arbitrators' demand for stock loans. Therefore, we made the decisions during the process described below with this purpose in mind.

As said in section **5.2.2**, we add up all the dividend yield values of the stock's proceeds paid in the quarter. However, it was necessary to adjust the dividend yield values when the dividend was paid towards the end of the quarter in such a way that the Ex-date was in one quarter and the Record date in the other. The figure 11 illustrates this issue.

– Figure 11: Dividends Paid at the End of the Quarter



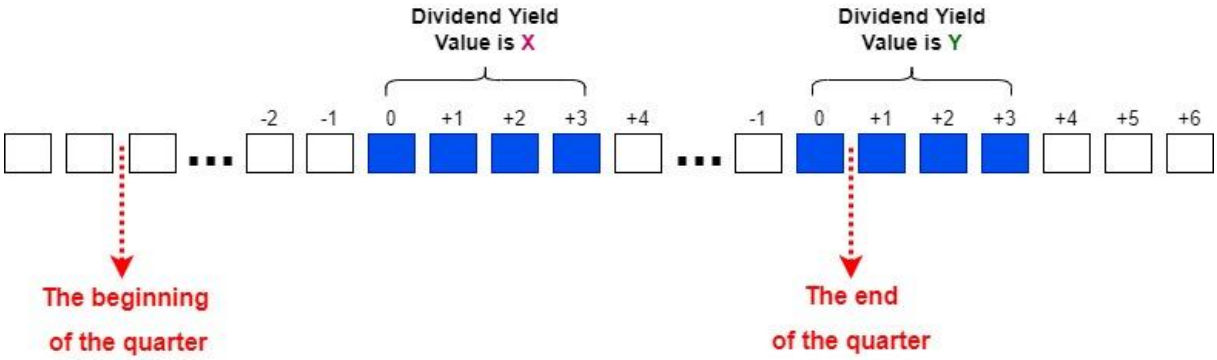
Source: Author's own elaboration (2022).

When this phenomenon occurs, arbitrage happens in both quarters. Therefore, ignoring this fact, we could consider that a firm was not under the influence of arbitrage in a quarter when it was, which may severely damage our analysis. However, the solution to this problem is not elementary. For instance, if we assign the dividend yield value for both quarters, we would neglect that one part of the arbitrage volume happened in one quarter and the remaining in another. Therefore, we had to adjust the dividend yield value to consider these issues.

As noted in the section *3.2.3.1* through the graph 3, tax arbitration started to impact the loan fees on the Cut-off date and stopped on the Record date. In blue, figure 11 highlights these four days when arbitrage affected loan fees. Then, observing the position

of these four days in the quarters, we created weights to adjust the dividend yield values. For instance, if two of those days are in the first quarter and the other two in the latter, both quarters receive half the dividend yield value. By the same logic, if three of these days are part of the first quarter and only one of the second, the first has $\frac{3}{4}$ of the dividend yield value while the second quarter receives $\frac{1}{4}$ of the value.

– Figure 12: Example of Calculating Quarterly Dividend Yield



Source: Author's own elaboration (2022).

In order to consolidate the understanding of the factors discussed so far, the image 12 will help us explain one more example. In this figure, we have that a particular stock paid two dividends in a quarter; further, the dividend yield value in the first is X and the value of the second is Y. Also, notice that the second dividend was paid at the end of the quarter, so the Cut-off date is in the first period, but the later dates are not; i.e., only one of the four days on which the arbitration effect occurs is in the first quarter. So, we can ask: what is the dividend yield value for this stock in the first quarter? To answer this question, we must add the value of the first dividend yield to the value of the second one, adjusted by the weight, that is: $X + \frac{1}{4}Y$.

Therefore, through this process, we estimate the quarterly dividend yield for the shares. Next, as explained in section **5.2.2**, when the company has more than one stock, we calculate the average of the dividend yield values. Consequently, we end up with the value of this variable for each company in each quarter.