PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO DE JANEIRO

DEPARTAMENTO DE ECONOMIA

MONOGRAFIA DE FINAL DE CURSO

The Impact of Illegal Insider Trading on Brazilian Stocks' Prices: An Empirical Analysis

Nome do aluno: João Rafael Rodrigues Santillo

Matrícula: 1610858

Orientador: Walter Novaes

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"Declaro que o presente trabalho é de minha autoria e que não recorri para realizá-lo, a nenhuma forma de ajuda externa, exceto quando autorizado pelo professor tutor".

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João Rafael Rodrigues Santillo

Julho 2020

As opiniões expressas neste trabalho são de responsabilidade única e exclusiva do autor.

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1. Introduction

The present thesis aims to investigate the effects on stocks' price of insider trading on Brazilian equities market. Insider trading here is defined as the trade of a company's stock by a person containing a relevant but undisclosed information about it. Professional investors consider this an unfair practice and it might lead them away from the capital market, making it less efficient. This could be extremely prejudicial for a country's economy, especially to a developing one, because the financial market canalizes savings to productive investments. Investments that could improve the country's productivity in the long run will not be made and thus the country's long-term growth will be negatively affected.

The debate on insider trading has been largely centered around the American capital market (Beny, 2004). Studying its effects in other countries would contribute greatly on understanding this practice's manifestation and effects, especially in an emerging economy such as Brazil. Furthermore, as concluded Bhattacharya (2014), there have been few empirical studies (despite a large and rich theoretical literature) about the impacts of insider trading, hindering any definite conclusion about the subject. Nevertheless, this lack of studies apparently was not a bother for regulators, since already in the 1990s most countries with capital markets have decided to prohibit this practice (Bhattacharya & Daouk, 2002). Moreover, according to Vilela & Prado (2015), 5% of the cases judged by the Brazilian capital markets regulator (Comissão de Valores Mobiliários, CVM) from 2002 to 2014 have been regarding insider trading. Although it seems a small number, CVM's recent actions shows that it is taking the issue of insider trading very seriously. In 2014, CVM approved a strategic project called "Regime Sancionador II (foco insider)" (Sanctioning Regime II, focus insider, my translation), aiming "to improve the Autarchy's capacity in identifying signs, raise evidence and attribute responsibility for the improper use of privileged information" [1] (my translation). In 2016, CVM launched "Caderno 11 – Uso indevido de informação privilegiada" (Notebook 11 – Improper use of privileged information, literal translation), an educational campaign containing guidelines on how to detect and prevent insider trading.[2]

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[1] Comissão de Valores Mobiliários, 2016, "Relatório Anual 2015", Rio de Janeiro: CVM, 2016. p. 29.

[2] More information available at: www.cvm.gov.br/noticias/arquivos/2016/20160601-2.html

This recent behavior clearly shows that insider trading is not the least important issue for the Brazilian regulators.

The purpose of the current thesis is to document how this activity manifests itself in Brazil, how it is regulated, its effects on stock prices (including if there is abnormal return for insider trading and any Run-up in the stocks' prices after insiders trade) and the punishment for those who breach the law.

Analyzing CVM's administrative proceedings (APs) related to insider trading, I have found 72 APs related to insider trading. In total, 76 stocks were insiders' target. Out of the 72 APs, in 43 of them, which involved 49 different stocks, CVM found the defendant guilty and fined him. Fines have ranged from as low as R$20.000 to more than R$400 million. Other punishments, such as warnings and temporary trading ban, have also been inflicted upon convicted defendants, depending on the degree of the illegal act. Using an event study analysis with a modified market model (as in Meulbroek, 1992), I concluded that the days in which insiders trade have significant price Run-ups, circa 50%, in line with what was found by Meulbroek (1992) in her analysis of illegal insider trading in the American stock market. I also found that the Run-up from convictions of insider trading do not significantly differ from the Run-up of acquitted cases. The analysis of a Run-up effect is the main distinction of this work from Eid Junior & Rochman (2007). Both of our works try to measure if insiders trading can result in abnormal returns. However, beside the Run-up effect, I contribute to the literature with data from illegal insider trading. Not only do the days convicted insiders trade have statistically significant abnormal returns, but these returns are also statistically higher than the abnormal return from traders accused of insider trading, but acquitted, in the sample. On the other hand, acquitted and convicted traders have similar Run-ups.

The thesis is organized in the following way. First, a brief revision on the literature of insider trading and its effects, its supporters and its detractors. Second, the introduction of the sample and its description. After that, explanation of the model used, followed by a section of empirical analysis and results. Finally, conclusions on the results and analysis of the current legislation.

2. Literature Review

The debate about insider trading acquired economic considerations after Henry Manne's classic "*Insider trading and the Stock Market*" (1966). Since then, other theoretical works have been published, usually presenting models on how insider trading would affect other economic variables, instigating a debate that had largely been held only in the legal field. Eventually empirical studies were made, using data from both legal and illegal insider trading, trying to understand the consequences of this practice.

In this section I will review some of the literature, beginning with the theoretical works following by a summary of empirical papers, in Brazil as well as in other countries. Brazilian literature has important contributions given by the juridical academia. The economic literature in Brazil focus on (1) trying to assess if insider trading is prevalent in Brazilian market and (2) how effective is the current legislation in preventing and punishing this practice.

2.1 Theoretical Literature on Insider Trading

In "*Insider trading and the Stock Market*" (1966), Henry Manne gave three primary reasons for legalization of the insider trading based on economic arguments.

First, insider trading had no harm on long-term investors. Second, it provided a form of compensation scheme for managers. By being able to trade on positive undisclosed information, it would be an incentive for managers to produce more positive material information, hence benefiting the company directly and society indirectly. Finally, that insider trading would make prices more accurate, since the material undisclosed information would be passed on to the market through insiders, resulting in more accurate prices and thus benefiting investors and society.

Before Henry Manne, the debate on insider trading was largely seen as a legal and ethical issue, not an economic one. From a legal viewpoint, Bainbridge (2001) reviews the history of insider trading in the United States. He examines how the argument of insider trading being an unfair practice became very hard to defend in the courts, since what is unfair can be very relative and subjective. Instead, the argument that prevailed was the misappropriation rule. That is, the relevant information belongs to the company and its

shareholders. Therefore, if an individual trades on that information, he is breaking a fiduciary duty to the company by misappropriating an information that is not his.

Bhattacharya (2014) makes a broad review on the literature of insider trading. The paper is structured as a court case about insider trading, with the defense citing papers with arguments in favor of the practice and the prosecutor citing papers against it, from both legal and economic viewpoints. It concludes that more studies with empirical evidence need to be made in order to achieve more significant conclusions.

Beny (2004) distinguishes two theories on insider trading: market theories and agency theories. Agency theories focuses on the relationship of insider trading with Agency problem, that is, what are the incentives that insider trading have on company insiders and managers. They analyze if insider trading exacerbates or attenuates the agency problems. On the other hand, market theories address other possible and broader consequences of insider trading, such as the impact on market efficiency.

Fischer (1992) concludes that insider trading prohibition is Pareto efficient only if there exists a problem of moral hazard (for example, an incentive for the manager not caring to destroy company value while shorting its stocks). This means that insider trading laws might mitigate already existing agency problems.

Leland (1992) states that insider trading may increase or decrease economic welfare, depending on how sensitive investment is to prices. Using a rational expectations model, he concludes which parties will gain or lose welfare when insider trading is permitted. Stock prices become more accurate and higher, expected real investment rises, market illiquidity rises, insiders and owners of investment projects benefit, and finally outside investors and liquidity traders have their welfare reduced. The general welfare increases or decreases depending on the conditions of each market. Insider trading is less desirable when investment is rigid, investors are more risk averse, liquidity trading is volatile and future price volatility is high.

Tighe & Michener (1994) develops a political economy model for insider trading laws, arguing that they serve to protect market professionals and to increase their own welfare, which explains why this group usually lobbies for insider trading laws. If insiders are

excluded from financial markets, then there is more profit to be explored by market professionals selling their services. Also, there could be some gain to noise traders, that is, nonrational investors with no information at all, but this gain would be offset by the increase in entry of market professionals. Moreover, insiders would reveal information to the market at no cost, while the prohibition would result in a deadweight loss to society that now has to allocate resources to discover information (that was once free) through market professionals.

2.2 Empirical Analysis of Insider Trading

Empirical studies have been made to understand the consequences of insider trading. This paper also contributes to this particular literature. Given the difficulty of analyzing illegal insider trading, it is common for studies observing insider trading impacts on stock prices to focus on legal insiders.

Del Brio, Miguel & Perote (2002) analyzes legal insider trading at the Spanish stock market. The authors conclude that traders earn excess profits when in possession of corporate nonpublic information, while outsiders replicating their strategies do not. This, according to the authors, would reject the hypothesis that insiders' trades communicate useful information for outsiders.

Ek & Erlinder (2015) makes a similar study in Sweden. The authors analyze how clusters of insiders' trades, which they define as at least three trades from insiders of a same company in a period of five days, affect outsiders' performance. Contrary to the study in Spain, they conclude that in Sweden insiders' trades are informative to outsiders and these investors can earn abnormal return by mimicking them.

Heinkel & Kraus (1997) examines the profitability of insider trading in the Vancouver Stock Exchange. Using the data from legal insider transactions, the authors discover that, overall, insiders do not tend to outperform outsiders.

On the other hand, Meulbroek (1992) investigates the impact of illegal insider trading on stocks' prices. She was the first one trying to figure out directly the impacts of insider trading, despite the discussion in economics had already been going on for a quarter of a century. Examining a sample of 183 stocks, she finds that there is a significant Run-up due to insider trading, as well as abnormal return for days insiders trade. She also makes

important discoveries on the characteristics of insider trading, such as when they usually occur, how many times insiders trade, the premium they get and the fines they receive.

However, Meulbroek (1992) uses data after insider trading is already prohibited, and therefore insider trading Run-ups may not be fully priced. That is an important point made by Banerjee and Eckard (2001), which analyzes the impact of insider trading on mergers from the turn of the XIXth to XXth century. This was before the practice was prohibited and when it was largely assumed and accepted that it was prevalent. They conclude that indeed insider trading at that time also led to a significant Run-up in stocks' prices.

Beny (2004) uses legal and economic data to compare insider trading laws and enforcement across countries. The paper finds that countries where enforcement against insider trading is more prevalent usually have more dispersed equity ownership distribution, higher liquidity in the stock markets and more informative prices.

Bhattacharya & Daouk (2002) investigates the impact of the adoption of insider trading laws during the 1990s. The study found out that, despite the fact of many countries prohibiting insider trading, the mere fact alone did not contribute to reduce the cost of equity but enforcing the law did. The authors, in a follow-up paper, Bhattacharya & Daouk (2009), demonstrate both empirically and theoretically that not enforcing the law is worse than not having it, and when this happens, for insider trading laws, there is higher cost of equity and lower liquidity.

Ataullah, Goergen & Le (2014), using data from the United Kingdom, investigates whether insider trading undermines investors' confidence or provides them with useful information, which can exacerbate or alleviate, respectively, financial constraints. The study finds that there is weak support for the confidence effect. However, when segregating the data between purchases and sales, the information effect dominates, informing outsiders on the internal situation of the company.

Vilela & Prado (2015) makes an X-ray on the CVM action on insider trading from 2002-2014. They show that during this period, 51 insider trading cases were judged by CVM, corresponding to about 5% of the total number of cases judged by the regulator. While that might seem as a small number, it is clearly not an irrelevant practice at the eyes of CVM.

There were in total 187 accused, from which 56 were company insiders, 119 were financial market professionals (brokers, for example) and 12 were other outsiders (such as lawyers from firms hired by the company during a merger, for example). However, the most shocking data is that, from the 187 accused, only 51 were considered guilty, being the rest acquitted. There were only 14 cases which all the accused were considered guilty, while in 17 cases all accused were acquitted and in 9 cases some were acquitted and others convicted.

In the book "Insider trading: Normas, Instituições e Mecanismos de Combate no Brasil" (Insider Trading: Norms, Institutions and Combat Mechanisms in Brazil, 2015), Viviane Prado Muller tells the history of Brazilian insider trading laws and regulatory apparatus. The author describes in her book the worries of Brazil's regulators in the 1960s in avoiding this practice but how little resources and oversight capacity was available to them.

Nagata (2017) used a market cleaning model to measure the level of insider trading in Brazilian equities financial markets, comparing with similar studies in the United Kingdom and Australia. The author found that Brazilian market cleanliness index is significantly higher than in both other countries, which means insider trading is more prevalent. This contributed to the literature to show that prohibiting the practice is not enough to deter it. It is also necessary for regulators to enforce it, otherwise managers and market professionals will continue to commit this crime.

In Eid Junior & Rochman (2007), the authors study whether legal insider trading in Brazil leads to abnormal returns. Using data from companies of different level of corporate governance from 2002 to 2004, the paper finds that trades by insiders provide abnormal returns in the day of the event announcement and on the following day. The authors also found that companies with low levels of governance (Levels 1 and 2) were related to insiders trading more often when compared to companies with high levels of corporate governance (Novo Mercado), an indication that companies with lower levels of internal compliance may have insiders more prone to trade on undisclosed information, making the practice more rampant than CVM official data makes it looks like.

Camargos, Romero & Barbosa (2008) makes an empirical analysis of recent Mergers and Acquisitions (M&A) from companies that had stocks or American Depositary Receipts

traded in Brazil. Their results indicate evidence that insider trading occurs around the announcement of the M&A, when significant abnormal returns are detected.

Finally, this present paper contributes to the empirical literature on insider trading in two following ways. First, it uses data from illegal insider trading, which, as seen in this section, had not been explored in Brazil. Secondly, it analyzes if illegal insider trading can result in abnormal returns, and if it is informative to other investors.

3. Sample Analysis and Data Description

The sample is constituted of stocks from administrative proceedings (here referred to as APs or cases) brought by CVM in which insider trading activity has been suspected. CVM's APs result from a regulator's investigation in which material evidences were found of someone committing irregularities in the capital markets. CVM then subpoenas the accused and the case is judged by the autarchy's commissioners.[3] The data was obtained through CVM's website by searching for APs related to insider trading, dating back from 1995 until 2016. The dates indicate the oldest and most recent cases available for insider trading activity judged by CVM. Also, the sample only includes cases in which the stocks were traded in the Brazilian stock market. One of Brazil's most famous cases of insider trading involved American Depositary Receipts from Sadia, which was judged by CVM and went on to the Brazilian courts. However, since it involves trading of securities in the United States, it is out of the scope of this study.[4]

Another important recent case that is out of scope is that of the Batista brothers. In March of 2017, the two brothers, controllers of JBS Group, recorded then President Michel Temer, in a conversation supposedly involving himself in a corruption scheme. However, after the conversation went public, CVM reported that they sold company stocks and bought dollars, predicting that it would bring major upheaval to Brazilian politics and consequently to its stock market. Nonetheless, there has not been a court ruling on these activities as of the day this thesis has been written.[5]

Administrative proceedings against insiders are brought by CVM, the Brazilian official authority on capital markets. I use these proceedings, available at CVM's website, as data to find out which stocks were a target of insiders, when it happened and what was the penalty in case the accused were found guilty. I had to search for the cases which the defendant was accused of insider trading and compile all the relevant information in an organized database.

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[3] Information provided by CVM at: www.cvm.gov.br/menu/processos/consulta_andamento.html
[4] More details available at: http://epocanegocios.globo.com/Revista/Common/0,,ERT74419-16355,00.html
[5] More on the case and the timeline are available at: www.poder360.com.br/justica/wesley-batista-vira-reu-por-uso-de-informacao-privilegiada/

In my research, I discovered other cases involving high profile people in Brazilian business sector. The largest fine was given to Eike Batista, a case that attracted a lot of attention for involving the richest Brazilian at the time. The current Economy Minister, Paulo Guedes, has also been accused of insider trading, when he was a partner at the hedge fund JGP. The accusation extended to the other partners as well, but he and most of them were considered not guilty. These findings show that even though powerful figures in Brazil are accused of insider trading, there is still little interest about this subject in the academia.

The cases brought forward by CVM contain the names of the accused, the stocks they traded, when the supposed insider trading activity happened, whether they were declared guilty or not, what was their penalty, whether they bought or sold the stock and in some cases how much did the insider trading returned to them or how much loss did they avoid. However, I read each case one by one and searched for this information myself in order to make a detailed analysis of insider trading activity in Brazil. I also deemed necessary to analyze the cases in which the accused was found innocent, in order to observe if CVM is prosecuting insider trading cases with enough evidence and if the mere suspicion of insider trading has any impact on stocks' prices.

There were 76 stocks which at some point in time insider trading activity was detected. Although it seems a small number for a period of 21 years, one explanation could be the relative incipient stock market in Brazil. In 1996, the number of listed companies in Brazil was 550, and in 2019 it was 328[6]. Concomitantly, in the United States, where similar empirical studies regarding illegal insider trading have been made, there were approximately 8000 listed companies in 1996 and about 4400 in 2018[7]. It is also worth noting that three of the companies in the sample were private companies when the insider activity happened.

Five stocks have been targeted more than once. One company, HRT, has even been targeted five times. In total, there were 85 insider attempts with some stock at some point in time. Of these 85 attempts, 31 were made only by company insiders, 44 only by outsiders and 10 by a combination of insiders and outsiders. This information is especially significant,

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[6] More on the number of listed companies in Brazil can be found at: valorinveste.globo.com/mercados/renda-variavel/bolsas-e-indices/noticia/2019/11/14/numero-de-empresas-na-bolsa-e-o-menor-desde-1996.ghtml
[7] Data was obtained from: www.theglobaleconomy.com/USA/Listed_companies/

since a major argument for insider trading prohibition is that company insiders, having more information than outsiders, would have more incentive to trade on this privilege. It could also be the case that insiders are more aware of the legal consequences of trading on insider information. Companies have to warn their employees about the consequences of insider trading, while outsiders might have the feeling that they are not being monitored. Furthermore, since the phenomenon of punishing insider trading is relatively recent, outsiders might not be fully aware of the regulations of this practice.

However, most of the insider trading involving only outsiders happened until 2007, while 70% of the trading involving only insiders happened from 2008 onwards. One possible explanation is the downturn on the Brazilian economy since then. This argument is corroborated by the fact that, from the 17 insider trading operations involving selling a stock, only two of them happened before 2008. Selling on insider information usually occurs when the information is not favorable to the future of the company, which frequently happens when the economy is going through a slowdown, as it happened after the 2008 financial crisis and specially during the 2010s.

In the data, company insiders are frequently members of the executive committee or the board, but there were also trades by workers who had access to privileged information. Typical outsiders were people who had some relationship with someone inside the company, which might be professional or personal. Outsiders with professional relationships to insiders include investors and lawyers who worked for an investment bank or a law firm hired by the targeted company at a relevant moment, which made possible for the outsiders to acquire the information. On the other hand, outsiders with personal relationships to insiders were relatives of a board or executive committee member who had access to private information. In this case, the outsider would receive the information in a casual event, such as having lunch with someone who worked for the targeted company, and trade on it.

Cases involving only outsiders had a greater probability of the defendants being acquitted. About 41% of cases involving only outsiders had the defendants acquitted, compared to 32% involving only insiders and 20% involving both.

Table 1 shows the number of stocks allegedly targeted by insider trading, chronologically. I also show how many of these attempts were actually found guilty and if

the accused was a company insider, outsider or both. Of the 85 stocks analyzed at different points in time, about 25% had some sort of insider trading suspicion between 2011 and 2013. In 53 of the stocks, the accused was found guilty of insider trading and received a fine as a penalty. In four of these 53, the accused was also temporarily banned from trading (two) or received a warning (two). In other two instances the convicted accused only received a warning.

Table 1

Stocks allegedly targeted for insider trading by time range

"Insider trading events" compiles data from CVM's cases by period of all 85 times stocks were targeted by insider trading. "Guilty" refers to how many of these stocks had the defendants found guilty of insider trading by CVM. The "Outsiders" column is the number of stocks in which the defendants were not professionally tied to the company targeted of insider trading, while the "Insiders" column refers to those stocks which defendants had professional ties to the company. The last column, "Insiders and Outsiders", refers to stocks in which there were defendants with and without professional ties to the company targeted of insider trading.

Period	Insider trading events	Guilty	Outsiders	Insiders	Insiders and Outsiders
1995-2000	8	7	6	1	1
2001-2003	20	14	7	6	5
2004-2007	17	6	13	3	1
2008-2010	16	13	8	7	0
2011-2013	21	12	4	14	3
2014-2016	3	3	3	0	0
Total	85	55	44	31	10

We can also point out that after insider trading was officially criminalized by the Brazilian Congress in 2001, there was a spike in allegations of now illegal activities by the CVM. Before the law, from 1995 to 2001 there were nine stocks which CVM brought forward insider trading accusations. In 2002, when the law was already in practice, it brought up ten charges, and in 2003, eight charges. Of these 18 charges, in six of them, a third of the cases, the accused were found not guilty. One reason for these weak results for the prosecution right after the criminalization might be that the prosecutors assumed that they would win more cases with the new law, even though there was not enough evidence against

the accused. Therefore, CVM started to search for insider trading where there was not any, leading to a series of defeats and later to a decrease in the number of cases.

Besides fines, guilty defendants could also receive light punishments, such as a warning, or harsher punishments, like temporary prohibition from trading. It should be noted that, for a defendant to be considered guilty, there is no need to obtain profit or avoid loss in the operation. To be considered guilty of insider trading, the accused only needs to trade on the information. For example, someone having privileged information about a company buys its stock, but his act is detected by CVM and he is charged before selling it. This way, he is guilty of insider trading, but does not make a profit from his crime.

Table 2 shows the median, minimum and maximum amount for profit gained, loss avoided and fines for the guilty defendant. The fines ranged from R$20.000 to more than R$440.000.000. Profits are considered when the accused had the intent to buy a stock, while losses are considered when intent was to sell the stock using insider trading. Profits and losses were calculated with the data provided by the APs. For each case, total profit or loss avoided was the sum of the values, stated in the APs, for all the accused. When the value of total profit is negative (under parenthesis), it means that the defendant bought the stock, but its price fell, so the investor incurred in a loss from the investment.

There have been nine cases with guilty convictions in which fines were applied, but the accused did not obtain profit or avoided loss. There were also cases which CVM would accuse the defendant of making a profit or avoiding a loss, but the defendant was considered innocent. There were 11 cases in which CVM accused of having avoided losses (three) or profited (eight) but in the end the defendant was innocent. Finally, there has only been one case in which the accused have been both accused of having gained profits and avoided losses.

Table 2

Benefits and penalties from insider trading

"Profit" refers to alleged profit by the defendants in cases which CVM identifies it. "Loss avoided" row refers to the loss avoided by the defendants allegedly illegally insider trading, and "Penalty" is the penalties in cases which defendants were considered guilty. For the columns, "Median" refers to the median value of the sample for each roll, "Minimum" states the lowest value, and "Maximum" the highest value. The "N" column is the sample, the number of cases for each roll category.

	Median	Minimum	Maximum	N
Profit	R$202,399.30	R$(411,000.00)	R$23,314,615.04	33
Loss avoided	R$329,206.00	R$1,480.00	R$176,312,169.20	13
Penalty	R$647,124.55	R$20,000.00	R$440,780,423.00	43

When CVM considers monetary penalties for the defendants, it is usually larger than their alleged benefits from insider trading, corrected by inflation, since a case can take years to be ruled.

Table 3 gives us the amount of stocks for each event according to a value range. While there were 15 cases convicted of trying to obtain gain (or avoid loss) of less than R$100.000 (more than 40% of the cases in this category), only four of the 43 cases with fines had the total penalty applied below this value. We can also observe that, on the cases that CVM has prosecuted but the defendants were considered innocent, the distribution among the labels was almost equal. That is a sign indicating CVM does not focus to prosecute only cases which the agency believes there is more money involved. Instead, the agency is focusing on the crime, independently of the benefit for the accused. Nevertheless, there is a tendency of the agency to fine considerably more than what the accused has benefited from the crime. This is a sensible attitude to take, because it poses a risk for the investors that, if they get caught on insider trading, the expected penalties will exceed the gains.

Table 3

Number of illegal insider trading by penalty range and characteristics

"Total", refers to total CVM's cases in each column category. The other three rows indicate the value range for each column's category, and how many cases for each category are included in that range. Column "Penalty" indicates the number of cases considered guilty and which penalties were applied. Columns "Profit" and "Avoid Loss" indicate if the intent of the defendant was to profit or avoid a loss, respectively, by trading on undisclosed information, segregating for convicted and acquitted defendants.

	Penalty	Convicted		Acquitted	
		Profit	Avoid Loss	Profit	Avoid Loss
Total	43	26	9	7	4
RS1 Million or greater	16	5	4	2	2
Between R$100.000 and R$1 Million	23	8	3	3	1
R$100.000 or less	4	13	2	2	1

Table 3 also shows how most of the insider trading committed in Brazil is focused on obtaining small gains or avoiding big losses in terms of nominal value. The data does not take into account the Return on Investment. This parameter is not mentioned on CVM reports, so apparently it is not an important factor when deciding to prosecute an insider trader.

Moreover, in Table 4 I analyze the companies' market value in the year they were a target of insider trading, to see if CVM has a bias to monitor larger companies. For this I use the common stock reported at Refnitiv Eikon platform for the quarter before the insider trading takes place or, in case this information is not reported, the first quarter balance sheet value for the year insider activity on the company was detected. The reason for choosing this method is to avoid any change in the common stock value due to the insider trading. If a company was targeted twice and cited in a different case by CVM, I count the values for both times, for the company's value could change from one case to another or the size of that company might make it a more attractive target for insider or for monitoring.

Table 4

Sample Companies' Market Value

"Common stock" shows the rows characterizing the value range for the common stock value at the beginning of the year, according do Refnitiv Eikon, for the firms allegedly targeted by insider trading. "Companies" is the number of companies in the sample by each common stock value range, and "Guilty" indicates those companies in cases which the defendants were considered guilty for each range. "Total" row is the total number of the sample for each column.

Common Stock	Companies	Guilty
> R$1 Billion	36	22
Between R$100 Million and R$1 Billion	27	16
< R$100 Million	13	8
Total	**76**	**46**

There were three companies which the common stock value was not available, and three companies which preferential and ordinary stocks were traded. In total, 76 values were analyzed.

Companies' common stock ranged from about R$ 5 million to more than R$ 48 Billion. I discovered that 36 of the target companies had a market value greater than R$ 1 Billion at the beginning of the year they were targeted, almost half of the companies. Out of these 36 companies, 22 had APs in which defendants were considered guilty, a proportion similar to the ratio in the overall sample. This means that CVM does not have a bias to condemn insiders that target larger companies.

Nonetheless, targets worth more than R$ 1 Billion in value are more represented in the sample. That means that either CVM is more prone to monitor bigger companies or bigger companies are a more prized targets by insiders.

Table 5 displays key characteristics of insider trading in Brazil. I consider here only 71 companies, because Refinitiv Eikon only allowed to observe data back to 2000. Cases that happened before were excluded from this sample and, subsequently, the regression.

Most of the cases had insiders trading for the last time six days or less before the announcement. While it is true that the closer insider trading days are from announcement days the harder it is to isolate the effect of either events, the great majority of the cases had insiders trading for at least one week before the announcement.

Table 5

Characteristics of insider trading cases in Brazil

"Insider Trading Days" is the days insider trading happened according to the CVM cases since the year 2000, "News Days" days with announcement of relevant information, and "Insider Trading with News" refers to days which insider trading and news announcement happened concomitantly. "Days before Public Announcement" tells how many days before the relevant information disclosure the defendants traded, and "Days between trades" shows the frequency which defendants traded. For each column, the mean, standard error, and median are displayed.

	Number of Days			Timing of Trade	
	Insider Trading Days	News Days	Insider Trading with News	Days before Public Announcement	Days between trades
Mean	6.9	0.4	0.03	21.8	7.8
(Standard error)	(0.6)	(0.2)	-	(4.8)	(2.2)
Median	4.0	-	-	6.0	2.0
Total Sample	492	30	2	-	-

In total, there have been 492 Insider Trading Days for the 71 cases, with an average of 6.9 insider trading days by case (median = 4.0). News days surrounding announcements were present in 11 stocks with a total of 30 days, resulting in a mean of approximately 0.4 days per case. Only two of the sample's days had insider trading concomitant to interim news announcement, showing that most of the effect for news days is not confounded with insider trading.

On average, insiders had their last trade 21.8 days before the company announcing to the market its relevant information (median = 6.0). Like Lisa Meulbroek's 1992 analysis,

half of the last days an insider traded occurred less than a week before the information announcement. In contrast, though, insiders in Brazil seem to space their trading more between each day (7.8 days between trades compared to 3.8 from Lisa's paper) and to start trading earlier. Also, the accused appear to trade with higher intensity than in Lisa's sample. (6.7 trading days per case versus 3.2).

Yet, these facts do not give us the full scope of insider trading in Brazil, since over a third of the sample's cases were from acquitted defendants. On Table 6, I analyzed the same variables (with exception to News Days) divided into stocks from convicted cases and acquitted cases. In this sample, traders were found guilty 46 times but innocent on 25 accounts. The number for acquitted cases is significant and shows that CVM is not as efficient as it should be on prosecuting insider trading, since the number of innocent defendants should be zero or closer to it. This comparison clarifies if there is any meaningful difference on the cases CVM prosecutes and could help identify further insider trading patterns.

Table 6

Characteristics of Convicted x Acquitted cases

"Insider Days" is the number of days insiders traded. "Days between Trades" is the days between trades by the defendants for the trading period identified in the cases. "Days before announcement" is the defendant's last trading day according to the case. Their respective means, standard error, and median are displayed for convicted and acquitted episodes.

	Insider Days		Days between Trades		Days before announcement	
	Convicted	Acquitted	Convicted	Acquitted	Convicted	Acquitted
Mean	5.1	10.4	11.3	4.0	23.3	19.2
(Standard error)	(0.8)	(1.8)	(3.0)	(1.0)	(6.8)	(5.6)
Median	3.0	8.0	3.0	1.0	4.0	7.0
Total Sample	233	259	-	-	-	-

By this data, it is possible to say that there are differences on the way guilty defendants trade from acquitted ones. I also ran a t-test to check if the absolute differences from the means and medians are greater than zero. For the means, I found the differences statistically significant for a 5% level (t=5.9643, p=0.01349), as well as for the medians (t=3.7796, p=0.03171). This serves to highlight that the prosecutors are pursuing cases with clear different characteristics that will probably result in different rulings.

Based on Table 6 data, convicted insiders on average trade on fewer days, space more their trades and have their last trade further from the announcement. They trade half the amount of days acquitted insiders do, and space their trades almost the triple the amount. Finally, they have their last trade on average four days before.

However, the median does not follow the same pattern. The median confirms that most convicted insiders trade extremely close to the relevant disclosure, three days or less, which is a small value compared to the acquitted insiders' median of eight days or less. The majority of convicted traders space their trades up to three days, compared to acquitted traders who usually trade on consecutive days. Nonetheless, when having access to privileged information, most traders tend to operate closer to its announcement, four days or less, compared to up to seven days of those who do not trade on inside information. Thus, insiders both have their last trade very close to the news announcement and start trading with great antecedence. One case, for example, of Manasa Madeireira, had insiders trading 204 days before the announcement.

4. Model

In this thesis I wish to answer the following questions: can other investors observe that insider trading is occurring? After insider trading days, is there any premium left from the information to be gained by the market? However, if markets do not detect insider trading, do insiders have statistically significant gains on the information disclosure date?

To better understand why I want to answer these questions, I will exemplify. Suppose a mining company insider receives news that they just discovered a new mine, which could significantly boost production and profits. The insider would open his homebroker and buy a number of stocks from his company. The ideal scenario for him would be that, when buying the stocks, prices remain stable, and that the gains on the information be reflected on prices only on the day the information is disclosed. Later on, the insider could sell his stocks and profit from the full value of the information.

Yet there's also another possibility. The demand for stocks created by the insider can be noticed by uninformed traders in the market. Hence, they would increase the ask price to take advantage of the new increased demand. Thus, some of the premium of the information would unintentionally be explored by the rest of investors, reducing the gains the insider would have when selling on the information disclosure day.

These results would have fundamentally different conclusions for policymakers. On the first case, insider trading only benefits the insider and even poses the risk of a moral hazard (for example, shorting the company's stocks in case of bad news instead of reversing the situation). On the second case, insiders do not fully benefit on their information, and can lead prices closer to their intrinsic price, making the market more informationally efficient.

To answer the first question, I want to measure if the average return on days insiders trade is statistically different from zero. This tells if the average market movement made by insiders is significant enough to alter prices on their desired direction.

On the second question, I wish to observe if the price movement provoked by insiders is significant enough that all or almost all gains on the information are gained on insider trading days. Therefore, I measure the Run-up of the compound average return of insider trading days and its share on the total premium awarded by the information.

The last question depends on the first two. If prices do not react significantly on the days insiders trade, do insiders have significant gains only on information disclosure? If yes, then insiders are able to gain the full information premium, meaning the information leads to significant gains to insiders.

To analyze these questions, I used Refnitiv Eikon platform to obtain the daily returns from each stock. However, despite insider trading occurring 85 times, regarding 73 different stocks, data constraints only allowed me to analyze 71 cases from 64 different stocks.

I estimated the impact of insider trading using a modified market model as an OLS regression for each individual case (I do not regress all episodes together). I used the following modified market model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \Upsilon_i Announce_{it} + \delta_i Inside_{it} + News_{it} + \varepsilon_{it}. \tag{1}$$

The variable in equation (1), R_{it}, stands for the return in case i (i = 1,…,71) at time t. R_{mt} is the Brazilian market return (in this case it is Ibovespa's daily returns) at time t. $Announce_{it}$ and $Inside_{it}$ are dummy variables which equals one if, respectively, the announcement of the relevant information is made and CVM accused of occurring insider trading on day t for case i. $News_{it}$ is a dummy variable controlling for news announcements before the relevant information announcement, which were cited on the CVM cases. This allows to control for important news announcements that might have influenced the price besides the aforementioned variables. $News_{it}$ equals one on date t when an important announcement has been made on case i according to CVM documents.

Coefficient δ_i measures insider trading impacts on stock price. I used an estimation window that encompasses from the relevant information announcement until 150 days before the first alleged insider trading date. Two companies that were targeted more than once for insider trading, OSX and HRT, had cases when the estimation window would overlap with insider trading days from another case made by CVM for the same stock. In order to isolate the effects of insider trading of one case from another for the same stock, in case there was this overlap I skipped the days CVM accused of having insider trading for the other cases of the same stock.

To calculate average abnormal returns (AR), I used the absolute values and took the average from the sample. This way, negative values will not cancel positive values, measuring more accurately the variation caused by each event. The compound abnormal return (CAR) is the average return adjusted by the number of days insiders traded on each case.

To measure the Run-up, I based myself on Banerjee and Eckard (2001), which measured insider trading impact in the US before it was criminalized. The authors measured the Run-up for a stock as how representative the CAR from insider trading days is on the premium gained by insider trading and from the public announcement. The premium for each stock is defined as the sum of the Run-up with the Event's Day Gain, which here will be the AR from Announcement Day. Furthermore, I used absolute values instead of nominal values to calculate the Run-up.

$$\text{Premium}_i = \text{Run-up}_i + \text{AR Announcement Day}_i, \tag{2}$$

$$\text{Run-up}_i = \delta_i * N_i / \text{Premium}_i, \tag{3}$$

$$\text{Average Run-up} = (\Sigma \delta_i * N_i / \text{Premium}_i)/N. \tag{4}$$

The Average Run-up is the mean of all ratios instead of the ratio of the means. This method avoids that extreme values influence the mean, as seen on days prior to insider trading on Table 6, allowing for each individual Run-up_i to be equally represented, hence producing better understanding of the variables impact.

Based on the economics and finance literature, there are three results we can expect.

First, that prices on days insiders trade will move in the same direction as they do on news announcement days, meaning that insider trading makes the market more efficient. This is a reasonable assumption considering the Efficient Markets Hypothesis on its strong-form, in which information known by insiders would quickly be reflected on prices, with no group with a monopoly on information acquiring abnormal returns. This would also mean that the observed abnormal return for announcements in insider trading cases would not be significantly different from zero.

On the other hand, it is also possible that the Run-up insider trading generates is statistically small, meaning that insiders only actually profit when information is released.

Finally, there can be a similar result to that of Meulbroek (1992), in which insider trading results in a significant Run-up the day they trade and generates abnormal returns the day the information is announced, benefiting insiders to some extent.

The first option would prove most detrimental for current defenders of the punitive regulations of insider trading. Society actually benefits from a more informationally efficient market. Also, there would be no evidence that insiders themselves profit from the activity.

In the second scenario, the current prohibition would prove necessary, since there would be no benefits acquired from insider trading. It means that the trade-off from prohibiting or legalizing is on the side of the prohibition. Moreover, if insiders do profit, then there are risks of moral hazard coming from insider trading. The most present in the literature is that of managers short-selling the company's stocks on negative periods, not producing incentive to reverse the firm's situation but to profit on it in the short-term.

The latter result would prove more challenging for easy conclusions. On the one hand, markets would be more informationally efficient due to insider trading, but on the other hand, insiders are able to profit, so there is possible risk of moral hazard. Future evidence would be needed on its impact in market liquidity and investment level to more accurately assess the trade-off of insider trading.

5. Results

The following table summarizes the results of the regressions. In the first two columns I show the average Abnormal Return (AR) of the relevant information's public announcement and of the days in which insider trading occurred. On the third column, I calculate the Compound Abnormal Return (CAR), meaning the compound impact of all insider trading days on the stock's price. Next, I measure if the results for the CAR are statistically relevant through a Z-Test and then I calculate the Run-up for the insider trading. Finally, I use a Sign-Test to measure if the Run-up is statistically different from zero.

Comparing the abnormal returns is important since, if the days when insiders trade have the same sign as the days of disclosure of relevant information, then it would mean that prices move in the same direction of the "correct" price for the stock.

I divided my sample under three groups. The first group (Total) comprises all 71 cases accused by the CVM, independent of the result for the accused. The second group (Convicted) is composed only of the 46 cases in which the accused were convicted of insider trading. The final group (Acquitted) is made only of the remaining cases in which the accused has been acquitted of the crimes.

Table 7

Regression Results

"Public Announcement Day" is the average regression results for the abnormal return (AR) on news announcement days, "Av.AR/Day of Insider Trading" tells the average AR for each individual day in which insider trading happened, and "CAR on Insider Trading Days" is the average compound AR (CAR) for insider trading attempts. "Z-Statistic of the CAR", is the Z-statistic to test the significance of the CAR. "Insider Trading Run-Up" tells the average Run-Up in days defendants traded. Finally, "Sign-test for Run-Up>0" is a one-tailed binomial sign-test to check Run-Up>0 probability. Standard errors are displayed below their respective means for every row. "N" represents the total number of episodes in the sample of each row. The rows are organized, top to bottom, as total number of episodes, convicted episodes, and acquitted episodes.

	Public Announcement Day	Av. AR/Day of Insider Trading	CAR on Insider Trading Days	Z-Statistic of CAR	Insider Trading Run-Up	Sign-test for Run-Up>0
Total	12.26%***	4.12%***	14.13%***	3.704	50.83%	<0.01
(Standard error) (N=71)	(0.005)	(0.003)	(0.009)		(0.009)	
Convicted	13.35%***	5.18%**	16.36%**	2.904	50.18%	<0.01
(Standard error) (N=46)	(0.009)	(0.006)	(0.017)		(0.014)	
Acquitted	10.25%***	2.17%**	10.05%***	3.164	52.03%	<0.01
(Standard error) (N=25)	(0.011)	(0.003)	(0.013)		(0.027)	

*** Statistically significant at 0,1% level

** Statistically significant at 1% level

The results for the variables of each class are the mean for the absolute values of its respective sample. As we can see, for the sample as a whole, AR on public announcement day is statistically significant at a 0.1% level, awarding a premium of 12.26%. Statistically significant results can also be drawn from insider trading AR and CAR, with 4.12% and 14.13% premiums, respectively.

It is possible to see from Table 7 that all CARs are statistically greater than zero at a very significant level. This means that indeed insider trading results in significant returns on the days insiders trade, meaning the market can detect the movements made by insiders and take advantage of that.

Nonetheless, one could point out that the important fact is not if in the days insiders trade there is significantly abnormal returns, but rather if these returns are significantly higher compared to when only regular investors trade. Hence, I used a t-test to see if the differences between the results from convicted cases to acquitted cases were significantly greater than zero. With t= 3.8146, I concluded that the difference is statistically different than zero at a 5% level, showing that, from CVM's cases, when traders with privileged information trade, daily returns are higher than when compared to regular traders wrongly accused. It also means that the difference between the abnormal return from public announcement day is also significant, meaning that insiders do gain higher returns from the information at the news announcement.

According to the table, we can see that all Run-ups are especially significant, with insider trading representing circa 50.83% of the premium from the information. The other Run-ups also correspond to little more than half of the total premium of the information.

It is worth noting that there has been 10 cases of negative nominal Run-up value, meaning that despite the information indicating a positive (negative) scenario, the average CAR of insider trading went the opposite way, which is paradoxical to the economic theory. However, analyzing the cases individually we notice that in most of these cases, CVM accused the investors of profiting before the news announcement. For example, in case of a negative information, insiders would take advantage of the information to buy and hold the stock just prior to the announcement. This way they would profit from prior positive movements from the market and sell just before the crash. These cases constitute the majority of negative acquitted Run-ups (3 out of 4).

On the other hand, there were also cases in which the insider would buy the stock and then sell after a positive news announcement. Nonetheless, days in which insiders traded before the announcement had on average a negative return. These cases constitute the majority of negative convicted Run-ups (4 out of 6).

Therefore, based on our results, we can deduct some key characteristics of Brazilian insider trading. First, as showed in Meulbroek (1992), insiders are usually active on days close to the announcement, and most of the alleged insider activity occurring 6 days or less before the information release were from guilty defendants (26 out of 37 cases). Second,

abnormal returns are not a good indicator of possible insider trading activity, since CAR from both guilty and acquitted cases are statistically different from zero. However, the price movement is significantly higher when traders with insider information trade when compared to regular uninformed traders. This means that insiders give a significant boost to the market, that is readily observable and explored, resulting in higher price changes. Third, insider information is passed on to the market when insiders trade on that information, as is shown by the Run-up results for the convicted cases, amounting for as much as 50% of the premium from the information. A Run-up of similar magnitude is also identified when acquitted defendants trade, so the Run-up could be a characteristic of the Brazilian market. Prices are thus more informationally efficient, and insiders do not necessarily enjoy the benefits of the information alone. Nevertheless, on the days of the information disclosure, the price change is significantly higher for cases with insider trading, meaning that insiders can obtain returns statistically higher from their information compared to outsiders. This gives evidence to a semi-strong form of Efficient Markets in Brazil since monopolistic control of information can award higher returns.

However, some limitations of these results should be noted. The Brazilian capital market is still very underdeveloped when compared to advanced economies. This means that usually stocks have relatively lower liquidity, specially if we take into account that most companies in this study are not part of Brazil's main index, Ibovespa. Another problem arises from the data collected. I made an effort to read all of CVM's cases to understand when the alleged illegal activity happened and when was the information disclosed to the market. Yet, four cases had to be discarded because of lack of clarity on the CVM's documents to when the trading occurred. Also, this research only applies to cases from 2000 upwards. Since models are only as good as the inputs used, it would be interesting to have a study comprising all cases. Finally, while I base myself on Lisa Meulbroek's 1992 study, the time period is completely different, and I do not take into account legal and financial developments that occurred since then on the matter of insider trading.

6. Conclusion

In this thesis I analyzed the characteristics of illegal insider trading in Brazil and its effects on the stock market. I showed that the crime is usually committed by company outsiders, punishment for those caught has a pretty severe economic cost and that little more than a third of the cases brought by CVM result in acquittal of all the accused. This is a very important point to demonstrate how efficiently the regulatory agency is performing its job.

I also present evidences on how CVM is prosecuting cases with radically different characteristics that will likely result in different rulings. Convicted traders usually trade closer to the news announcement, less often and space more the days between their trades. Assessing this information is important for prosecutors to make best use of their time and resources, and better enforcing the law against those who actually break it.

In my empirical analysis, I concluded that the compound abnormal return for insider trading is statistically significant. This is perhaps the most important conclusion from this thesis. It means that their movements can be detected by other market participants and result in greater daily changes from this change in supply-demand composition. It also shows that this change is significantly higher when compared to regular uninformed traders.

The evidence also reveals a significant Run-up effect from days insiders trade, meaning that investors can infer that new information has been added to the market on those days. Hence, it indicates that insider trading could serve as an indirect mean to add new information to the market. It also gives support to a semi-strong Efficient Market Hypothesis present in the Brazilian stock market, since informed investors, detaining monopoly of the information, might be able to achieve on average abnormal returns greater than zero.

Some remarks need to be made. Although I do show the effects of illegal insider trading on prices, I do not analyze how it impacts liquidity. This is crucial to determine if indeed insider trading, as its opponents argue, impairs the credibility of the financial markets, leading to investors departure, which would thus harm the economy and society. Another important topic not approached here was that of insider trading being used as a form of compensation scheme. Future studies should analyze if insider trading in Brazil can lead to

more efficient forms of compensation to managers or if it produces another form of moral hazard. I also do not regress all episodes together, only separately.

Finally, the evidence for a semi-strong form Efficient Market present in Brazil is certainly good news, as is the increase in information efficiency given by insiders. Yet, this does not settle the issue, but rather reinforces the need on further research of other consequences of insider trading. An especially important topic for future studies is how more accurate prices relate to real investment. Economic welfare and growth certainly depend on real investments, and future analysis on its relationship with more accurate prices due to insider trading should be studied.

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