

**Fundação Getulio Vargas
Escola de Administração de Empresas**

Marcelo Golhiardi

**Investigating Derivative Usage Decisions of Brazilian
Companies**

São Paulo
2021

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Dissertação submetida à Escola de Administração de Empresas de São Paulo como requisito parcial para a obtenção do grau de Mestre em Administração de Empresas.

Área de Concentração: Gestão de Risco

Orientador: Prof^o Dr. Paulo Renato Soares Terra

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Resumo

O objetivo desta dissertação é duplo: primeiro, identificar quais os principais motivos que levam as empresas a utilizarem derivativos e, segundo, entender se o uso de derivativos por empresas brasileiras aumenta o valor da empresa. Encontramos evidências de que empresas que utilizam instrumentos financeiros derivativos, em particular para especulação financeira, apresentam um valor de mercado maior do que empresas que não os utilizam. Em relação às motivações para o hedge, o tamanho das empresas, a distribuição de dividendos aos seus acionistas, a participação nas receitas do exterior, os gastos de capital em oportunidades de crescimento e os gastos de capital em branding e reputação aumentam a probabilidade das empresas se envolverem em atividades de hedge. Em relação às motivações para especular, os investimentos em oportunidades de crescimento, maior lucratividade e maior alavancagem financeira reduzem a probabilidade de a empresa se envolver em atividades de especulação com derivativos. Este estudo contribui para complementar estudos anteriores realizados no Brasil, publicados por Rossi (2008) e Serafini e Sheng (2011), ao focar as diferentes finalidades de uso de derivadas, bem como analisar os direcionadores para esses diferentes tipos de uso. de derivados. Nossas descobertas podem ajudar os investidores a avaliar melhor as empresas dentro de suas carteiras para melhorar seus retornos, selecionando empresas que administram melhor seu uso de derivativos. Além disso, fornece uma estrutura que ajuda os investidores a identificar os motivadores que levam as empresas a se envolver no uso de derivativos.

Palavras-chave: Exposição Cambial, Finanças Corporativas, Decisões de Hedging, Derivativos, Gestão de Risco.

Abstract

The purpose of this dissertation is twofold: first, to identify what are the main reasons that lead companies to use derivatives, and second, to understand whether the use of derivatives by Brazilian companies increases the value of the company. We find evidence that firms that use financial derivative instruments, in particular for financial speculation, present a higher market value than firms that do not use them. Regarding the motivations for hedging, the size of the companies, the distribution of dividends to its shareholders, the share of revenues from abroad, capital expenditures on growth opportunities, and capital expenditures on branding and reputation increase the probability of companies engaging in hedging activities. Regarding the motivations for speculating, capital expenditures on growth opportunities, higher profitability, and more financial leverage reduce the probability that the firm engages in speculating activities with derivatives. This study contributes to complement previous studies carried out in Brazil, published by Rossi (2008) and Serafini and Sheng (2011), by focusing on the different purposes for derivative usage, as well as on analyzing the drivers for these different types of usage of derivatives. Our findings can help investors better assess companies within their portfolios to improve their returns by selecting firms that better manage their derivative usage. Also, it provides a framework that helps investors identify the drivers that lead companies to engage in derivative usage.

Keywords: Foreign Exchange Exposure, Corporate Finance, Hedging Decisions, Derivatives, Risk Management.

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1 Introduction

One point can be made about why we should study Brazil. According to data from the International Monetary Fund, in 2016 Brazil was the 10th largest economy, in 2017 it was 9th and in 2018 the 10th largest economy. Looking at the data, over the last 3 years, Brazil has remained in the top 10 of the largest global economies, showing that it is indeed an important player in the global economic setting. Also, Brazil presented several examples of misuse of derivatives by its multinational companies. *Sadia* announced a loss of R\$ 2.5 billion in 2008, mainly due to its operations with foreign exchange derivatives (dollar-linked financial securities)¹. Also, *Sadia* declared that it lost R\$ 760 million in losses when terminating its derivative contracts in 2010². *Aracruz*³, a company of the *Votorantim* group, also reported a loss of R\$ 2 billion in 2008⁴. *Ambev*'s financial result was negative by R\$ 1.1 billion in the 3rd quarter of 2020 and the company cited losses with derivative instruments of R\$ 562.7 million as one of the main reasons for this result⁵. These are examples that occurred in recent years has shown the inefficient of usage of derivatives by Brazilian multinational companies. So, understanding whether the use of derivatives adds value to the company and what are the reasons that lead companies to engage in hedge activities becomes very important. After the losses reported by *Sadia* and *Aracruz*, in 2008, the CVM - Comissão de Valores Mobiliários (2008) issued *Resolution nº 550*, which regulates the presentation of information on derivative financial instruments, which requires publicly traded companies to disclose, on a quarterly basis, qualitative and quantitative information on all its derivative financial instruments, whether recognized or not as an asset or liability in its balance sheet, such as its adopted hedge policy, the level of exposure and sensitivity to risk factors, and gains or losses with derivatives.

Brazilian listed companies are using derivatives but, unfortunately, the impact on the company's value for this usage and the reasons that lead companies to engage in derivative usage are still not well explored within the literature. Therefore, there is a gap in research on the impact of the use of derivatives on the company's value by Brazilian listed companies. Consequently, the purpose of this study is to investigate the impact of the usage of derivatives on the company's value and to identify the reasons why Brazilian listed companies engage in derivative usage. What are the main drives for a Brazilian listed company to engage in derivative usage? Do derivative usage increase the company's value? This work contributes to complement a similar study previously published by Serafini and Sheng (2011). We extended their research not only by increasing the sample size through the selection of a larger number of companies and a longer analysis time due to greater availability of data but also by focusing on the different purposes for derivative usage, as well as on analyzing the drivers for these different types of usage of derivatives.

¹<https://www1.folha.uol.com.br/fsp/dinheiro/fi1905200907.htm>

²<https://exame.com/invest/seu-dinheiro/sadia-temia-perder-mais-ainda-com-derivativos-dizem-analistas-m0168377/>

³<https://exame.com/invest/seu-dinheiro/ex-diretor-aracruz-fala-pela-primeira-vez-perdas-derivativos-404818/>

⁴<https://economia.estadao.com.br/noticias/geral,aracruz-sabia-das-operacoes-com-derivativos,283663>

⁵<https://g1.globo.com/economia/noticia/2020/10/29/ambev-tem-lucro-de-r-2274-bilhoes-no-3o-trimestre-queda-de-89percent.ghtml>

Bartov and Bodnar (1994) state that the exchange rate is one of the most important prices in the economy. It is the price of one country's currency in terms of another, and, as such, it converts prices denominated in one currency into prices denominated in another currency. Changes in exchange rates should, therefore, have a significant effect on the performance of firms involved in international activities. Movements in the foreign exchange rate result in direct changes in the relative prices of domestic and foreign goods, thus influencing both the current and future expected cash flows of firms operating internationally. Also, changes in exchange rates alter the domestic currency value of foreign currency-denominated assets and liabilities, thereby adding another dimension to how exchange rate changes affect the value of firms with cross-country activities. The literature on foreign exchange exposure is extensive. Several studies are focused in measuring the foreign exchange exposure of companies and their relationship to the value of firms Adler and Dumas (1984), Jorion (1990) and Bartov and Bodnar (1994). Other several empirical articles are interested in investigating foreign exchange exposure and its determinants, like Tufano (1998), Williamson (2001), Pantzalis et al. (2001) and Bodnar and Marston (2002).

"Currency exposure is a measure of a company's profitability potential, net cash flow and market value change due to a change in exchange rates" (Eiteman et al., 2013). One of the duties of the financial manager within a company is to be able to measure foreign exchange exposure and manage it in a way that maximizes the company's profitability, net cash flow and market value. Multinational companies, as the name suggests, have activities in several countries and, consequently, a multiplicity of cash flows among other assets that are sensitive to changes in exchange rates. Therefore, to protect themselves against these rate variations, companies engage in hedge activities.

The use of derivatives for hedging purposes can increase firm's market value. Hedging refers to the activities undertaken by the firm in order to reduce the variability of future cash flows, and price of goods, and consequently increasing company's present value. Additionally, due to the stability in future cash flows and price of goods, firms are able to increase its debt capacity. Given that Brazilian listed companies are subject to currency exposure, the most common way for companies to hedge against these risks is through the usage of derivatives. In a complementary way, Brazilian companies could also use financial derivative instruments to speculate in the financial market, being financial speculation understood here as the purchase (or sale) of assets by the firm for purposes not for their direct usage, but for their future sale (or purchase) at a profit, under conditions of uncertainty.

Mian (1996) provides empirical evidence on the determinants of corporate hedging decisions for U.S. firms. Géczy et al. (1997) examines the usage of derivatives in order to differentiate among existing theories of hedging behavior. Allayannis and Weston (2001) tested in their work whether the use of derivatives is associated with higher firm market value. They found that the usage of foreign currency derivatives is positively associated with firm market value and that firms that begin a hedging policy experience an increase in value above those firms that chose to remain unhedged and that firms that quit hedging experience a decrease in value relative to those firms that choose to remain hedged. Adam and Fernando (2006) showed in their work that the usage of derivatives can translate into increases in shareholder value. They provided evidence that derivative transactions have

positive net present values that increase cashflows and that this premium is a potential important motive for firms to engage in hedging activities. Chernenko and Faulkender (2011) examines, using panel data, if U.S. companies use interest rate derivatives to hedge or to speculate.

Regarding Brazil, there are few previous studies on the use of derivatives and hedge decisions due to the low availability of financial information on the use of derivatives by companies. Saito and Schiozer (2007) researched the use of derivatives in non-financial companies listed on the stock exchange in Brazil, through the application of online questionnaires. Schiozer and Saito (2009) investigated the determinants of currency risk management in non-financial firms in Argentina, Brazil, Chile, and Mexico, based on a panel data sample of firms that list American depositary receipts. Serafini and Sheng (2011) examined the impact of the use of currency derivatives on the firm's market value, based on a sample of non-financial listed companies. Coutinho et al. (2012) studies the behavior of the cost of capital of non-financial Brazilian companies when they use derivative-based financial instruments to protect (or hedge) their cash flow. Lopes et al. (2013) investigated the dynamics in the use of currency derivatives by Brazilian non-financial companies, based on over-the-counter operations effectively contracted with a major international bank. Oliveira (2020) examined how the demand for foreign exchange derivatives by non-financial Brazilian corporations affects their stock market returns, by identifying if corporations were hedging or speculating with foreign exchange derivatives. The main studies on foreign exchange exposure in Brazil are conducted by Rossi (2004, 2011, 2012).

We found evidence that firms that use financial derivative instruments, in particular for the purpose of financial speculation, have a higher market value than firms that do not use them, coinciding with the results found by Allayannis and Weston (2001). Regarding the use of derivatives for hedging purposes, our results coincide with those found by Jin and Jorion (2006) and Serafini and Sheng (2011), rejecting the hypothesis that hedging with derivatives increases the firm value of companies. We have found no evidence to reject the claims that either decision to start or quit hedging are unaffected by the size. Additionally, we have found evidence that the decision to start using derivatives and the decision to speculate with derivatives are affected by firm's market value, but no evidence was found to reject the claims that the decision to stop using derivatives and stop speculating are not affected by the size of the firm's market value. Looking at our results, it became evident that the drivers for companies to hedge and to speculate with financial derivative instruments are different, having only one point of similarity, which would be that the larger the size of companies, the greater the probabilities for hedging and speculation with derivatives. Regarding the motivators for hedging, the size of the companies, the act of distribution of dividends to its investors, presenting revenues from abroad, expending capital on growth opportunities, and expending capital on branding and reputation increases the probability of companies engaging in hedging activities. Regarding the motivators for speculating, expending capital on growth opportunities, the more profitable the firm, and the more levered the firm, the less probable the company to engage in speculating activities with derivatives.

One of the contributions of this work to the empirical literature, occurs through the evaluation of the impact of the use of derivatives on the company's value. With

this, investors are able to assess whether the companies in their portfolios are adding or destroying value by engaging in derivative usage. A second contribution is to identify what are the main factors that lead a company to engage in derivative usage. Thus, investors can adjust their portfolios according to the economic situation in which the company finds itself and improve their possible return. Another contribution is that this work extends the derivative usage literature to the Brazilian reality.

The remainder of this paper is organized as follows: Section II provides an overview of the determinants of corporate hedging. Section III describes discusses our methodological strategy and the data used in this study, containing our sample and the derivative data. Section IV presents and discuss our findings. Section V concludes.

2 Determinants of Corporate Hedging

2.1 Costs of Financial Distress

Mayers and Smith (1982) states that the existence of bankruptcy transaction costs induces companies to use derivatives to hedge against some risks. The transaction costs associated with bankruptcy are a small fraction of the assets of a large company, but even small bankruptcy costs will be sufficient to induce companies to become involved in the use of derivatives, if the present value of the reduction in expected bankruptcy costs is greater than the present value of the contract loading fees. Nance et al. (1993) state that financial distress can lead to bankruptcy and reorganization or, possibly, liquidation, situations in which the firm faces direct legal costs. Then by engaging in hedging activities, the firm can reduce the variability of the firm's future value, thereby reducing the expected costs of financial distress. Additionally, firms can also reduce the financial distress costs by maintaining greater short term liquidity. Also, it is debated in their work that if exists a fixed cost component, then smaller firms are more likely to hedge. Mian (1996) argues that if financial distress is costly, firms have incentive to reduce its probability. However, within his article, the author suggests, with respect to the models of hedging, that evidence is inconsistent with financial distress cost models. Géczy et al. (1997) discuss that exogenous bankruptcy costs create incentives for hedging. By reducing the variance of a firm's cash flows, hedging decreases the probability, and thus the costs, of financial distress. The lower a firm's coverage ratio and the higher its long-term debt ratio, the greater the probability of financial distress. Consequently, the expected costs of financial distress for those firms are greater.

2.2 Agency Costs

Myers (1977) states that in order to avoid the underinvestment problem, the firm has incentives to engage in hedging activities. Hedging restricting the states in which the firm would default on bond payments, thus guaranteeing the bondholder's payments, freeing the firm to engage in more positive net present value investment opportunities. Therefore, firms with more growth options in their investment opportunity set are more likely to undertake a hedging program aimed at reducing the variance in firm value and as the underinvestment problem is more pronounced with more debt in the firm's capital structure, firms with higher leverage are more likely to engage in hedging activities. On their work, Froot et al. (1993) address the use of derivatives as an instrument to overcome the issue of capital market imperfections. They argue that if the imperfections of the capital market make funds obtained externally more expensive than those generated internally, they can generate justification for risk management, that is, a justification for hedging strategies. The argument is that hedging can add value by reducing the investment distortions associated with debt finance. The theory rely on the basic observation that, without hedging, firms may be forced to underinvest because it is costly or impossible to raise external finance. The conclusions reached by the authors are that when external financing is more expensive than that generated internally, it makes sense for firms to hedge Géczy et al. (1997) argues that hedging mitigates the underinvestment problem by reducing not only the costs of obtaining external funds, but also a firm's dependence on

external finance. Additionally, the underinvestment cost hypothesis predicts that these costs result from the interaction between both potential growth opportunities and costly external financing.

2.3 Tax Incentives

Smith and Stulz (1985), in their work, argue that transaction costs can induce publicly traded companies to protect themselves. By reducing the variability of the company's future value, the hedge reduces the expected costs of financial distress and reduces the likelihood of incurring bankruptcy costs. This decrease in expected bankruptcy and financial distress costs benefits the shareholders greatly. Additionally, when talking about tax incentives to use hedge, they argue that the structure of the tax code can make it advantageous for firms to take positions in derivative markets. If hedging reduces the variability of pre-tax firm values, then the expected corporate tax liability is reduced and the expected post-tax value of the firm is increased, as long as the cost of the hedge is not too large. Mian (1996) state that hedging can reduce the expected tax liability for a firm facing a progressive corporate tax structure over the range of possible income outcomes. Géczy et al. (1997) discuss that reducing variance through hedging increases the expected value of tax benefits because the probability of using preference items increases with the level of a firm's taxable income.

2.4 Foreign Exposure

Géczy et al. (1997) state that firms with greater variation in cash flows or accounting earnings resulting from exposure to foreign exchange-rate risk have greater potential benefits of using derivatives.

2.5 Brazilian Derivative Usage

Saito and Schiozer (2007) researched the use of derivatives in non-financial companies listed on the stock exchange in Brazil. They provided evidence that Brazilian managers are more concerned with institutional and legal aspects than with economic and financial issues regarding the use of derivatives. They also demonstrated that the managers of Brazilian non-financial companies use derivatives mainly for the purpose of managing risk, and not for speculative purposes.

Schiozer and Saito (2009) investigated the determinants of currency risk management in non-financial firms in Argentina, Brazil, Chile, and Mexico, based on a panel data sample of firms that list American depositary receipts from 2001 to 2004. They present evidence that indicates that derivatives held for hedging purposes can yield cash flows of the same order of magnitude of capital expenditures, operational earnings, and financial expense. The authors find that the costs of financial distress related to currency exposure are the main driving forces for both the decision to use derivatives and the magnitude of derivatives holdings. Also, they find that firms hedge to mitigate underinvestment problems. Regarding Brazilian firms, they presented evidence that Brazilian firms are not only more likely to use derivatives, but also hedge more in terms of magnitude.

Serafini and Sheng (2011) examined the impact of the use of currency derivatives on the firm's market value, based on a sample of non-financial listed companies, covering the period from 1999 to 2007. They found evidence that firms that use derivatives have no higher market value than companies that do not use derivatives. Additionally, the authors found evidence that companies that start using derivatives experience a momentary increase in their market value. However, those companies that stop using these instruments, at a certain moment, also have their market value increased.

Coutinho et al. (2012) studies the behavior of the cost of capital of non-financial Brazilian companies when they use derivative-based financial instruments to protect (or hedge) their cash flow. The authors verify that the correct use of hedging instruments genuinely does free up capital for the company. Additionally, they showed that for the period pre-crisis (pre-2008), the usage of derivative instruments increased the WACC, confirming previous studies showing that firms were not using derivatives purely for protection. A second test, for the period post-crisis (post-2008), found that the usage of derivatives diminished the WACC for firms, giving evidence that companies adopted greater caution in their hedging operations while falling under greater scrutiny of regulators and even investors.

Lopes et al. (2013) investigated the dynamics in the use of currency derivatives by Brazilian non-financial companies, based on over-the-counter operations effectively contracted with a major international bank. The evidence they found for the *pre-crisis* period indicates that the decision-maker was not only concerned with the optimization of financial risks, but also with the result of their positions, once the company liquidated its positions at the peak 'present value' in the history of the contract. Additionally, the authors found strong evidence that the events of great losses of Brazilian companies in 2008 may have served as a warning that investors, advisors and financial managers have increased the monitoring and diligence in carrying out derivative transactions, avoiding the approval of speculative positions with these instruments, given that for the *post-crisis* period, they did not find the same evidence of speculative behavior.

Oliveira (2020) examined how the demand for foreign exchange derivatives by non-financial Brazilian corporations affects their stock market returns from 2010 to 2016. His results indicate that, after foreign exchange depreciation, corporations that hedge foreign exchange exposure and whose market returns are negatively affected by depreciation, observe an increase in their market returns. On the other hand, speculation has no effect on a corporation's market returns. His results are economically and statistically significant and robust to different specifications and econometric techniques. Having presented this, we arrived here at our hypotheses to be tested:

Hypothesis 1 *The use of derivatives by companies positively impacts the firm's value.*

Hypothesis 2 *Hedging with derivatives positively impact the company's value.*

Hypothesis 3 *Speculating with derivatives positively impact the company's value.*

Within the next section, we'll specify the framework to verify if derivative usage indeed increase firm value and what are the factors that contributes to firms engage in those activities.

3 Empirical Methodology

3.1 Definition of Hedgers and Speculators

The disclosure of transactions with derivatives as hedging or speculative is somewhat complex. As explained by Lopes et al. (2013), although companies' financial reports must distinguish between operations for protection or speculation, few companies admit to using derivatives for speculation. In Serafini and Sheng (2011), to classify a company as being a user of derivatives, the firm needed to have explicitly informed the use of foreign exchange derivatives. Other derivatives (interest, and commodities, for example) were not considered for the classification. Thus, the authors created a dummy variable, assuming the value of 1, if the firm is a user of derivatives; otherwise, it assumes a value of 0. For the purpose of robustness testing, a similar hedge variable, *DerivUsage*, was created and employed.

The model used previously by Allayannis and Weston (2001) and Serafini and Sheng (2011) does not differ the usage of derivatives between hedging and speculation. In order to assess this, we will employ here the methodology previously performed by Oliveira (2020) to identify speculation and hedge. With this model, we not only consider all types of derivatives used by firms, but we are also able to classify the usage of these derivatives in hedge and speculation.

We have 4 cases in which we may consider a corporation to be hedging. They are:

- Exists foreign debt, corporation net imports = 0, corporation net exports = 0, and net derivatives > 0 (Hedge1);
- Exists foreign debt, corporation net importer and net derivatives > 0 (Hedge2);
- No foreign debt, corporation net exporter and net derivatives < 0 (Hedge3);
- No foreign debt, corporation net importer and net derivatives > 0 (Hedge4).

We define that a corporation is hedging (*Hedging*) in a certain year if at least one of the definitions of hedge above holds for a corporation at the end of a certain year of our sample period.

We have 5 situations in which we may consider a corporation to be speculating. They are:

- No foreign debt, corporation net imports = 0, corporation net exports = 0, and net derivatives $\neq 0$ (Spec1);
- No foreign debt, corporation net exporter and net derivatives > 0 (Spec2);
- No foreign debt, corporation net importer and net derivatives < 0 (Spec3);
- Exists foreign debt, corporation net imports = 0, corporation net exports = 0, and net derivatives > foreign debt (Spec4);
- Exists foreign debt, corporation net imports = 0, corporation net exports = 0, and net derivatives < 0 (Spec5).

We define that a corporation is speculating (*Speculating*) in a certain year if at least one of the definitions of speculation above holds for a corporation at the end of a certain year of our sample period.

Additionally, for the cases that were classified simultaneously as hedgers and speculators within the same period of time, another dummy variable, *Both*, was created to test the effects of using derivatives for both hedge and speculation in the firm value.

3.2 Firm Market Value

The *Tobin's Q* index was used as a proxy for the companies' market value, and in order to investigate the sensitivity of the results to the *Tobin's Q* index, three alternative measures were built following the previous literature performed by Allayannis and Weston (2001), Rossi (2008) and Serafini and Sheng (2011).

In the first measure of Tobin's Q, we adopted a methodology similar to that of Serafini and Sheng (2011),

$$Q1 = \frac{AT - VCE + VME}{AT} \quad (1)$$

where AT represents the book value of assets, VCE is the book value of shareholders' equity and VM indicates the market value of shareholders' equity.

The second alternative measure of Tobin's Q proposed was the methodology found in Rossi (2008),

$$Q2 = \frac{VMA + VCPC - VCAC + VCE + VCDLP}{AT} \quad (2)$$

where VMA is the firm's market value, $VCPC$ is the book value of the firm's current liabilities, $VCAC$ is the book value of current assets, VCE is the book value of inventories and $VCDLP$ is presented at the book value of long-term debt. AT represents the firm's total assets.

The third alternative measure of Tobin's Q proposed was the methodology found in Serafini and Sheng (2011),

$$Q3 = \frac{VMA + VCD}{AT} \quad (3)$$

where again VMA represents the firm's market value and VCD is the book value of debts. The AT is the total value of the assets.

3.3 Control Variables

To capture the relationship between the use of foreign exchange derivatives and the firm's market value, it is necessary to control the variables that may have an impact on Tobin's Q. In choosing the variables, the models previously performed by Allayannis and Weston (2001), Rossi (2008) and Serafini and Sheng (2011) were followed. Below, we

describe the various controls that we use in our multivariate tests and the theoretical reasons that led us to use them.

As in Allayannis and Weston (2001) and Serafini and Sheng (2011), there is evidence that implicates that the larger the company, the more derivatives it uses; for example, due to the existence of high initial fixed hedging costs. The natural logarithm of total assets was used for the Size control variable.

If hedge users abandon projects, because they do not get necessary funding, their Qs should remain high, as they only retain projects whose net present value is positive. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. If the company has paid dividends, it is more unlikely that it has had capital restrictions and therefore should have a reduced Q index.

The company's capital structure must also be related to its value. To control differences in the capital structure, a Leverage variable defined as long-term debt, divided by shareholder's equity, was used.

A profitable company is likely to trade with a premium compared to a less profitable company. So, if firms that use foreign exchange derivatives are more profitable, they will have a higher Q index. To control profitability, the return on assets was used, defined as the ratio of net revenues to total assets.

Companies also depend on future investment opportunities. Since derivative firms are likely to have more investment opportunities, this control is important. The capital expenditures on sales index was used as a proxy for Investment Opportunity.

In the same way that access to financial markets was controlled, if derivative users abandon projects because they do not obtain the necessary financing, their Qs should remain high, as they only retain projects whose net present value is positive. Therefore, more liquid companies would have the lowest Q value. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities.

Several theories suggest that Geographic Diversification (multinationalization) increases the firm's value. For example, the internationalization theory says that foreign direct investments occur, when a company can increase its value, internalizing markets for some of its intangible assets, such as consumer gratitude. Other theories suggest that this is a consequence of the agency problem. The external sales index on total sales was used as a continuous measure of multinationality in the tests.

If exporting companies concentrate industries with a high Q value, then these companies may have greater value, not because they use derivatives, but because they have a large part of their revenues from abroad. Therefore, a dummy variable was used, which assumes a value of 1, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise.

We also control for Year and Industry effects, using annual and sectors dummies, respectively, in all regressions.

Additionally, in the same way that exporting industries were controlled, companies that have foreign sales from those that operate only in the domestic market were also controlled. A dummy variable was used, which assumes a value of 1, if the company has

revenues from abroad; and value 0, otherwise.

An intangible asset that may affect firm value is consumer goodwill. Consumer goodwill accounts for non-quantifiable returns that are difficult to measure and categorize, like customer loyalty, brand reputation, and customer value. *Goodwill* is the proxy used to capture consumer goodwill and is calculated as the ratio of the costs that a business incurs to market and distribute its products and services to total assets.

In Table 1 is a summary of the control variables used in the tests and the theoretical (simplified) reasons that led us to use them.

Table 1: Control Variables and Description

Control Variable	Proxy	Description
Size	Natural logarithm of total assets	There is no clear evidence that company size leads to higher accounting profits. However, the larger the company, the more derivatives it uses; for example, due to the existence of high initial fixed hedging costs. The natural logarithm of total assets was used for the Size control variable.
Access to Financial Markets	Dummy Dividends: 1 if the company paid that year; zero otherwise	If hedge users abandon projects, because they do not get the necessary funding, their Qs should remain high, as they only retain projects whose net present value is positive. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. If the company has paid dividends, it is more unlikely that it has had capital restrictions and therefore should have a reduced Q index.
Leverage	Long-term debt / Equity	The company's capital structure must also be related to its value. To control differences in the capital structure, a Leverage variable defined as long-term debt was used, divided by the equity of shareholders.
Profitability	Net Revenue / Total Assets	A profitable company is likely to trade with a premium compared to a less profitable company. So, if firms that use foreign exchange derivatives are more profitable, they will have a higher Q index. To control Profitability, the return on assets was used, defined as the ratio of net revenues to total assets.
Growth opportunities	CAPEX / Total Sales	Companies also depend on future investment opportunities. Since derivative firms are likely to have more investment opportunities, this control is important. The ratio of capital expenditures to sales was used as a proxy for Growth Opportunity. It always presents negative values, as reported.
Liquidity	Current Assets / Current Liabilities	In the same way that access to financial markets was controlled, if derivative users abandon projects because they do not obtain the necessary financing, their Qs should remain high, as they only retain projects whose net present value is positive. Therefore, more liquid companies would have the lowest Q value. As a proxy for the firm's Liquidity, the current liquidity index, which is the ratio between the firm's current assets and liabilities.
Geographic Diversification	External Sales / Total Sales	Several theories suggest that Geographic Diversification (multinationalization) increases the firm's value. For example, the internationalization theory says that foreign direct investments occur, when a company can increase its value, internalizing markets for some of its intangible assets, such as consumer gratitude. Other theories suggest that this is a consequence of the agency problem. The external sales to total sales ratio was used as a continuous measure of multinationality in the tests.
Exporter	Dummy Exporter: 1 if the company has external sales = 40% of total sales; 0 otherwise.	If exporting companies concentrate industries with a high Q value, then these companies may have greater value, not because they use derivatives, but because they have a large part of their revenues from abroad. Therefore, a dummy variable was used, which assumes a value of 1, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise.
Effects of time Foreign Sales	Dummies for each year from 2000 to 2019. Dummy Foreign Sales: 1 case the company exported in a given year; The contrary case.	We also control the effect of time, using annual dummies in all regressions. Additionally, in the same way that exporting industries were controlled, companies that have foreign sales from those that operate only in the domestic market were also controlled. A dummy variable was used, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise.
Consumer Goodwill	Advertising Expense / Total Sales	An intangible asset that may affect firm value is consumer goodwill. Consumer goodwill accounts for non-quantifiable returns that are difficult to measure and categorize, like customer loyalty, brand reputation, and customer value. Goodwill is the proxy used to capture consumer goodwill and is calculated as the ratio of the costs that a business incurs to market and distribute its products and services to total sales.
Hedging	We have 4 cases in which we may consider a corporation to be hedging. They are: exists foreign debt, corporation non-tradable and net derivatives0 (Hedge1); exists foreign debt, corporation net importer and net derivatives0 (hedge2); no foreign debt, corporation net exporter and net derivatives0 (Hedge3); no foreign debt, corporation net importer and net derivatives0 (Hedge4).	We define that a corporation is Hedging with derivatives in a certain year if at least one of the 4 definitions of hedge holds for a corporation at the end of a certain year of our sample period.
Speculating	We have 5 situations in which we may consider a corporation to be speculating. They are: no foreign debt, corporation non-tradable and net derivatives#0 (Spec1); no foreign debt, corporation net exporter and net derivatives0 (Spec2); no foreign debt, corporation net importer and net derivatives0 (Spec3); exists foreign debt, corporation non-tradable and net derivativesforeign debt (Spec4); exists foreign debt, corporation non-tradable and net derivatives0 (Spec5).	We define that a corporation is Speculating with derivatives in a certain year if one of the 5 definitions of speculation holds for a corporation at the end of a certain year of our sample period.
Both	Dummy variable that assumes the value of 1 if, in the same period of time, the variables Hedging and Speculating assumes the value of 1. Assumes the value of 0 otherwise.	We define a company as Both if it was classified simultaneously as Hedging and Speculating within the same period of time.
DerivUsage	Dummy variable that assumes the value of 1 if the company declared the use of derivative instruments in the period. Assumes the value of 0 otherwise.	We define a variable as a user of derivative instruments if it has declared the usage within its financial statements.

3.4 Derivative Usage and Firm Market Value

As in Allayannis and Weston (2001), Rossi (2008) and Serafini and Sheng (2011), the estimated equations below verifies our hypothesis if the use of derivatives is aligned with the increase in the company's value::

$$Q_{i,t} = \alpha_i + \delta_1 Hedging_{i,t} + \gamma \cdot X_{i,t} + \Theta_t + \Gamma_t + \xi_{i,t} \quad (4)$$

$$Q_{i,t} = \alpha_i + \delta_1 Speculating_{i,t} + \gamma \cdot X_{i,t} + \Theta_t + \Gamma_t + \xi_{i,t} \quad (5)$$

where Q represents Tobin's Q value for each firm i in period t , Θ represents the temporal dummies, Γ represents the sector dummies, X is the set of control variables mentioned in table 1, δ_1 , for both equations, is the coefficient of interest, as it indicates the impact of using derivatives (for hedging or speculating) in the firm's value and ξ is the error term.

As explained earlier, we additionally created a dummy variable for cases where the company's use of derivatives was classified as hedgers and speculators within the same period of time. Given this, the equation below was estimated to verify whether the use of derivatives for both purposes, hedging and speculating simultaneously, is aligned with an increase in firm's value:

$$Q_{i,t} = \alpha_i + \delta_1 Both_{i,t} + \gamma \cdot X_{i,t} + \Theta_t + \Gamma_t + \xi_{i,t} \quad (6)$$

where Q represents Tobin's Q value for each firm i in period t , Θ represents the temporal dummies, Γ represents the sector dummies, X is the set of control variables mentioned in table 1. δ_1 is the coefficient of interest, as it indicates the impact of the use of derivatives, both for hedging and speculation purposes simultaneously, on the company's value, and ξ is the error term.

We also performed a regression using the dummy variable similar to that of Serafini and Sheng (2011) in order to verify whether the use of derivatives is in line with an increase in firm value:

$$Q_{i,t} = \alpha_i + \delta_1 DerivUsage_{i,t} + \gamma \cdot X_{i,t} + \Theta_t + \Gamma_t + \xi_{i,t} \quad (7)$$

where Q represents Tobin's Q value for each firm i in period t , Θ represents the temporal dummies, Γ represents the sector dummies, X is the set of control variables mentioned in table 1, δ_1 is the coefficient of interest, as it indicates the impact of using derivatives (for hedging or speculating) in the firm's value and ξ is the error term.

3.5 Reverse Causality Tests

Alternative explanations were sought to clarify the effect of the use of derivatives on the firm's market value. Following the methodology from Allayannis and Weston (2001) and Serafini and Sheng (2011), the high value of Tobin's Q index indicates that a company's market value exceeds the replacement cost of its assets. If companies with a higher Q value have more profitable investment opportunities, then those companies must have an additional incentive to pursue derivative transactions. That is, if firms that

use derivatives have greater value, this may simply reflect the fact that firms with higher Q s are more likely to use derivative transactions, rather than the fact that the use of these derivatives causes an increase in the value of the firm.

To test the possibility of this reverse causality, we followed the model executed by Serafini and Sheng (2011), classifying the sample firms for each year into one of four categories: (1) companies that did not use derivatives in the current period and in the following period (NN_D); (2) companies that used derivatives in the current period, but stopped using them in the following period (HN_D); (3) companies that did not use derivatives in the current period and started to use them in the following period (NH_D); and (4) companies that used derivatives in the current period and continued to use them in the following period (HH_D). Then, dummy variables for categories (1) - (3) were constructed and the following cross-sectional regression was estimated:

$$Q_{i,t} = \alpha_i + \delta_1(NN_{D,t,t+1}) + \delta_2(HN_{D,t,t+1}) + \delta_3(NH_{D,t,t+1}) + \gamma \cdot X_{i,t} + \xi_{i,t} \quad (8)$$

If companies with a higher Q value choose to engage in derivative usage, then companies that start engaging in hedging activities in the next period, NH_D , should have a higher Q value than companies that remained without engaging in derivative usage in the next period, NN_D . Therefore, it is expected that $\delta_3 > \delta_1$. Also, if companies choose not to engage in derivative usage because they have a low Q value, then, similarly, companies that stop using derivatives in the next period are expected to have a lower Q value than companies that continue to use it. Therefore, $\delta_2 < 0$ is expected. Finally, it is suggested that companies that do not engage in derivative usage have a lower Q value than those that engage in it, that is, $\delta_1 < 0$. Having stated this, this new subset of hypothesis were tested:

Hypothesis 1a *Engaging in derivative usage do not add value ($\delta_1 = 0$).*

Hypothesis 1b *The decision to start using derivatives is not affected by the size of the Q ($\delta_3 = \delta_1$).*

Hypothesis 1c *The decision to stop using derivatives is not affected by the size of the Q ($\delta_2 = 0$).*

Additionally, we performed the reverse causality test on our *Hedging* variable, employing the same reasoning used in our previous reverse causality tests. Similarly, we classified the sample firms for each year into one of four categories: (1) companies that did not use derivatives for the purpose of hedging in the current period and in the following period (NN); (2) companies that used derivatives for the purpose of hedging in the current period, but stopped using them in the following period (HN); (3) companies that did not use derivatives for the purpose of hedging in the current period and started to use them in the following period (NH); and (4) companies that used derivatives for the purpose of hedging in the current period and continued to use them in the following period (HH). Then, dummy variables for categories (1) - (3) were constructed and the following cross-sectional regression was estimated:

$$Q_{i,t} = \alpha_i + \delta_1(NN_{t,t+1}) + \delta_2(HN_{t,t+1}) + \delta_3(NH_{t,t+1}) + \gamma \cdot X_{i,t} + \xi_{i,t} \quad (9)$$

If companies with a higher Q value choose to engage in hedging activities, then companies that start engaging in hedging activities in the next period, NH , should have a higher Q value than companies that remained without engaging in hedging activities in the next period, NN . Therefore, it is expected that $\delta_3 > \delta_1$. Also, if companies choose not to engage in hedging activities because they have a low Q value, then, similarly, companies that stop engaging in hedging activities in the next period are expected to have a lower Q value than companies that continue to engage in it. Therefore, $\delta_2 < 0$ is expected. Finally, it is suggested that companies that do not engage in hedging activities have a lower Q value than those that engage in it, that is, $\delta_1 < 0$. Given this, another subset of hypothesis were tested:

Hypothesis 2a *Hedging activities do not add value ($\delta_1 = 0$).*

Hypothesis 2b *The decision to start hedging is not affected by the size of the Q ($\delta_3 = \delta_1$).*

Hypothesis 2c *The decision to stop hedging is not affected by the size of the Q ($\delta_2 = 0$).*

The same rationale for the causality test for companies classified as *Hedging* was done for companies classified as *Speculating*. Then, a new regression was estimated:

$$Q_{i,t} = \alpha_i + \delta_1(NN_{t,t+1}) + \delta_2(SN_{t,t+1}) + \delta_3(NS_{t,t+1}) + \gamma \cdot X_{i,t} + \xi_{i,t} \quad (10)$$

If companies with a higher Q value choose to engage in speculating activities, then companies that start engaging in speculating activities in the next period, NS , should have a higher Q value than companies that remained without engaging in speculating activities in the next period, NN . Therefore, it is expected that $\delta_3 > \delta_1$. Also, if companies choose not to engage in speculating activities because they have a low Q value, then, similarly, companies that stop engaging in speculating activities in the next period are expected to have a lower Q value than companies that continue to engage in it. Therefore, $\delta_2 < 0$ is expected. Finally, it is suggested that companies that do not engage in speculating activities have a lower Q value than those that engage in it, that is, $\delta_1 < 0$. Having stated this, our final subset of hypothesis were tested:

Hypothesis 3a *Speculating activities do not add value ($\delta_1 = 0$).*

Hypothesis 3b *The decision to start speculating is not affected by the size of the Q ($\delta_3 = \delta_1$).*

Hypothesis 3c *The decision to stop speculating is not affected by the size of the Q ($\delta_2 = 0$).*

3.6 First Difference Test

In the previous subsection we propose a test in order to verify if a firm's market value influences the decision to engage in derivative usage. With this first difference test, we took a more direct approach of testing for the direct causality that engaging in derivative usage causes firms to have a higher value. To accomplish this we perform a test on the changes in derivative usage policy for both our samples. That is, We investigate whether the decision to begin engaging (or to quit engaging) in derivative usage impacts a firm's value change. According to Allayannis and Weston (2001), this test has the advantage that it perfectly controls for unidentifiable firm-specific characteristics that may affect the level-Q tests.

Following the rationale used in our reverse causality test, we classified our sample firms for each year into one of four categories: (1) companies that did not use derivatives for the purpose of hedging in the current period and in the following period (NN); (2) companies that used derivatives for the purpose of hedging in the current period, but stopped using them in the following period (HN); (3) companies that did not use derivatives for the purpose of hedging in the current period and started to use them in the following period (NH); and (4) companies that used derivatives for the purpose of hedging in the current period and continued to use them in the following period (HH). Then, we regress the change in firm's market value from period t to $t+1$ on the four dummy variables outline above, controlling for the other factors that could change the firm's market value. The estimated regression model is:

$$\Delta Q_{i,t} = \alpha_i + \delta_1(HH_{t,t+1}) + \delta_2(NN_{t,t+1}) + \delta_3(NH_{t,t+1}) + \delta_4(HN_{t,t+1}) + \gamma \cdot \Delta X_{i,t} + \xi_{i,t} \quad (11)$$

where ΔQ is the change in Tobin's Q and ΔX is a vector of changes in firm size, leverage, profitability, growth, liquidity, geographic diversification, and goodwill. Other controls that are dummies were also added, like dividends, exporter, and foreign sales.

If hedging causes an increase in value then we should expect firms that begin hedging to experience an increase in value relative to firms that remain unhedged, that is, $\delta_3 > \delta_2$. Similarly, if hedging causes an increase in value then we should expect that the decision to quit hedging should cause a decrease in Q relative to firms that remained hedged, or $\delta_4 < \delta_1$. Also, as with our reverse causality test, the same reasoning was employed for our speculating variable and derivative usage variables.

$$\Delta Q_{i,t} = \alpha_i + \delta_1(SS_{t,t+1}) + \delta_2(NN_{t,t+1}) + \delta_3(NS_{t,t+1}) + \delta_4(SN_{t,t+1}) + \gamma \cdot \Delta X_{i,t} + \xi_{i,t} \quad (12)$$

If speculating with derivatives causes an increase in value then we should expect firms that begin speculating to experience an increase in value relative to firms that remain without speculating, that is, $\delta_3 > \delta_2$. Similarly, if speculating with derivatives causes an increase in value then we should expect that the decision to quit speculating should cause a decrease in Q relative to firms that remained speculating with derivatives, or $\delta_4 < \delta_1$.

$$\Delta Q_{i,t} = \alpha_i + \delta_1(HH_{D,t,t+1}) + \delta_2(NN_{D,t,t+1}) + \delta_3(NH_{D,t,t+1}) + \delta_4(HN_{D,t,t+1}) + \gamma \cdot \Delta X_{i,t} + \xi_{i,t} \quad (13)$$

If unspecified derivative usage causes an increase in value then we should expect firms that begin engaging in derivative usage activities to experience an increase in value relative to firms that did not engage in such activities, that is, $\delta_3 > \delta_2$. Similarly, if unspecified derivative usage causes an increase in value then we should expect that the decision to quit engaging in derivative usage activities should cause a decrease in Q relative to firms that remained engaging in such activities, or $\delta_4 < \delta_1$.

3.7 Determinants of Derivative Usage

In order to identify the main motivators of companies to engage in the use of derivatives, both for hedge and for speculation (or both), we performed three logistic regressions, as exemplified by the equations below:

$$LOGIT_{Hedging} = \alpha_i + \gamma \cdot X_{i,t} + \xi_{i,t} \quad (14)$$

$$LOGIT_{Speculating} = \alpha_i + \gamma \cdot X_{i,t} + \xi_{i,t} \quad (15)$$

$$LOGIT_{Both} = \alpha_i + \gamma \cdot X_{i,t} + \xi_{i,t} \quad (16)$$

The logistic regression in Equation 14 aims to produce a model that allows the forecast of the log of the chance of a company to engage in hedge activities. Similarly, Equation 15 aims to forecast the log of the chance of a company to engage in speculation activities with derivatives, and Equation 16 with the forecast of the company to use derivatives for both purposes, hedging and speculation, simultaneously.

Additionally, just as it was done with our tests to identify a relationship between derivatives usage and the firm's market value, we also perform a logit regression with the dummy variable similar to that used by Serafini and Sheng (2011), in order to produce an alternative forecast model the log of the chance of a company to engage in derivative usage:

$$LOGIT_{DerivUsage} = \alpha_i + \gamma \cdot X_{i,t} + \xi_{i,t} \quad (17)$$

3.8 Data Description

In this study, tests were performed on two samples. The first sample concerns companies that are part of the IBrX-100 index⁶. In this sample, we have data on 59 publicly traded non-financial companies, within the analyzed period from 2009 to 2019. In the second sample, all active companies of the B3 Stock Exchange⁷ were included, thus expanding the first sample. In total, data was included on 221 publicly traded companies, within the same period from 2009 to 2019. Financial information about the companies, from both samples, was collected through *Bloomberg's* database and the information is

⁶http://www.b3.com.br/pt_br/market-data-e-indices/indices/indices-amplos/indice-brasil-100-ibrx-100.htm/

⁷<http://www.b3.com.br/>

as reported (millions figure and on an annual basis). One point needs to be emphasized about the limitation during data collection, which is that we are subject only to the information available, at the time of collection, within the *Bloomberg's* database.

Table 2 presents summary statistics of our sample concerning our IBrX-100 sample, on the main variables that we employed in our tests.

Table 2: Summary statistics for the IBrX-100 sample. This table presents summary statistics of our sample concerning our IBrX-100 sample, on the main variables that we employed in our tests, from 2009–2019. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Q1	547	1.772	1.083	0.237	1.085	2.132	9.307
Q2	547	1.368	1.074	−0.506	0.687	1.730	9.141
Q3	547	1.883	1.066	0.344	1.200	2.252	9.387
Size	547	9.444	1.375	6.496	8.466	10.263	13.739
Dividends	547	0.841	0.366	0	1	1	1
Leverage	547	1.378	5.341	−28.003	0.399	1.569	110.964
Profitability	547	0.045	0.091	−1.240	0.014	0.079	0.268
Growth	547	−0.283	2.041	−30.280	−0.097	−0.018	0.000
Liquidity	547	1.970	3.111	0.251	1.177	2.130	69.503
Geographic Diversification	547	7.794	20.102	0	0	0	100
Exporter	547	0.091	0.288	0	0	0	1
Foreign Sales	547	0.245	0.430	0	0	0	1
Goodwill	547	0.083	0.097	0.000	0.014	0.117	0.546
Hedging	547	0.155	0.363	0	0	0	1
Speculating	547	0.190	0.393	0	0	0	1
Both	547	0.015	0.120	0	0	0	1
DerivUsage	547	0.391	0.488	0	0	1	1

As previously presented, in relation to our IBrX-100 sample, we have 547 annual observations from 59 publicly traded non-financial companies, in the analyzed period from 2009 to 2019. Our sample reported a mean value of Size of 9.444. Approximately 84% (460 firm-year observations) of our sample distributed dividends to its investors. Regarding revenues from foreign sales, 24.5% (134 firm-year observations) reported having revenues from foreign sales, with only 9.1% (50 firm-year observations) of our sample being

classified as being exporters.

Regarding the use of derivatives, 39.1% (214 firm-year observations) of the IBrX-100 sample reported having used financial derivative instruments. According to our previous specification on the use of derivatives (see section 3.1 on page 18), 15.5% (85 firm-year observations) of the sample was classified as a hedge practitioner, 19% (104 firm-year observations) was classified as a derivative speculator and 1.5% (8 firm-year observations) has been classified as both.

Table 3 shows the correlation matrix of our IBrX-100 sample, on the main variables we used in our tests.

Table 3: Correlation Matrix of IBrX-100 sample

	Q1	Q2	Q3	Size	Dividends	Leverage	Profitability	Growth	Liquidity	Geo_Diversific	Exporter	FSales	Goodwill	Hedging	Speculating	Both	DerivUsage
Q1	1	0.984	0.983	-0.356	0.106	-0.045	0.361	0.078	0.082	-0.069	-0.035	0.052	0.431	-0.102	0.008	-0.060	-0.068
Q2	0.984	1	0.983	-0.342	0.131	-0.073	0.381	0.067	0.048	-0.144	-0.106	-0.003	0.403	-0.090	0.031	-0.034	-0.062
Q3	0.983	0.983	1	-0.381	0.119	-0.053	0.365	0.056	0.072	-0.141	-0.109	-0.032	0.393	-0.117	0.045	-0.059	-0.066
Size	-0.356	-0.342	-0.381	1	0.118	0.046	-0.126	0.039	-0.182	0.248	0.188	0.202	-0.229	0.255	0.077	0.111	0.342
Dividends	0.106	0.131	0.119	0.118	1	0.018	0.303	0.190	-0.091	-0.032	-0.053	0.073	0.057	0.145	-0.044	0.053	0.072
Leverage	-0.045	-0.073	-0.053	0.046	0.018	1	-0.075	0.003	-0.028	0.080	0.075	0.053	-0.031	0.010	-0.030	-0.001	-0.020
Profitability	0.361	0.381	0.365	-0.126	0.303	-0.075	1	0.111	-0.023	-0.123	-0.114	0.012	0.204	0.017	-0.046	-0.017	-0.056
Growth	0.078	0.067	0.056	0.039	0.190	0.003	0.111	1	-0.062	0.040	0.034	0.059	0.097	0.038	-0.111	0.005	-0.050
Liquidity	0.082	0.048	0.072	-0.182	-0.091	-0.028	-0.023	-0.062	1	-0.009	-0.013	-0.002	-0.069	-0.090	0.068	-0.030	-0.009
Geo_Diversific	-0.069	-0.144	-0.141	0.248	-0.032	0.080	-0.123	0.040	-0.009	1	0.901	0.681	-0.048	-0.042	-0.145	-0.047	0.213
Exporter	-0.035	-0.106	-0.109	0.188	-0.053	0.075	-0.114	0.034	-0.013	0.901	1	0.557	-0.053	-0.084	-0.154	-0.039	0.214
FSales	0.052	-0.003	-0.032	0.202	0.073	0.053	0.012	0.059	-0.002	0.681	0.557	1	0.122	0.037	-0.124	-0.069	0.162
Goodwill	0.431	0.403	0.393	-0.229	0.057	-0.031	0.204	0.097	-0.069	-0.048	-0.053	0.122	1	0.030	-0.033	-0.053	-0.018
Hedging	-0.102	-0.090	-0.117	0.255	0.145	0.010	0.017	0.038	-0.090	-0.042	-0.084	0.037	0.030	1	-0.105	0.284	0.535
Speculating	0.008	0.031	0.045	0.077	-0.044	-0.030	-0.046	-0.111	0.068	-0.145	-0.154	-0.124	-0.033	-0.105	1	0.251	0.604
Both	-0.060	-0.034	-0.059	0.111	0.053	-0.001	-0.017	0.005	-0.030	-0.047	-0.039	-0.069	-0.053	0.284	0.251	1	0.152
DerivUsage	-0.068	-0.062	-0.066	0.342	0.072	-0.020	-0.056	-0.050	-0.009	0.213	0.214	0.162	-0.018	0.535	0.604	0.152	1

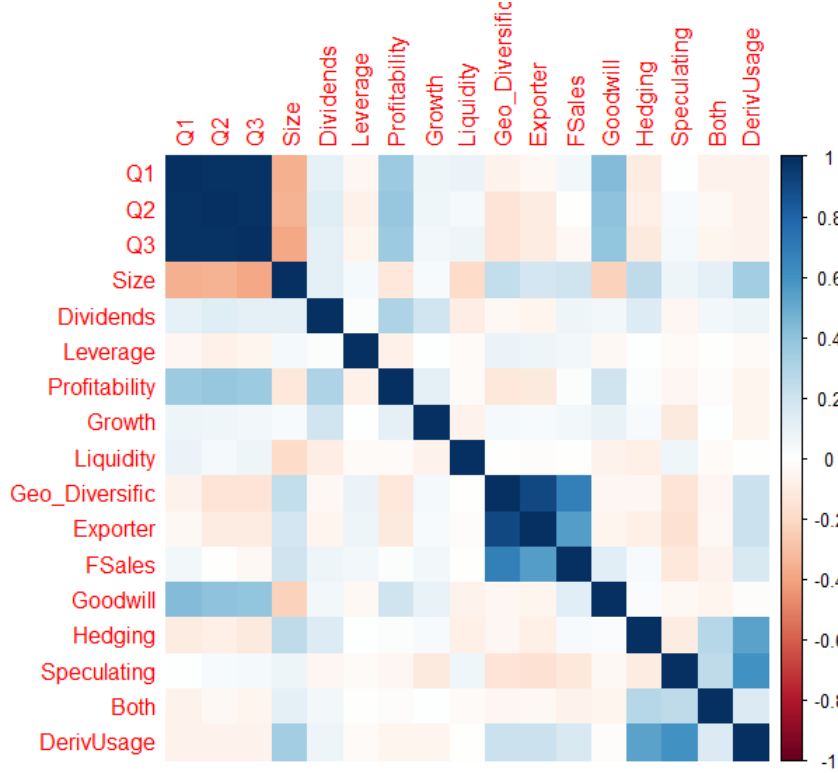


Figure 1: Correlation Matrix of IBrX-100 sample

Table 4 presents summary statistics of our sample concerning our B3 Stock Exchange

sample, on the main variables that we employed in our tests.

Table 4: Summary statistics for the B3 sample. This table presents summary statistics of our sample concerning our B3 Stock Exchange sample, on the main variables that we employed in our tests, from 2009–2019. Q1, Q2, and Q3 represent three alternative measures of Tobin’s Q that was used as a proxy for the companies’ market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm’s Liquidity, the current liquidity variable, which is the ratio between the firm’s current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Q1	1,301	1.587	1.136	0.237	0.931	1.848	17.064
Q2	1,301	1.184	1.106	−0.509	0.575	1.406	16.582
Q3	1,301	1.740	1.212	0.344	1.045	2.059	16.881
Size	1,301	8.557	1.721	2.771	7.539	9.642	13.739
Dividends	1,301	0.739	0.440	0	0	1	1
Leverage	1,301	1.266	7.993	−115.115	0.271	1.248	183.603
Profitability	1,301	0.021	0.153	−1.450	0.002	0.074	2.218
Growth	1,301	−0.259	2.367	−56.320	−0.078	−0.014	0.000
Liquidity	1,301	2.012	2.950	0.007	1.093	2.242	69.503
Geographic Diversification	1,301	8.749	30.092	0	0	1.6	515
Exporter	1,301	0.081	0.272	0	0	0	1
Foreign Sales	1,301	0.277	0.448	0	0	1	1
Goodwill	1,301	0.074	0.181	0.000	0.007	0.086	3.350
Hedging	1,301	0.115	0.320	0	0	0	1
Speculating	1,301	0.166	0.372	0	0	0	1
Both	1,301	0.007	0.083	0	0	0	1
DerivUsage	1,301	0.344	0.475	0	0	1	1

As before, in relation to our B3 Stock Exchange sample, we have 1301 annual observations from 221 publicly traded non-financial companies, in the same analyzed period, that goes from 2009 to 2019. Our sample reported a mean value of Size of 8,557. Approximately 74% (961 firm-year observations) of our sample distributed dividends to its investors. Regarding revenues from foreign sales, 27,7% (361 firm-year observations) reported having revenues from foreign sales, with only 8.1% (105 firm-year observations) of our sample being classified as being exporters.

Regarding the use of derivatives, 34,4% (447 firm-year observations) of the B3 Stock Exchange sample reported having used financial derivative instruments. According to our previous specification on the use of derivatives (see section 3.1 on page 18), 11,5% (150 firm-year observations) of the sample was classified as a hedge practitioner, 16,6% (216

firm-year observations) was classified as a derivative speculator and 0,69% (9 firm-year observations) has been classified as both.

Table 5 shows the correlation matrix of our B3 Stock Exchange sample, on the main variables we used in our tests.

Table 5: Correlation Matrix of B3 sample

	Q1	Q2	Q3	Size	Dividends	Leverage	Profitability	Growth	Liquidity	Geo_Diversific	Exporter	FSales	Goodwill	Hedging	Speculating	Both	DerivUsage
Q1	1	0.982	0.939	-0.186	0.015	-0.035	0.090	0.007	-0.001	-0.020	-0.024	-0.008	0.344	-0.072	0.003	-0.025	-0.054
Q2	0.982	1	0.944	-0.184	0.027	-0.039	0.092	0.006	-0.035	-0.059	-0.072	-0.048	0.299	-0.071	0.026	-0.008	-0.056
Q3	0.939	0.944	1	-0.267	-0.051	-0.039	0.022	0.002	-0.014	-0.056	-0.079	-0.050	0.277	-0.094	-0.001	-0.025	-0.099
Size	-0.186	-0.184	-0.267	1	0.392	-0.007	0.119	0.032	-0.111	0.091	0.172	0.094	-0.168	0.251	0.176	0.095	0.393
Dividends	0.015	0.027	-0.051	0.392	1	-0.042	0.366	0.120	0.031	0.041	0.003	0.091	-0.062	0.171	0.077	0.050	0.169
Leverage	-0.035	-0.039	-0.039	-0.007	-0.042	1	0.002	0.001	-0.025	0.013	0.044	-0.014	-0.015	0.005	-0.013	-0.004	0.006
Profitability	0.090	0.092	0.022	0.119	0.366	0.002	1	0.020	0.076	0.001	-0.023	0.017	0.013	0.054	0.029	0.011	0.039
Growth	0.007	0.006	0.002	0.032	0.120	0.001	0.020	1	-0.029	0.024	0.023	0.050	-0.006	0.026	-0.035	0.003	0.004
Liquidity	-0.001	-0.035	-0.014	-0.111	0.031	-0.025	0.076	-0.029	1	-0.004	-0.030	0.009	-0.046	-0.066	0.002	-0.023	-0.059
Geo_Diversific	-0.020	-0.059	-0.056	0.091	0.041	0.013	0.001	0.024	-0.004	1	0.633	0.469	-0.025	-0.048	-0.086	-0.024	0.156
Exporter	-0.024	-0.072	-0.079	0.172	0.003	0.044	-0.023	0.023	-0.030	0.633	1	0.478	-0.035	-0.080	-0.132	-0.025	0.255
FSales	-0.008	-0.048	-0.050	0.094	0.091	-0.014	0.017	0.050	0.009	0.469	0.478	1	0.002	-0.003	-0.064	-0.052	0.144
Goodwill	0.344	0.299	0.277	-0.168	-0.062	-0.015	0.013	-0.006	-0.046	-0.025	-0.035	0.002	1	-0.014	-0.025	-0.017	-0.053
Hedging	-0.072	-0.071	-0.094	0.251	0.171	0.005	0.054	0.026	-0.066	-0.048	-0.080	-0.003	-0.014	1	-0.103	0.231	0.499
Speculating	0.003	0.026	-0.001	0.176	0.077	-0.013	0.029	-0.035	0.002	-0.086	-0.132	-0.064	-0.025	-0.103	1	0.187	0.617
Both	-0.025	-0.008	-0.025	0.095	0.050	-0.004	0.011	0.003	-0.023	-0.024	-0.025	-0.052	-0.017	0.231	0.187	1	0.115
DerivUsage	-0.054	-0.056	-0.099	0.393	0.169	0.006	0.039	0.004	-0.059	0.156	0.255	0.144	-0.053	0.499	0.617	0.115	1

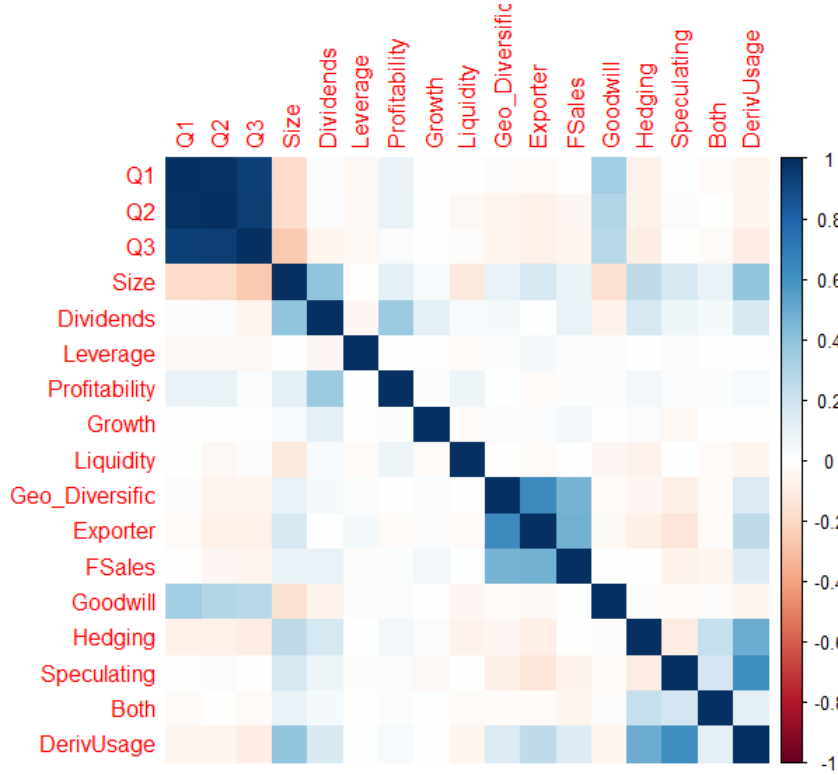


Figure 2: Correlation Matrix of B3 sample

Regarding the comparison of the two samples, some important points deserve to be highlighted. As expected, companies in the IBrX-100 sample have presented some values that are higher when compared to the B3 Stock Exchange sample. For all measures of firm value (Q1, Q2, and Q3), size of companies, percentage of companies that distributed dividends to investors, levels of financial leverage, profitability, investment in growth opportunities, and consumer goodwill, the IBrX-100 sample presented values that were

expected to be higher, since these companies are part of the companies with greater negotiability and representativeness of the Brazilian stock market.

Regarding the use of derivatives, the IBrX-100 sample also showed an expected behavior when compared to the B3 Stock Exchange sample. It presented a higher percentage of companies that declared to engage in the usage of derivative financial instruments, presented a larger number of companies classified as hedge practitioners, a larger number of companies classified as speculators with derivatives, and a higher percentage of companies that use derivatives for both hedge and speculation, simultaneously.

Now, some points regarding financial income from foreign sales have emerged. The B3 Stock Exchange sample showed a higher percentage of companies that reported having revenues from foreign sales, and that the percentage of those revenues over the company's total revenue was also higher when compared to the IBrX-100 sample. The IBrX-100 sample, however, showed a higher percentage of firms classified as exporters than the B3 Stock Exchange sample.

4 Results

This section presents the results obtained in the tests proposed in the Section 3. The results presented here are divided into subsections for each test performed and, for each subsection, are separated for each sample in which the tests were performed.

4.1 The Use of Derivatives and Firm Market Value

Firstly, we will explore the test results on the use of derivatives and the impact on the firm's market value on the IBrX-100 sample. The results of Equation 4, located on page 23, of the IBrX-100 sample on the use of derivatives for hedging purposes, are shown in Table 6. Regression 1 uses the variable $Q1$ as a dependent variable. Regressions 2 and 3 use variables $Q2$ and $Q3$, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 6: **OLS regression results (Hedging) for the IBrX-100 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	Q1	Q2	Q3	Q1	Q2	Q3
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.123*** (0.037)	-0.100*** (0.037)	-0.121*** (0.036)	-0.121*** (0.038)	-0.098*** (0.038)	-0.120*** (0.037)
Dividends	0.074 (0.113)	0.114 (0.113)	0.135 (0.112)	0.085 (0.111)	0.127 (0.111)	0.148 (0.109)
Leverage	-0.003 (0.007)	-0.007 (0.007)	-0.003 (0.007)	-0.003 (0.007)	-0.007 (0.007)	-0.004 (0.007)
Profitability	2.997*** (0.446)	3.059*** (0.449)	2.858*** (0.443)	2.774*** (0.444)	2.822*** (0.444)	2.634*** (0.439)
Growth	0.001 (0.019)	-0.005 (0.019)	-0.009 (0.019)	0.005 (0.019)	-0.001 (0.019)	-0.006 (0.018)
Liquidity	0.022* (0.013)	0.015 (0.013)	0.022* (0.013)	0.021* (0.012)	0.013 (0.012)	0.020* (0.012)
Geographic Diversification	-0.011** (0.005)	-0.016*** (0.005)	-0.010* (0.005)	-0.011** (0.005)	-0.016*** (0.005)	-0.010* (0.005)
Exporter	0.576* (0.306)	0.551* (0.308)	0.276 (0.303)	0.499* (0.301)	0.469 (0.301)	0.192 (0.298)
Foreign Sales	0.133 (0.148)	0.194 (0.149)	0.072 (0.147)	0.187 (0.147)	0.254* (0.148)	0.126 (0.146)
Goodwill	3.457*** (0.478)	3.280*** (0.481)	3.143*** (0.474)	3.493*** (0.469)	3.317*** (0.470)	3.185*** (0.464)
Hedging	0.025 (0.117)	-0.010 (0.118)	-0.020 (0.116)	0.030 (0.117)	-0.004 (0.117)	-0.018 (0.116)
Communications	-1.007*** (0.253)	-1.014*** (0.254)	-1.184*** (0.251)	-1.006*** (0.249)	-1.014*** (0.249)	-1.179*** (0.246)
Cyclical Consumption	-0.377** (0.163)	-0.490*** (0.164)	-0.473*** (0.162)	-0.375** (0.161)	-0.488*** (0.161)	-0.474*** (0.159)
Non-Cyclical Consumption	-0.123 (0.175)	-0.301* (0.176)	-0.282 (0.173)	-0.139 (0.172)	-0.318* (0.172)	-0.297* (0.170)
Basic Materials	-0.327 (0.213)	-0.355* (0.215)	-0.545** (0.212)	-0.360* (0.210)	-0.392* (0.211)	-0.576*** (0.208)
Oil, Gas and Biofuels	-0.388* (0.217)	-0.504*** (0.218)	-0.671*** (0.215)	-0.397* (0.213)	-0.604*** (0.213)	-0.680*** (0.211)
Health	-0.072 (0.198)	-0.062 (0.200)	-0.137 (0.197)	-0.065 (0.196)	-0.054 (0.196)	-0.135 (0.194)
Information Technology	0.654** (0.256)	0.534** (0.258)	0.501** (0.254)	0.695*** (0.254)	0.580** (0.254)	0.537** (0.251)
Public utility	-0.618*** (0.167)	-0.618*** (0.168)	-0.629*** (0.166)	-0.608*** (0.164)	-0.607*** (0.164)	-0.618*** (0.162)
Constant	2.719*** (0.379)	2.206*** (0.382)	2.932*** (0.377)			
Observations	547	547	547	547	547	547
R ²	0.397	0.380	0.387	0.405	0.389	0.396
Adjusted R ²	0.375	0.357	0.365	0.371	0.355	0.362
Residual Std. Error (df = 527)	0.856	0.861	0.850			
F Statistic	18.259*** (df = 19; 527)	16.966*** (df = 19; 527)	17.537*** (df = 19; 527)	18.505*** (df = 19; 517)	17.341*** (df = 19; 517)	17.862*** (df = 19; 517)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result over Table 6, there is no clear evidence here that the use of derivatives for hedging purposes increases the firm's value. Consistent with the results found on Allayannis and Weston (2001), we found that the size of the companies showed a negative and statistically significant sign. For each percentage increase in the firm's total assets, there is a decrease of 0,123 of the firm value, represented by Q1 (Tobin's Q).

Similar to the finding by Allayannis and Weston (2001) and Serafini and Sheng (2011), Profitability and Liquidity showed positive signs. For each increase in a Profitability and Liquidity unit, the firm value increases by 2,997 and 0.022, respectively. Additionally, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a positive sign. For each increase in a unit of Goodwill, the firm value increases by 3.457. Unlike Allayannis and Weston (2001), we found that the percentage of foreign sales over total sales, represented by the Geographic Diversification proxy, showed a negative sign. For each increase in Geographic Diversification, the firm value decreases by -0.011. In the case of companies classified as exporters, the company presents a premium in its firm value of 0.576. The results are maintained, even repeating for variables $Q2$ and $Q3$ and even applying fixed time effects, proving to be robust.

As for the different industries, the Communication, Cyclical Consumption, Petroleum gas and biofuels, and Public Utility sectors were different, with a statistically significant negative sign, than the Industrial sector. The Information Technology sector was different, with a statistically significant positive sign, than the Industrial sector. The other sectors did not differ.

The results of Equation 5, located on page 23, of the IBrX-100 sample on the use of derivatives for speculation purposes, are shown in Table 7. Regression 1 uses the variable $Q1$ as a dependent variable. Regressions 2 and 3 use variables $Q2$ and $Q3$, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 7: **OLS regression results (Speculating) for the IBrX-100 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	Q1	Q2	Q3	Q1	Q2	Q3
	OLS	OLS	OLS	Year	Year	Year
	(1)	(2)	(3)	Fixed Effect	Fixed Effect	Fixed Effect
Size	-0.131*** (0.037)	-0.109*** (0.037)	-0.132*** (0.036)	-0.127*** (0.038)	-0.104*** (0.038)	-0.129*** (0.037)
Dividends	0.079 (0.112)	0.117 (0.113)	0.137 (0.111)	0.090 (0.110)	0.129 (0.110)	0.150 (0.108)
Leverage	-0.002 (0.007)	-0.007 (0.007)	-0.003 (0.007)	-0.002 (0.007)	-0.007 (0.007)	-0.003 (0.007)
Profitability	3.034*** (0.445)	3.103*** (0.448)	2.911*** (0.441)	2.806*** (0.443)	2.858*** (0.443)	2.679*** (0.437)
Growth	0.005 (0.019)	-0.001 (0.019)	-0.005 (0.019)	0.009 (0.019)	0.003 (0.019)	-0.001 (0.018)
Liquidity	0.020 (0.013)	0.012 (0.013)	0.019 (0.013)	0.018 (0.012)	0.011 (0.013)	0.017 (0.012)
Geographic Diversification	-0.011** (0.005)	-0.016*** (0.005)	-0.010* (0.005)	-0.011** (0.005)	-0.016*** (0.005)	-0.009* (0.005)
Exporter	0.603** (0.304)	0.587* (0.306)	0.322 (0.302)	0.524* (0.299)	0.504* (0.300)	0.238 (0.295)
Foreign Sales	0.130 (0.147)	0.187 (0.148)	0.063 (0.146)	0.189 (0.147)	0.253* (0.147)	0.123 (0.145)
Goodwill	3.480*** (0.475)	3.293*** (0.478)	3.157*** (0.471)	3.516*** (0.467)	3.329*** (0.467)	3.196*** (0.461)
Speculating	0.172* (0.098)	0.183* (0.098)	0.222** (0.097)	0.168* (0.097)	0.180* (0.097)	0.218** (0.096)
Communications	-0.986*** (0.241)	-1.017*** (0.242)	-1.192*** (0.238)	-0.983*** (0.236)	-1.014*** (0.237)	-1.188*** (0.233)
Cyclic Consumption	-0.369** (0.162)	-0.478*** (0.163)	-0.457*** (0.161)	-0.367** (0.160)	-0.474*** (0.160)	-0.456*** (0.158)
Non-Cyclical Consumption	-0.122 (0.174)	-0.297* (0.175)	-0.277 (0.173)	-0.140 (0.171)	-0.318* (0.171)	-0.295* (0.169)
Basic Materials	-0.300 (0.213)	-0.327 (0.215)	-0.510** (0.211)	-0.337 (0.210)	-0.369* (0.210)	-0.548*** (0.207)
Oil, Gas and Biofuels	-0.348 (0.217)	-0.549** (0.219)	-0.617*** (0.215)	-0.361* (0.213)	-0.564*** (0.214)	-0.630*** (0.211)
Health	-0.099 (0.198)	-0.087 (0.199)	-0.167 (0.196)	-0.090 (0.195)	-0.075 (0.195)	-0.159 (0.193)
Information Technology	0.679*** (0.256)	0.565** (0.257)	0.539** (0.253)	0.724*** (0.253)	0.616** (0.254)	0.584** (0.250)
Public utility	-0.608*** (0.166)	-0.612*** (0.167)	-0.623*** (0.164)	-0.599*** (0.163)	-0.601*** (0.163)	-0.612*** (0.161)
Constant	2.750*** (0.378)	2.246*** (0.380)	2.982*** (0.375)			
Observations	547	547	547	547	547	547
R ²	0.400	0.384	0.393	0.408	0.393	0.402
Adjusted R ²	0.379	0.361	0.371	0.375	0.359	0.369
Residual Std. Error (df = 527)	0.853	0.858	0.845			
F Statistic	18.525*** (df = 19; 527)	17.258*** (df = 19; 527)	17.984*** (df = 19; 527)	18.764*** (df = 19; 517)	17.636*** (df = 19; 517)	18.312*** (df = 19; 517)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result throughout Table 7, there is evidence that the use of derivatives for speculation purposes increases the firm's value. Speculating using financial derivative instruments increases the firm's value by 0,172, which is statistically significant. Consistent with the results found in Allayannis and Weston (2001), we encountered that the size of the companies showed a negative and statistically significant sign. For each per-

centage increase in the firm’s total assets, there is a decrease of 0,131 of the firm value, represented by $Q1$ (Tobin’s Q). Similar to that found by Allayannis and Weston (2001) and Serafini and Sheng (2011), Profitability shows a positive sign. For each increase in a Profitability unit, the firm value increases by 3,034. Being an exporting company showed a statistically significant positive sign, causing an increase in the firm value of 0,603. In addition, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a positive sign. For each increase in a unit of Goodwill, the firm value increases by 3,480. Unlike Allayannis and Weston (2001), we found that the percentage of foreign sales over total sales, represented by the Geographic Diversification proxy, showed a negative sign. For each increase in Geographic Diversification, the firm value decreases by -0,011. The results are maintained, even repeating for variables $Q2$ and $Q3$ and even applying fixed time effects, proving to be robust.

As for the different industries, the Communication, Cyclical Consumption, and Public Utility sectors were different, with a statistically significant negative sign, than the Industrial sector. The Information Technology sector was different, with a statistically significant positive sign, than the Industrial sector. The other sectors did not differ.

The results of Equation 6, located on page 23, of the IBrX-100 sample on the use of derivatives for both hedging and speculating purposes, are shown in Table 8. Regression 1 uses the variable $Q1$ as a dependent variable. Regressions 2 and 3 use variables $Q2$ and $Q3$, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 8: **OLS regression results (Both) for the IBrX-100 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	Q1	Q2	Q3	Q1	Q2	Q3
	OLS	OLS	OLS	Year	Year	Year
	(1)	(2)	(3)	Fixed Effect	Fixed Effect	Fixed Effect
Size	-0.123*** (0.037)	-0.101*** (0.037)	-0.121*** (0.036)	-0.121*** (0.038)	-0.099*** (0.038)	-0.121*** (0.037)
Leverage	-0.003 (0.007)	-0.007 (0.007)	-0.003 (0.007)	-0.003 (0.007)	-0.007 (0.007)	-0.004 (0.007)
Dividends	0.076 (0.112)	0.113 (0.113)	0.134 (0.111)	0.087 (0.110)	0.126 (0.110)	0.146 (0.109)
Profitability	2.995*** (0.446)	3.064*** (0.448)	2.858*** (0.443)	2.774*** (0.444)	2.827*** (0.444)	2.635*** (0.439)
Growth	0.002 (0.019)	-0.005 (0.019)	-0.009 (0.019)	0.005 (0.019)	-0.001 (0.019)	-0.006 (0.018)
Liquidity	0.022* (0.013)	0.015 (0.013)	0.022* (0.013)	0.021* (0.012)	0.013 (0.012)	0.020* (0.012)
Geographic Diversification	-0.011** (0.005)	-0.016*** (0.005)	-0.010* (0.005)	-0.011** (0.005)	-0.016*** (0.005)	-0.010* (0.005)
Exporter	0.570* (0.305)	0.552* (0.307)	0.281 (0.302)	0.491 (0.300)	0.468 (0.300)	0.196 (0.296)
Foreign Sales	0.135 (0.148)	0.192 (0.148)	0.070 (0.146)	0.189 (0.147)	0.253* (0.147)	0.124 (0.145)
Goodwill	3.465*** (0.477)	3.281*** (0.480)	3.136*** (0.473)	3.505*** (0.468)	3.321*** (0.469)	3.180*** (0.463)
Both	0.020 (0.318)	0.121 (0.320)	-0.047 (0.315)	0.062 (0.312)	0.166 (0.313)	-0.005 (0.309)
Communications	-0.991*** (0.242)	-1.027*** (0.243)	-1.195*** (0.240)	-0.989*** (0.237)	-1.025*** (0.238)	-1.191*** (0.235)
Cyclic Consumption	-0.378** (0.164)	-0.481*** (0.165)	-0.474*** (0.163)	-0.375** (0.162)	-0.476*** (0.162)	-0.472*** (0.160)
Non-Cyclical Consumption	-0.123 (0.176)	-0.292* (0.177)	-0.284 (0.175)	-0.136 (0.173)	-0.307* (0.173)	-0.296* (0.171)
Basic Materials	-0.325 (0.215)	-0.347 (0.216)	-0.548** (0.213)	-0.355* (0.211)	-0.381* (0.212)	-0.577*** (0.209)
Oil, Gas and Biofuels	-0.387* (0.219)	-0.582*** (0.220)	-0.675*** (0.217)	-0.393* (0.215)	-0.590*** (0.215)	-0.679*** (0.212)
Health	-0.073 (0.199)	-0.053 (0.200)	-0.138 (0.198)	-0.065 (0.196)	-0.042 (0.197)	-0.133 (0.194)
Information Technology	0.652** (0.257)	0.542** (0.258)	0.500* (0.255)	0.694*** (0.254)	0.591** (0.255)	0.540** (0.252)
Public utility	-0.614*** (0.168)	-0.611*** (0.169)	-0.634*** (0.166)	-0.601*** (0.164)	-0.598*** (0.165)	-0.620*** (0.163)
Constant	2.715*** (0.379)	2.208*** (0.381)	2.936*** (0.376)			
Observations	547	547	547	547	547	547
R ²	0.397	0.380	0.387	0.405	0.390	0.396
Adjusted R ²	0.375	0.357	0.365	0.371	0.355	0.362
Residual Std. Error (df = 527)	0.856	0.861	0.850			
F Statistic	18.256*** (df = 19; 527)	16.978*** (df = 19; 527)	17.536*** (df = 19; 527)	18.503*** (df = 19; 517)	17.365*** (df = 19; 517)	17.859*** (df = 19; 517)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result throughout Table 8, there is no clear evidence that the use of derivatives for both hedge and speculation purposes, occurring simultaneously, increases the firm's value. Consistent with the results found in Allayannis and Weston (2001), we encountered that the size of the companies showed a negative and statistically significant sign. For each percentage increase in the firm's total assets, there is a decrease of 0,123

of the firm value, represented by $Q1$ (Tobin's Q). Similar to that found by Allayannis and Weston (2001) and Serafini and Sheng (2011), Profitability and Liquidity showed positive signs. For each increase in a Profitability unit, the firm value increases by 2,995 and 0,022, respectively. Being an exporting company showed a statistically significant positive sign, causing an increase in the firm value of 0,570. In addition, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a positive sign. For each increase in a unit of Goodwill, the firm value increases by 3,465. Unlike Allayannis and Weston (2001), we found that the percentage of foreign sales over total sales, represented by the Geographic Diversification proxy, showed a negative sign. For each increase in Geographic Diversification, the firm value decreases by -0,011. The results are maintained, even repeating for variables $Q2$ and $Q3$ and even applying fixed time effects, proving to be robust.

As for the different industries, the Communication, Cyclical Consumption, Petroleum gas and biofuels, and Public Utility sectors were different, with a statistically significant negative sign, than the Industrial sector. The Information Technology sector was different, with a statistically significant positive sign, than the Industrial sector. The other sectors did not differ.

The results of Equation 7, located on page 23, of the IBrX-100 sample on the unspecified use of derivatives, are shown in Table 9. Regression 1 uses the variable $Q1$ as a dependent variable. Regressions 2 and 3 use variables $Q2$ and $Q3$, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 9: **OLS regression results (DerivUsage) for the IBrX-100 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	Q1	Q2	Q3	Q1	Q2	Q3
	OLS	OLS	OLS	Year	Year	Year
	(1)	(2)	(3)	Fixed Effect	Fixed Effect	Fixed Effect
Size	-0.138*** (0.038)	-0.117*** (0.038)	-0.142*** (0.037)	-0.133*** (0.038)	-0.110*** (0.038)	-0.137*** (0.038)
Dividends	0.065 (0.112)	0.102 (0.113)	0.119 (0.111)	0.076 (0.110)	0.114 (0.110)	0.130 (0.109)
Leverage	-0.002 (0.007)	-0.006 (0.007)	-0.003 (0.007)	-0.002 (0.007)	-0.006 (0.007)	-0.003 (0.007)
Profitability	3.040*** (0.445)	3.107*** (0.448)	2.920*** (0.441)	2.810*** (0.443)	2.861*** (0.443)	2.685*** (0.437)
Growth	0.005 (0.019)	-0.002 (0.019)	-0.006 (0.019)	0.008 (0.019)	0.002 (0.019)	-0.002 (0.018)
Liquidity	0.020 (0.013)	0.012 (0.013)	0.019 (0.013)	0.018 (0.012)	0.011 (0.013)	0.017 (0.012)
Geographic Diversification	-0.011** (0.005)	-0.016*** (0.005)	-0.010* (0.005)	-0.011** (0.005)	-0.016*** (0.005)	-0.009* (0.005)
Exporter	0.521* (0.305)	0.502 (0.307)	0.215 (0.302)	0.444 (0.300)	0.421 (0.300)	0.134 (0.296)
Foreign Sales	0.107 (0.148)	0.164 (0.149)	0.033 (0.146)	0.169 (0.147)	0.233 (0.147)	0.098 (0.145)
Goodwill	3.404*** (0.476)	3.215*** (0.479)	3.058*** (0.472)	3.436*** (0.468)	3.247*** (0.469)	3.093*** (0.462)
DerivUsage	0.157* (0.086)	0.159* (0.087)	0.204** (0.085)	0.158* (0.086)	0.162* (0.086)	0.206** (0.085)
Communications	-1.055*** (0.243)	-1.086*** (0.245)	-1.281*** (0.241)	-1.054*** (0.239)	-1.086*** (0.239)	-1.280*** (0.236)
Cyclic Consumption	-0.349** (0.163)	-0.458*** (0.164)	-0.431*** (0.162)	-0.344** (0.161)	-0.451*** (0.161)	-0.426*** (0.159)
Non-Cyclical Consumption	-0.096 (0.175)	-0.271 (0.176)	-0.243 (0.173)	-0.115 (0.172)	-0.293* (0.172)	-0.264 (0.169)
Basic Materials	-0.296 (0.213)	-0.325 (0.215)	-0.505** (0.211)	-0.335 (0.210)	-0.368* (0.210)	-0.546*** (0.207)
Oil, Gas and Biofuels	-0.332 (0.218)	-0.535** (0.220)	-0.596*** (0.216)	-0.346 (0.214)	-0.550** (0.215)	-0.610*** (0.211)
Health	-0.077 (0.197)	-0.063 (0.199)	-0.138 (0.196)	-0.064 (0.195)	-0.048 (0.195)	-0.126 (0.192)
Information Technology	0.691*** (0.256)	0.575** (0.257)	0.555** (0.253)	0.743*** (0.254)	0.634** (0.255)	0.608** (0.251)
Public utility	-0.618*** (0.166)	-0.623*** (0.167)	-0.636*** (0.164)	-0.610*** (0.163)	-0.613*** (0.163)	-0.626*** (0.161)
Constant	2.813*** (0.382)	2.308*** (0.384)	3.065*** (0.378)			
Observations	547	547	547	547	547	547
R ²	0.401	0.383	0.394	0.409	0.393	0.403
Adjusted R ²	0.379	0.361	0.372	0.375	0.359	0.370
Residual Std. Error (df = 527)	0.853	0.858	0.845			
F Statistic	18.544*** (df = 19; 527)	17.250*** (df = 19; 527)	18.027*** (df = 19; 527)	18.794*** (df = 19; 517)	17.642*** (df = 19; 517)	18.369*** (df = 19; 517)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result throughout Table 9, there is evidence that the usage of derivatives increases the firm's value. Using derivatives increases the firm value by 0,157. Consistent with the results found in Allayannis and Weston (2001), we encountered that the size of the companies showed a negative and statistically significant sign. For each percentage increase in the firm's total assets, there is a decrease of 0,138 of the firm value,

represented by Q1 (Tobin's Q). Similar to that found by Allayannis and Weston (2001) and Serafini and Sheng (2011), Profitability presents a positive sign. For each increase in a Profitability unit, the firm value increases by 3,040. Being an exporting company showed a statistically significant positive sign, causing an increase in the firm value of 0,521. In addition, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a positive sign. For each increase in a unit of Goodwill, the firm value increases by 3,404. Unlike Allayannis and Weston (2001), we found that the percentage of foreign sales over total sales, represented by the Geographic Diversification proxy, showed a negative sign. For each increase in Geographic Diversification, the firm value decreases by -0,011. The results are maintained, even repeating for variables $Q2$ and $Q3$ and even applying fixed time effects, proving to be robust.

As for the different industries, the Communication, Cyclical Consumption and Public Utility sectors were different, with a statistically significant negative sign, than the Industrial sector. The Information Technology sector was different, with a statistically significant positive sign, than the Industrial sector. The other sectors did not differ.

Analyzing the four Tables (6, 7, 8, and 9) on the IBrX-100 sample together, the collective of the results point to some conclusions. When we analyzed the use of derivatives and the market value of the firm, our results were consistent with those found by Allayannis and Weston (2001) and Rossi (2008), and divergent from those found by Serafini and Sheng (2011). The results imply that our hypothesis that using derivatives increases the firm's value is confirmed, for the IBrX-100 sample. Specifically, using derivative instruments for speculation purposes increases the company's market value. Although using derivatives for hedging or using derivatives for both hedging and speculating, simultaneously, has not been statistically significant, its signs are positive, implying that they also increase the firm value. It was observed that a negative relationship between firm size and value. Results are similar to those found by Allayannis and Weston (2001) and divergent from those found by Serafini and Sheng (2011), who found a null relationship between firm size and value, and divergent also from Mian (1996), in which larger companies would have greater access to the financial market, greater gains in scale and, therefore, , a higher value. There is no clear evidence that paying dividends results in a premium on the company's market value, a result that is similar to that found by Serafini and Sheng (2011) and divergent from that found by Allayannis and Weston (2001). As for growth opportunities, the results are similar to those found by Allayannis and Weston (2001) and Serafini and Sheng (2011), where we have no obvious evidence that the amount of capital expenditures impacts the firm's market value. The results also confirm that more profitable firms have higher firm values. According to Serafini and Sheng (2011), this result suggests that more profitable firms would have greater access to investments and, with this, greater opportunities to grow. Additionally, we find that Consumer Goodwill is one of the most relevant factors in the firm's value. Firms that spend more to develop the firm's intangible assets, such as brand value and reputation, are awarded a higher valuation by the market.

Moving on with the tests, we now explore the test results on the use of derivatives and the impact on the firm's market value on the B3 Stock Exchange Sample. The results of Equation 4, located on page 23, of the B3 Stock Exchange sample on the use of derivatives for hedging purposes, are shown in Table 10. Regression 1 uses the variable

Q1 as a dependent variable. Regressions 2 and 3 use variables Q2 and Q3, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 10: **OLS regression results (Hedging) for the B3 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	<i>Dependent variable:</i>					
	Q1 <i>OLS</i>	Q2 <i>OLS</i>	Q3 <i>OLS</i>	Q1 <i>Year Fixed Effect</i>	Q2 <i>Year Fixed Effect</i>	Q3 <i>Year Fixed Effect</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.087*** (0.022)	-0.087*** (0.021)	-0.150*** (0.024)	-0.088*** (0.022)	-0.084*** (0.022)	-0.147*** (0.024)
Dividends	0.211*** (0.077)	0.231*** (0.076)	0.152* (0.085)	0.190** (0.077)	0.215*** (0.076)	0.137 (0.085)
Leverage	-0.003 (0.004)	-0.004 (0.003)	-0.005 (0.004)	-0.002 (0.003)	-0.003 (0.003)	-0.004 (0.004)
Profitability	0.566*** (0.200)	0.508** (0.198)	0.193 (0.220)	0.488** (0.200)	0.433** (0.198)	0.121 (0.220)
Growth	0.006 (0.012)	0.004 (0.012)	0.006 (0.013)	0.009 (0.012)	0.007 (0.012)	0.008 (0.013)
Liquidity	-0.012 (0.010)	-0.022** (0.010)	-0.017 (0.011)	-0.013 (0.010)	-0.024** (0.010)	-0.018* (0.011)
Geographic Diversification	0.0001 (0.001)	-0.0003 (0.001)	-0.00003 (0.001)	-0.0003 (0.001)	-0.001 (0.001)	-0.0003 (0.001)
Exporter	-0.006 (0.143)	-0.160 (0.142)	-0.186 (0.157)	0.012 (0.142)	-0.146 (0.141)	-0.175 (0.157)
Foreign Sales	-0.033 (0.084)	-0.044 (0.083)	-0.060 (0.092)	-0.003 (0.084)	-0.017 (0.083)	-0.033 (0.093)
Goodwill	1.849*** (0.162)	1.526*** (0.161)	1.471*** (0.179)	1.866*** (0.161)	1.548*** (0.159)	1.491*** (0.178)
Hedging	-0.026 (0.095)	-0.061 (0.094)	-0.080 (0.104)	-0.001 (0.095)	-0.038 (0.093)	-0.060 (0.104)
Communications	-0.303 (0.198)	-0.280 (0.196)	-0.292 (0.218)	-0.328* (0.197)	-0.308 (0.194)	-0.316 (0.217)
Cyclic Consumption	0.131 (0.092)	0.088 (0.091)	0.032 (0.101)	0.129 (0.091)	0.085 (0.090)	0.029 (0.100)
Non-Cyclical Consumption	0.565*** (0.122)	0.499*** (0.121)	0.458*** (0.134)	0.539*** (0.121)	0.476*** (0.120)	0.437*** (0.134)
Basic Materials	-0.127 (0.120)	-0.150 (0.119)	-0.115 (0.132)	-0.144 (0.119)	-0.170 (0.118)	-0.133 (0.132)
Oil, Gas and Biofuels	0.406*** (0.154)	0.215 (0.153)	0.173 (0.170)	0.399*** (0.153)	0.210 (0.151)	0.168 (0.169)
Health	0.893*** (0.133)	0.933*** (0.132)	0.763*** (0.146)	0.896*** (0.132)	0.937*** (0.130)	0.767*** (0.145)
Information Technology	0.797*** (0.208)	0.678*** (0.206)	0.561** (0.229)	0.822*** (0.207)	0.706*** (0.205)	0.587** (0.228)
Public utility	-0.201* (0.105)	-0.152 (0.104)	-0.157 (0.116)	-0.207** (0.105)	-0.161 (0.103)	-0.166 (0.115)
Constant	1.943*** (0.169)	1.609*** (0.167)	2.802*** (0.186)			
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.230	0.205	0.182	0.235	0.209	0.184
Adjusted R ²	0.219	0.194	0.170	0.217	0.191	0.165
Residual Std. Error (df = 1281)	1.004	0.993	1.104			
F Statistic	20.192*** (df = 19; 1281)	17.421*** (df = 19; 1281)	15.025*** (df = 19; 1281)	20.536*** (df = 19; 1271)	17.713*** (df = 19; 1271)	15.081*** (df = 19; 1271)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result over Table 10, there is no clear evidence here that the use of derivatives for hedging purposes increases the firm's value. Consistent with the results

found on Allayannis and Weston (2001), we encountered that the size of the companies showed a negative and statistically significant sign. For each percentage increase in the firm's total assets, there is a decrease of 0,087 of the firm value, represented by $Q1$ (Tobin's Q). Similar to the finding by Allayannis and Weston (2001) and Serafini and Sheng (2011), Profitability showed a statistically significant positive value. For each increase in a Profitability unit, the firm value increases by 0,566. Additionally, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a statistically significant positive value. For each increase in a unit of Goodwill, the firm value increases by 1,849. Unlike Allayannis and Weston (2001), who found a negative relationship, and unlike Serafini and Sheng (2011), who found a null relationship, we found a statistically significant positive relationship between the company paying dividends and its firm market value. If the company distributes dividends in the period, its market value increases by 0.211.

As for the different industries, Public Utility sector was shown to be statistically significant, with negative signs, from the Industrial sector. The Information Technology sector, as long with the Non-Cyclical Consumption, Oil, Gas and Biofuels and Health sector, were significantly significant, with positive signs, from the Industrial sector. The other sectors did not differ.

The results of Equation 5, located on page 23, of the B3 Stock Exchange sample on the use of derivatives for speculation purposes, are shown in Table 11. Regression 1 uses the variable $Q1$ as a dependent variable. Regressions 2 and 3 use variables $Q2$ and $Q3$, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 11: **OLS regression results (Speculating) for the B3 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	Q1	Q2	Q3	Q1	Q2	Q3
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.093*** (0.022)	-0.095*** (0.022)	-0.157*** (0.024)	-0.092*** (0.022)	-0.091*** (0.022)	-0.154*** (0.025)
Dividends	0.211*** (0.077)	0.230*** (0.076)	0.149* (0.085)	0.191** (0.077)	0.215*** (0.076)	0.134 (0.085)
Leverage	-0.003 (0.004)	-0.004 (0.003)	-0.005 (0.004)	-0.002 (0.003)	-0.003 (0.003)	-0.004 (0.004)
Profitability	0.569*** (0.200)	0.512*** (0.198)	0.197 (0.220)	0.491** (0.200)	0.437** (0.197)	0.124 (0.220)
Growth	0.007 (0.012)	0.005 (0.012)	0.006 (0.013)	0.010 (0.012)	0.008 (0.012)	0.009 (0.013)
Liquidity	-0.012 (0.010)	-0.023** (0.010)	-0.017 (0.011)	-0.014 (0.010)	-0.024** (0.010)	-0.019* (0.011)
Geographic Diversification	0.0001 (0.001)	-0.0003 (0.001)	-0.00002 (0.001)	-0.0003 (0.001)	-0.001 (0.001)	-0.0003 (0.001)
Exporter	0.020 (0.144)	-0.120 (0.142)	-0.149 (0.158)	0.031 (0.143)	-0.113 (0.141)	-0.143 (0.157)
Foreign Sales	-0.036 (0.084)	-0.049 (0.083)	-0.066 (0.092)	-0.004 (0.084)	-0.020 (0.083)	-0.038 (0.092)
Goodwill	1.846*** (0.162)	1.520*** (0.161)	1.465*** (0.179)	1.865*** (0.161)	1.544*** (0.159)	1.486*** (0.178)
Speculating	0.085 (0.078)	0.118 (0.077)	0.098 (0.086)	0.073 (0.078)	0.105 (0.077)	0.084 (0.085)
Communications	-0.309 (0.194)	-0.300 (0.192)	-0.321 (0.213)	-0.324* (0.192)	-0.319* (0.190)	-0.337 (0.212)
Cyclic Consumption	0.140 (0.092)	0.103 (0.091)	0.047 (0.101)	0.134 (0.091)	0.096 (0.090)	0.041 (0.100)
Non-Cyclical Consumption	0.567*** (0.122)	0.503*** (0.121)	0.462*** (0.134)	0.540*** (0.121)	0.479*** (0.120)	0.440*** (0.134)
Basic Materials	-0.119 (0.120)	-0.139 (0.119)	-0.105 (0.132)	-0.138 (0.119)	-0.161 (0.118)	-0.124 (0.132)
Oil, Gas and Biofuels	0.424*** (0.155)	0.242 (0.153)	0.196 (0.170)	0.413*** (0.154)	0.232 (0.152)	0.187 (0.169)
Health	0.889*** (0.133)	0.932*** (0.131)	0.764*** (0.146)	0.891*** (0.132)	0.934*** (0.130)	0.767*** (0.145)
Information Technology	0.801*** (0.208)	0.687*** (0.206)	0.571** (0.229)	0.824*** (0.207)	0.712*** (0.204)	0.594*** (0.228)
Public utility	-0.197* (0.105)	-0.148 (0.104)	-0.155 (0.116)	-0.204* (0.105)	-0.157 (0.103)	-0.163 (0.115)
Constant	1.966*** (0.169)	1.645*** (0.168)	2.837*** (0.186)			
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.231	0.207	0.183	0.235	0.210	0.184
Adjusted R ²	0.220	0.195	0.171	0.218	0.192	0.166
Residual Std. Error (df = 1281)	1.003	0.993	1.104			
F Statistic	20.269*** (df = 19; 1281)	17.550*** (df = 19; 1281)	15.071*** (df = 19; 1281)	20.596*** (df = 19; 1271)	17.827*** (df = 19; 1271)	15.123*** (df = 19; 1271)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result over Table 11, there is no clear evidence here that the use of derivatives for speculating purposes increases the firm's value. Consistent with the results found on Allayannis and Weston (2001), we encountered that the size of the companies showed a negative and statistically significant sign. For each percentage increase in the firm's total assets, there is a decrease of 0,093 of the firm value, represented by Q1 (Tobin's Q). Similar to the finding by Allayannis and Weston (2001) and Serafini and Sheng

(2011), Profitability showed a statistically significant positive value. For each increase in a Profitability unit, the firm value increases by 0,569. Additionally, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a statistically significant positive value. For each increase in a unit of Goodwill, the firm value increases by 1,846. Unlike Allayannis and Weston (2001), who found a negative relationship, and unlike Serafini and Sheng (2011), who found a null relationship, we found a statistically significant positive relationship between the company paying dividends and its firm market value. If the company distributes dividends in the period, its market value increases by 0.211.

As for the different industries, Public Utility sector was shown to be statistically significant, with negative signs, from the Industrial sector. The Information Technology sector, as long with the Non-Cyclical Consumption, Oil, Gas and Biofuels and Health sector, were significantly significant, with positive signs, from the Industrial sector. The other sectors did not differ.

The results of Equation 6, located on page 23, of the B3 Stock Exchange sample on the use of derivatives for both hedging and speculating purposes, are shown in Table 12. Regression 1 uses the variable $Q1$ as a dependent variable. Regressions 2 and 3 use variables $Q2$ and $Q3$, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 12: **OLS regression results (Both) for the B3 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	Q1	Q2	Q3	Q1	Q2	Q3
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.089*** (0.021)	-0.090*** (0.021)	-0.153*** (0.024)	-0.089*** (0.022)	-0.086*** (0.022)	-0.150*** (0.024)
Dividends	0.209*** (0.077)	0.227*** (0.076)	0.147* (0.085)	0.190** (0.077)	0.213*** (0.076)	0.133 (0.085)
Leverage	-0.003 (0.004)	-0.004 (0.003)	-0.005 (0.004)	-0.002 (0.003)	-0.003 (0.003)	-0.004 (0.004)
Profitability	0.566*** (0.200)	0.508** (0.198)	0.193 (0.221)	0.488*** (0.200)	0.432** (0.197)	0.120 (0.220)
Growth	0.006 (0.012)	0.004 (0.012)	0.006 (0.013)	0.009 (0.012)	0.007 (0.012)	0.008 (0.013)
Liquidity	-0.012 (0.010)	-0.022** (0.010)	-0.017 (0.011)	-0.013 (0.010)	-0.024** (0.010)	-0.018* (0.011)
Geographic Diversification	0.0001 (0.001)	-0.0003 (0.001)	-0.00002 (0.001)	-0.0003 (0.001)	-0.001 (0.001)	-0.0003 (0.001)
Exporter	-0.001 (0.142)	-0.149 (0.141)	-0.173 (0.156)	0.013 (0.142)	-0.139 (0.140)	-0.164 (0.156)
Foreign Sales	-0.034 (0.084)	-0.046 (0.083)	-0.063 (0.092)	-0.002 (0.084)	-0.017 (0.083)	-0.035 (0.092)
Goodwill	1.847*** (0.162)	1.522*** (0.161)	1.466*** (0.179)	1.866*** (0.161)	1.545*** (0.159)	1.487*** (0.178)
Both	0.129 (0.342)	0.278 (0.339)	0.146 (0.376)	0.188 (0.340)	0.336 (0.336)	0.202 (0.375)
Communications	-0.321* (0.194)	-0.321* (0.192)	-0.334 (0.214)	-0.339* (0.193)	-0.343* (0.191)	-0.353* (0.213)
Cyclic Consumption	0.136 (0.092)	0.098 (0.091)	0.042 (0.101)	0.132 (0.091)	0.094 (0.090)	0.038 (0.100)
Non-Cyclical Consumption	0.568*** (0.122)	0.505*** (0.121)	0.463*** (0.134)	0.542*** (0.121)	0.483*** (0.120)	0.442*** (0.134)
Basic Materials	-0.123 (0.120)	-0.142 (0.119)	-0.109 (0.132)	-0.140 (0.120)	-0.162 (0.118)	-0.127 (0.132)
Oil, Gas and Biofuels	0.410*** (0.154)	0.225 (0.153)	0.180 (0.170)	0.403*** (0.153)	0.219 (0.151)	0.175 (0.169)
Health	0.898*** (0.133)	0.945*** (0.131)	0.774*** (0.146)	0.900*** (0.132)	0.948*** (0.130)	0.776*** (0.145)
Information Technology	0.801*** (0.208)	0.687*** (0.206)	0.570** (0.229)	0.825*** (0.207)	0.714*** (0.204)	0.595*** (0.228)
Public utility	-0.200* (0.105)	-0.150 (0.104)	-0.158 (0.116)	-0.205* (0.105)	-0.158 (0.103)	-0.165 (0.115)
Constant	1.949*** (0.169)	1.623*** (0.167)	2.817*** (0.185)			
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.231	0.205	0.182	0.235	0.210	0.184
Adjusted R ²	0.219	0.194	0.170	0.218	0.192	0.165
Residual Std. Error (df = 1281)	1.004	0.993	1.104			
F Statistic	20.197*** (df = 19; 1281)	17.438*** (df = 19; 1281)	14.997*** (df = 19; 1281)	20.557*** (df = 19; 1271)	17.769*** (df = 19; 1271)	15.078*** (df = 19; 1271)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result over Table 12, there is no clear evidence that the use of derivatives for both hedge and speculation purposes, occurring simultaneously, increases the firm value. Consistent with the results found on Allayannis and Weston (2001), we encountered that the size of the companies showed a negative and statistically significant sign. For each percentage increase in the firm's total assets, there is a decrease of 0,089 of the firm value, represented by Q1 (Tobin's Q). Similar to the finding by Allayannis and

Weston (2001) and Serafini and Sheng (2011), Profitability showed a statistically significant positive value. For each increase in a Profitability unit, the firm value increases by 0,566. Additionally, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a statistically significant positive value. For each increase in a unit of Goodwill, the firm value increases by 1,847. Unlike Allayannis and Weston (2001), who found a negative relationship, and unlike Serafini and Sheng (2011), who found a null relationship, we found a statistically significant positive relationship between the company paying dividends and its firm market value. If the company distributes dividends in the period, its market value increases by 0.209.

As for the different industries, Communications and Public Utility sectors were shown to be statistically significant, with negative signs, from the Industrial sector. The Information Technology sector, as long with the Non-Cyclical Consumption, Oil, Gas and Biofuels and Health sector, were significantly significant, with positive signs, from the Industrial sector. The other sectors did not differ.

The results of Equation 7, located on page 23, of the B3 Stock Exchange sample on the unspecified use of derivatives, are shown in Table 13. Regression 1 uses the variable $Q1$ as a dependent variable. Regressions 2 and 3 use variables $Q2$ and $Q3$, respectively. Regressions 4, 5, and 6 repeat the structure of regressions 1, 2, and 3, but now with a *Year* fixed effect.

Table 13: **OLS regression results (DerivUsage) for the B3 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	Q1	Q2	Q3	Q1	Q2	Q3
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.094*** (0.022)	-0.094*** (0.022)	-0.155*** (0.024)	-0.094*** (0.023)	-0.091*** (0.022)	-0.153*** (0.025)
Dividends	0.208*** (0.077)	0.225*** (0.076)	0.147* (0.085)	0.188** (0.077)	0.210*** (0.076)	0.132 (0.085)
Leverage	-0.003 (0.004)	-0.004 (0.003)	-0.005 (0.004)	-0.002 (0.003)	-0.003 (0.003)	-0.004 (0.004)
Profitability	0.569*** (0.200)	0.511** (0.198)	0.195 (0.221)	0.490*** (0.200)	0.435** (0.197)	0.121 (0.220)
Growth	0.006 (0.012)	0.004 (0.012)	0.006 (0.013)	0.010 (0.012)	0.007 (0.012)	0.009 (0.013)
Liquidity	-0.012 (0.010)	-0.022** (0.010)	-0.017 (0.011)	-0.014 (0.010)	-0.024** (0.010)	-0.018* (0.011)
Geographic Diversification	0.0001 (0.001)	-0.0003 (0.001)	-0.00001 (0.001)	-0.0003 (0.001)	-0.001 (0.001)	-0.0003 (0.001)
Exporter	-0.021 (0.144)	-0.171 (0.142)	-0.184 (0.158)	-0.008 (0.143)	-0.161 (0.141)	-0.176 (0.157)
Foreign Sales	-0.037 (0.084)	-0.050 (0.083)	-0.065 (0.092)	-0.005 (0.084)	-0.021 (0.083)	-0.037 (0.092)
Goodwill	1.846*** (0.162)	1.520*** (0.161)	1.465*** (0.179)	1.864*** (0.161)	1.544*** (0.159)	1.486*** (0.178)
DerivUsage	0.062 (0.067)	0.069 (0.066)	0.034 (0.074)	0.069 (0.067)	0.074 (0.066)	0.038 (0.074)
Communications	-0.334* (0.195)	-0.328* (0.193)	-0.337 (0.214)	-0.351* (0.194)	-0.349* (0.191)	-0.354* (0.213)
Cyclic Consumption	0.144 (0.092)	0.105 (0.091)	0.045 (0.101)	0.140 (0.091)	0.101 (0.090)	0.041 (0.101)
Non-Cyclical Consumption	0.565*** (0.122)	0.500*** (0.121)	0.460*** (0.134)	0.538*** (0.121)	0.475*** (0.120)	0.437*** (0.134)
Basic Materials	-0.122 (0.120)	-0.144 (0.119)	-0.110 (0.132)	-0.140 (0.119)	-0.165 (0.118)	-0.129 (0.132)
Oil, Gas and Biofuels	0.422*** (0.155)	0.235 (0.153)	0.185 (0.171)	0.415*** (0.154)	0.229 (0.152)	0.180 (0.170)
Health	0.897*** (0.133)	0.941*** (0.131)	0.772*** (0.146)	0.898*** (0.132)	0.943*** (0.130)	0.774*** (0.145)
Information Technology	0.806*** (0.208)	0.691*** (0.206)	0.572** (0.229)	0.830*** (0.207)	0.718*** (0.204)	0.597*** (0.228)
Public utility	-0.198* (0.105)	-0.150 (0.104)	-0.158 (0.116)	-0.204* (0.105)	-0.159 (0.103)	-0.165 (0.115)
Constant	1.972*** (0.171)	1.646*** (0.169)	2.828*** (0.188)			
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.231	0.206	0.182	0.236	0.210	0.184
Adjusted R ²	0.220	0.194	0.170	0.218	0.192	0.165
Residual Std. Error (df = 1281)	1.003	0.993	1.104			
F Statistic	20.246*** (df = 19; 1281)	17.464*** (df = 19; 1281)	15.001*** (df = 19; 1281)	20.609*** (df = 19; 1271)	17.785*** (df = 19; 1271)	15.077*** (df = 19; 1271)

Note:

*p<0.1; **p<0.05; ***p<0.01

Looking at the result over Table 13, there is no clear evidence here that the use of derivatives increases the firm value. Consistent with the results found on Allayannis and Weston (2001), we encountered that the size of the companies showed a negative and statistically significant sign. For each percentage increase in the firm's total assets, there is a decrease of 0,094 of the firm value, represented by Q1 (Tobin's Q). Similar to the finding by Allayannis and Weston (2001) and Serafini and Sheng (2011), Profitability

showed a statistically significant positive value. For each increase in a Profitability unit, the firm value increases by 0,569. Additionally, consistent with what was reported by Allayannis and Weston (2001), Goodwill showed a statistically significant positive value. For each increase in a unit of Goodwill, the firm value increases by 1,846. Unlike Allayannis and Weston (2001), who found a negative relationship, and unlike Serafini and Sheng (2011), who found a null relationship, we found a statistically significant positive relationship between the company paying dividends and its firm market value. If the company distributes dividends in the period, its market value increases by 0.208.

As for the different industries, Communications and Public Utility sectors were shown to be statistically significant, with negative signs, from the Industrial sector. The Information Technology sector, as long with the Non-Cyclical Consumption, Oil, Gas and Biofuels and Health sector, were significantly significant, with positive signs, from the Industrial sector. The other sectors did not differ.

Analyzing the four Tables (10, 11, 12, and 13) on the B3 Stock Exchange sample together, the collective of the results point to some conclusions. When we analyzed the use of derivatives and the market value of the firm, our results were consistent with those found by Serafini and Sheng (2011), and divergent from those found by Allayannis and Weston (2001) and Rossi (2008). The results imply that our hypothesis, that using derivatives increases the firm's value is rejected, for the B3 Stock Exchange sample. None of our four derivative usage measures was statistically significant, resulting in a lack of clear evidence that their usage has an impact on the companies' market value. It is necessary to highlight the fact that a possible cause of the lack of clear evidence (statistical significance) on the use of derivatives and its reflection on the firm market value of companies is due to the lack of available information on the use of derivatives within *Bloomberg's* database. When looking upon B3 Stock Exchange sample, almost half of the declared data available on the use of derivatives (214 out of 447 firm-year observations) came from the companies in the IBRX-100 sample. Although companies, after 2009, disclosure information about the usage of derivatives, apparently *Bloomberg* has been concerned with making available, so far, more complete information about the companies with the most negotiability and representativeness of the Brazilian stock market, leaving the inclusion of such data about the others less negotiable firms to a second moment. Nonetheless, despite not being statistically significant and not providing clear evidence of such impact on firm value, using derivatives, specifically for speculating reasons, seems to indicate that it increases firm market value (*Speculating* and *DerivUsage* with positive signs). It was observed that a negative relationship between firm size and value. Results are similar to those found by Allayannis and Weston (2001) and divergent from those found by Serafini and Sheng (2011), who found a null relationship between firm size and value, and divergent also from Mian (1996), in which larger companies would have greater access to the financial market, greater gains in scale and, therefore, a higher value. There is a clear evidence that paying dividends results in a premium on the company's market value, a result that is divergent from that found by Allayannis and Weston (2001), that found a negative relationship, and divergent from those found by Serafini and Sheng (2011), who found a null relationship. As for growth opportunities, the results are similar to those found by Allayannis and Weston (2001) and Serafini and Sheng (2011), where we have no obvious evidence that the amount of capital expenditures impacts the firm's market value. The results also confirm that more profitable firms have higher firm values.

According to Serafini and Sheng (2011), this result suggests that more profitable firms would have greater access to investments and, with this, greater opportunities to grow. Additionally, we find that Consumer Goodwill is one of the most relevant factors in the firm's value. Firms that spend more to develop the firm's intangible assets, such as brand value and reputation, are awarded a higher valuation by the market.

Alternative explanations were sought to clarify the effect of the use of derivatives on the firm's market value. If firms that use currency derivatives have greater value, this may simply reflect the fact that firms with higher Qs are more likely to use currency derivative transactions, rather than the fact that the use of these derivatives causes an increase in the value of the firm. In the next subsection, we test for the possibility of this reverse causality.

4.2 Reverse Causality Tests

First, we will explore the results of the reverse causality test on the IBrX-100 sample. The results of Equations 9 and 10, located on page 25, are shown in Table 14. Regressions 1, 2, and 3 use variables $Q1$, $Q2$ and $Q3$ respectively, and relate to Equation 9. Regressions 4, 5, and 6 use variables $Q1$, $Q2$ and $Q3$ respectively, and relate to Equation 10.

Table 14: **Results of the reverse causation tests (Hedging and Speculating) for the IBrX-100 sample.** Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	<i>Dependent variable:</i>					
	Q1 (1)	Q2 (2)	Q3 (3)	Q1 (4)	Q2 (5)	Q3 (6)
Size	-0.212*** (0.032)	-0.195*** (0.032)	-0.226*** (0.032)	-0.218*** (0.031)	-0.203*** (0.031)	-0.236*** (0.031)
Dividends	0.112 (0.114)	0.164 (0.114)	0.174 (0.113)	0.140 (0.112)	0.194* (0.112)	0.205* (0.111)
Leverage	-0.001 (0.007)	-0.006 (0.007)	-0.002 (0.007)	-0.001 (0.007)	-0.006 (0.007)	-0.002 (0.007)
Profitability	2.968*** (0.456)	3.108*** (0.457)	2.935*** (0.453)	2.948*** (0.455)	3.088*** (0.455)	2.917*** (0.451)
Growth	0.011 (0.019)	0.004 (0.019)	0.002 (0.019)	0.013 (0.019)	0.007 (0.019)	0.006 (0.019)
Liquidity	0.025* (0.013)	0.013 (0.013)	0.019 (0.013)	0.023* (0.013)	0.012 (0.013)	0.017 (0.013)
Geographic Diversification	-0.008 (0.005)	-0.010** (0.005)	-0.005 (0.005)	-0.007 (0.005)	-0.010** (0.005)	-0.004 (0.005)
Exporter	0.580* (0.312)	0.510 (0.313)	0.299 (0.310)	0.536* (0.308)	0.463 (0.308)	0.254 (0.305)
Foreign Sales	0.171 (0.128)	0.150 (0.128)	0.003 (0.127)	0.213* (0.127)	0.195 (0.127)	0.048 (0.126)
Goodwill	3.497*** (0.427)	3.111*** (0.428)	3.034*** (0.425)	3.500*** (0.422)	3.114*** (0.422)	3.037*** (0.418)
NN	-0.143 (0.099)	-0.159 (0.099)	-0.132 (0.098)			
HN	-0.031 (0.227)	-0.048 (0.227)	-0.014 (0.225)			
NH	-0.041 (0.213)	-0.064 (0.213)	0.011 (0.211)			
NN _s				-0.330*** (0.095)	-0.361*** (0.095)	-0.391*** (0.094)
SN				-0.206 (0.195)	-0.220 (0.195)	-0.207 (0.193)
NS				-0.458*** (0.171)	-0.506*** (0.171)	-0.453*** (0.170)
Constant	3.278*** (0.346)	2.773*** (0.347)	3.555*** (0.344)	3.465*** (0.327)	2.976*** (0.327)	3.826*** (0.324)
Observations	547	547	547	547	547	547
R ²	0.339	0.324	0.325	0.353	0.342	0.346
Adjusted R ²	0.323	0.308	0.309	0.338	0.326	0.330
Residual Std. Error (df = 533)	0.891	0.894	0.886	0.881	0.882	0.873
F Statistic (df = 13; 533)	21.034***	19.669***	19.779***	22.406***	21.286***	21.673***

Note:

*p<0.1; **p<0.05; ***p<0.01

Cohesive with our previous results, we have found evidence that hedging does not add value. Also, either decision to start or quit hedging are unaffected by the size of Q , for the IBrX-100 sample.

Consistent with our findings in the previous section, our results continue to show that companies that use derivatives for speculative purposes have a higher value than companies that do not use derivatives, that is, we reject *Hypothesis 3a* for the three measures of Tobin's Q (p-values of 0,0005, 0,0001, and 0,0003, respectively). Additionally, we found evidence that the decision to start speculating is affected by the size of Tobin's Q for the three measures of Q (p-values of 0,007, 0,003, and 0,007, respectively), thus rejecting *Hypothesis 3b*. We confirm *Hypothesis 3c*, that the decision to stop speculating is not affected by Q (p-values of 0,29, 0,25, and 0,28, respectively). Our results are consistent with the hypothesis that speculation causes an increase in the company's value, for the IBrX-100 sample.

The results of Equation 8, located on page 24, on the IBrX-100 sample, are shown in Table 15. Regressions 1, 2, and 3 use variables $Q1$, $Q2$ and $Q3$ respectively.

Table 15: **Results of the reverse causation tests (DerivUsage) for the IBrX-100 sample.** Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	<i>Dependent variable:</i>		
	Q1 (1)	Q2 (2)	Q3 (3)
Size	-0.229*** (0.033)	-0.216*** (0.033)	-0.249*** (0.032)
Dividends	0.115 (0.112)	0.167 (0.113)	0.173 (0.112)
Leverage	-0.001 (0.007)	-0.006 (0.007)	-0.001 (0.007)
Profitability	2.881*** (0.459)	3.026*** (0.459)	2.870*** (0.456)
Growth	0.007 (0.019)	0.0001 (0.019)	0.0003 (0.019)
Liquidity	0.027** (0.013)	0.015 (0.013)	0.020 (0.013)
Geographic Diversification	-0.008 (0.005)	-0.011** (0.005)	-0.005 (0.005)
Exporter	0.495 (0.310)	0.414 (0.310)	0.194 (0.308)
Foreing Sales	0.193 (0.127)	0.172 (0.127)	0.022 (0.126)
Goodwill	3.399*** (0.425)	2.999*** (0.425)	2.925*** (0.422)
NN _D	-0.179** (0.087)	-0.212** (0.087)	-0.241*** (0.086)
HN _D	-0.382 (0.265)	-0.381 (0.265)	-0.326 (0.263)
NH _D	-0.507*** (0.180)	-0.564*** (0.180)	-0.460** (0.179)
Constant	3.471*** (0.348)	3.005*** (0.349)	3.851*** (0.346)
Observations	547	547	547
R ²	0.349	0.337	0.337
Adjusted R ²	0.333	0.321	0.321
Residual Std. Error (df = 533)	0.884	0.885	0.879
F Statistic (df = 13; 533)	21.963***	20.820***	20.832***

Note:

* p<0.1; ** p<0.05; *** p<0.01

Consistent with our findings in the previous section, our results continue to show that companies that use derivatives have a higher value than companies that do not use them, that is, we reject *Hypothesis 1a* for the three measures of Tobin's Q (p-values of 0,03, 0,01, and 0,005, respectively). Additionally, we found evidence that the decision to start using derivatives is affected by the size of Tobin's Q for the three measures of Q (p-values of 0,005, 0,001, and 0,01, respectively), thus rejecting *Hypothesis 1b*. We *cannot* reject *Hypothesis 1c*, that is, the decision to stop using derivatives is not affected by Q (p-values of 0,14, 0,15, and 0,21, respectively). Our results are consistent with the hypothesis that using derivatives causes an increase in the company's value, for the IBrX-100 sample.

Moving on with the tests, we will explore the results of the reverse causality test on the B3 Stock Exchange sample. The results of Equations 9 and 10, located on page 25, are shown in Table 16. Regressions 1, 2, and 3 use variables Q1, Q2 and Q3 respectively, and relate to Equation 9. Regressions 4, 5, and 6 use variables Q1, Q2 and Q3 respectively, and relate to Equation 10.

Table 16: **Results of the reverse causation tests (Hedging and Speculating) for the B3 sample.** Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	<i>Dependent variable:</i>					
	Q1	Q2	Q3	Q1	Q2	Q3
	(1)	(2)	(3)	(4)	(5)	(6)
Size	−0.115*** (0.019)	−0.116*** (0.019)	−0.175*** (0.021)	−0.119*** (0.019)	−0.121*** (0.019)	−0.179*** (0.021)
Dividends	0.195** (0.078)	0.231*** (0.077)	0.147* (0.084)	0.197** (0.078)	0.233*** (0.077)	0.150* (0.084)
Leverage	−0.004 (0.004)	−0.005 (0.004)	−0.005 (0.004)	−0.004 (0.004)	−0.005 (0.004)	−0.005 (0.004)
Profitability	0.605*** (0.206)	0.593*** (0.203)	0.255 (0.222)	0.625*** (0.205)	0.614*** (0.202)	0.271 (0.221)
Growth	0.002 (0.012)	0.001 (0.012)	0.003 (0.013)	0.001 (0.012)	0.0004 (0.012)	0.002 (0.013)
Liquidity	−0.006 (0.010)	−0.020** (0.010)	−0.015 (0.011)	−0.007 (0.010)	−0.021** (0.010)	−0.016 (0.011)
Geographic Diversification	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)
Exporter	0.137 (0.147)	−0.014 (0.145)	−0.044 (0.158)	0.167 (0.146)	0.028 (0.144)	−0.012 (0.158)
Foreign Sales	−0.020 (0.077)	−0.064 (0.076)	−0.057 (0.083)	−0.034 (0.077)	−0.081 (0.076)	−0.070 (0.083)
Goodwill	1.996*** (0.164)	1.649*** (0.162)	1.577*** (0.177)	1.996*** (0.164)	1.651*** (0.162)	1.579*** (0.177)
NN	−0.003 (0.069)	−0.025 (0.068)	−0.025 (0.075)			
HN	−0.096 (0.189)	−0.171 (0.186)	−0.151 (0.204)			
NH	−0.106 (0.166)	−0.165 (0.163)	−0.137 (0.179)			
NN _s				−0.077 (0.068)	−0.125* (0.067)	−0.124* (0.073)
SN				0.170 (0.144)	0.172 (0.142)	0.092 (0.155)
NS				−0.225 (0.141)	−0.252* (0.139)	−0.259* (0.152)
Constant	2.294*** (0.171)	1.973*** (0.168)	3.094*** (0.184)	2.369*** (0.168)	2.073*** (0.165)	3.187*** (0.181)
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.152	0.132	0.135	0.155	0.137	0.139
Adjusted R ²	0.143	0.123	0.127	0.147	0.128	0.130
Residual Std. Error (df = 1287)	1.051	1.036	1.133	1.049	1.033	1.130
F Statistic (df = 13; 1287)	17.708***	15.014***	15.502***	18.186***	15.675***	15.948***

Note:

*p<0.1; **p<0.05; ***p<0.01

Cohesive with our previous results, we have found evidence that hedging does not add value. Also, either decision to start or quit hedging are unaffected by the size of Q , for the B3 Stock Exchange sample.

Consistent with our findings in the previous section, our results continue to show that companies that use derivatives for speculative purposes have a higher value than companies that do not use derivatives, that is, we reject *Hypothesis 3a* for the two measures of Tobin's Q , $Q2$ and $Q3$ (p-values of 0,06, and 0,09, respectively). Additionally, we found evidence that the decision to start speculating is affected by the size of Tobin's Q for the two measures of Tobin's Q , $Q2$ and $Q3$ (p-values of 0,07, and 0,08, respectively), thus rejecting *Hypothesis 3b*. We confirm *Hypothesis 3c*, that the decision to stop speculating is not affected by Q (p-values of 0,23, 0,22, and 0,55, respectively). Our results are consistent with the hypothesis that speculation causes an increase in the company's value, for a 10% significance level, for the B3 Stock Exchange sample.

The results of Equation 8, located on page 24, on the B3 Stock Exchange sample, are shown in Table 17. Regressions 1, 2, and 3 use variables $Q1$, $Q2$ and $Q3$ respectively.

Table 17: **Results of the reverse causation tests (DerivUsage) for the B3 sample.** Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	<i>Dependent variable:</i>		
	Q1 (1)	Q2 (2)	Q3 (3)
Size	−0.119*** (0.020)	−0.123*** (0.019)	−0.181*** (0.021)
Dividends	0.199** (0.078)	0.235*** (0.077)	0.152* (0.084)
Leverage	−0.004 (0.004)	−0.005 (0.004)	−0.005 (0.004)
Profitability	0.611*** (0.206)	0.600*** (0.203)	0.252 (0.222)
Growth	−0.0001 (0.012)	−0.001 (0.012)	0.0003 (0.013)
Liquidity	−0.005 (0.010)	−0.019* (0.010)	−0.013 (0.011)
Geographic Diversification	−0.001 (0.001)	−0.001 (0.001)	−0.0004 (0.001)
Exporter	0.131 (0.147)	−0.026 (0.145)	−0.059 (0.159)
Foreign Sales	−0.035 (0.077)	−0.083 (0.076)	−0.076 (0.083)
Goodwill	1.990*** (0.164)	1.643*** (0.162)	1.572*** (0.177)
NN _D	−0.035 (0.064)	−0.070 (0.063)	−0.057 (0.069)
HN _D	−0.113 (0.177)	−0.144 (0.174)	−0.242 (0.191)
NH _D	−0.291** (0.143)	−0.341** (0.141)	−0.320** (0.154)
Constant	2.354*** (0.174)	2.059*** (0.171)	3.167*** (0.187)
Observations	1,301	1,301	1,301
R ²	0.154	0.135	0.138
Adjusted R ²	0.146	0.126	0.130
Residual Std. Error (df = 1287)	1.050	1.034	1.131
F Statistic (df = 13; 1287)	18.041***	15.431***	15.901***

Note:

Our findings do *not* support our claims to reject *Hypothesis 1a* for the three measures of Tobin's Q (p-values of 0,58, 0,26, and 0,40, respectively), showing that firms that use derivatives *are not* valued higher than firms that do not use derivatives, for the B3 Stock Exchange sample. Additionally, we found evidence that the decision to start using derivatives is affected by the size of Tobin's Q for the three measures of Q (p-values of 0,04, 0,01, and 0,03, respectively), thus rejecting *Hypothesis 1b*. We confirm *Hypothesis 1c*, that the decision to stop using derivatives is not affected by Q (p-values of 0,52, 0,40, and 0,20, respectively). Our results are consistent with the hypothesis that using derivatives causes an increase in the company's value, for a 5% significance level, for the B3 Stock Exchange sample.

Within this subsection, we propose a test in order to verify if a firm's market value influences the decision to engage in derivative usage. In the next section, we took a more direct approach of testing for the direct causality that engaging in derivative usage causes firms to have a higher value. As specified in our *Methodological Approach* section, on page 18, we performed an event study of changes in derivative usage policy both our samples.

4.3 First Difference Test

First, we will explore the results of the first difference test on the IBrX-100 sample. The results of Equation 11, located on page 26, are shown in Table 18. Regressions 1, 2, and 3 use variables $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ respectively. Regressions 4, 5, and 6 follow the same structure, but with year fixed effects.

Table 18: **Results of the first difference test (Hedging) for the IBrX-100 sample.** $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ represent three alternative measures of change in Tobin's Q that was used as a proxy for the companies' change in market value. $\Delta Size$ is the change in firm size. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. $\Delta Leverage$ is the change in leverage. $\Delta Profitability$ is the change in firm's profitability. $\Delta Growth$ is the change in growth opportunities. $\Delta Liquidity$ is the change in firm's liquidity. $\Delta Geographic Diversification$ is the change in external sales on total sales. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. $\Delta Goodwill$ is the change in firm's consumer goodwill. Industrial sector was used as the basis. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Size$	-0.115* (0.059)	-0.082 (0.058)	-0.091 (0.058)	-0.126** (0.057)	-0.088 (0.056)	-0.103* (0.056)
Dividends	-0.040 (0.089)	-0.035 (0.088)	-0.046 (0.088)	-0.066 (0.086)	-0.062 (0.084)	-0.074 (0.085)
$\Delta Leverage$	-0.001 (0.004)	-0.0001 (0.004)	0.0002 (0.004)	-0.003 (0.004)	-0.002 (0.004)	-0.002 (0.004)
$\Delta Profitability$	0.383 (0.395)	0.457 (0.391)	0.351 (0.391)	0.325 (0.381)	0.392 (0.376)	0.294 (0.376)
$\Delta Growth$	-0.011 (0.017)	-0.006 (0.017)	-0.012 (0.017)	-0.010 (0.017)	-0.005 (0.017)	-0.011 (0.017)
$\Delta Liquidity$	0.034*** (0.009)	0.026*** (0.009)	0.033*** (0.009)	0.032*** (0.008)	0.024*** (0.008)	0.031*** (0.008)
$\Delta Geographic Diversification$	0.004 (0.003)	0.002 (0.003)	0.002 (0.003)	0.003 (0.003)	0.001 (0.003)	0.001 (0.003)
Exporter	0.144 (0.146)	0.129 (0.144)	0.146 (0.144)	0.119 (0.140)	0.102 (0.138)	0.120 (0.138)
Foreign Sales	-0.133 (0.110)	-0.122 (0.109)	-0.127 (0.109)	-0.166 (0.106)	-0.156 (0.104)	-0.161 (0.104)
$\Delta Goodwill$	3.428*** (0.692)	3.093*** (0.684)	3.055*** (0.685)	3.304*** (0.680)	3.078*** (0.670)	2.928*** (0.671)
HH	0.258 (0.164)	0.236 (0.163)	0.230 (0.163)	-1.361* (0.722)	-0.887 (0.711)	-1.440** (0.712)
NN	0.246** (0.122)	0.236* (0.121)	0.239** (0.121)	-1.318* (0.713)	-0.830 (0.702)	-1.374* (0.703)
NH	0.175 (0.202)	0.176 (0.200)	0.183 (0.200)	-1.327* (0.730)	-0.823 (0.720)	-1.365* (0.721)
HN	0.325 (0.209)	0.317 (0.207)	0.326 (0.207)	-1.291* (0.733)	-0.805 (0.722)	-1.342* (0.723)
Communications	0.043 (0.209)	0.058 (0.207)	0.070 (0.207)	0.065 (0.201)	0.082 (0.198)	0.092 (0.198)
Cyclic Consumption	0.016 (0.129)	0.011 (0.128)	0.009 (0.128)	-0.014 (0.124)	-0.017 (0.122)	-0.022 (0.123)
Non-Cyclical Consumption	-0.029 (0.136)	-0.041 (0.135)	-0.043 (0.135)	-0.024 (0.130)	-0.035 (0.128)	-0.038 (0.129)
Basic Materials	0.023 (0.174)	-0.001 (0.172)	0.027 (0.172)	0.050 (0.167)	0.026 (0.165)	0.054 (0.165)
Oil, Gas and Biofuels	0.036 (0.167)	0.034 (0.165)	0.036 (0.166)	0.026 (0.160)	0.025 (0.158)	0.026 (0.158)
Health	-0.031 (0.158)	-0.042 (0.157)	-0.036 (0.157)	-0.073 (0.152)	-0.088 (0.150)	-0.080 (0.150)
Information Technology	-0.135 (0.206)	-0.158 (0.204)	-0.151 (0.204)	-0.166 (0.198)	-0.193 (0.195)	-0.182 (0.196)
Public utility	-0.008 (0.138)	-0.026 (0.136)	-0.020 (0.137)	-0.024 (0.132)	-0.042 (0.130)	-0.037 (0.130)
Constant	-0.166 (0.184)	-0.152 (0.182)	-0.148 (0.182)			
Observations	547	547	547	547	547	547
R ²	0.109	0.081	0.094	0.128	0.096	0.113
Adjusted R ²	0.072	0.043	0.056	0.073	0.040	0.058
F Statistic	2.913*** (df = 22; 524)	2.111*** (df = 22; 524)	2.466*** (df = 22; 524)	3.415*** (df = 22; 514)	2.476*** (df = 22; 514)	2.974*** (df = 22; 514)

Note:

*p<0.1; **p<0.05; ***p<0.01

We investigate here, more directly, whether the decision to engage in hedging activities with derivatives, or the decision to stop using them, changes the firm's market value, for the IBrX-100 sample. We found no evidence that the termination of the hedging policy negatively impacts the firm's market value, compared to the firm that maintains its hedging policy. Both coefficients, HH and HN were not statistically significant. However, we found evidence that initiating a hedging policy negatively impacts the firm's market value, compared to firms that maintained their policy of not engaging in hedging activities with derivatives, given that $NN > NH$.

The results of Equation 12, located on page 26, are shown in Table 19. Regressions 1, 2, and 3 use variables $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ respectively. Regressions 4, 5, and 6 follow the same structure, but with year fixed effects.

Table 19: **Results of the first difference test (Speculating) for the IBrX-100 sample.** $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ represent three alternative measures of change in Tobin's Q that was used as a proxy for the companies' change in market value. $\Delta Size$ is the change in firm size. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. $\Delta Leverage$ is the change in leverage. $\Delta Profitability$ is the change in firm's profitability. $\Delta Growth$ is the change in growth opportunities. $\Delta Liquidity$ is the change in firm's liquidity. $\Delta Geographic Diversification$ is the change in external sales on total sales. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. $\Delta Goodwill$ is the change in firm's consumer goodwill. Industrial sector was used as the basis. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Size$	-0.113* (0.059)	-0.080 (0.058)	-0.089 (0.058)	-0.125** (0.057)	-0.087 (0.056)	-0.101* (0.056)
Dividends	-0.034 (0.088)	-0.029 (0.088)	-0.041 (0.088)	-0.064 (0.085)	-0.059 (0.084)	-0.071 (0.084)
$\Delta Leverage$	-0.001 (0.004)	-0.0001 (0.004)	0.0002 (0.004)	-0.003 (0.004)	-0.002 (0.004)	-0.002 (0.004)
$\Delta Profitability$	0.411 (0.396)	0.490 (0.392)	0.374 (0.393)	0.318 (0.383)	0.388 (0.377)	0.282 (0.378)
$\Delta Growth$	-0.011 (0.017)	-0.007 (0.017)	-0.013 (0.017)	-0.010 (0.017)	-0.006 (0.017)	-0.012 (0.017)
$\Delta Liquidity$	0.035*** (0.009)	0.027*** (0.009)	0.035*** (0.009)	0.033*** (0.008)	0.025*** (0.008)	0.033*** (0.008)
$\Delta Geographic Diversification$	0.004 (0.003)	0.002 (0.003)	0.002 (0.003)	0.003 (0.003)	0.001 (0.003)	0.001 (0.003)
Exporter	0.169 (0.144)	0.159 (0.143)	0.176 (0.143)	0.141 (0.139)	0.128 (0.137)	0.147 (0.137)
Foreign Sales	-0.132 (0.109)	-0.120 (0.108)	-0.129 (0.108)	-0.173 (0.106)	-0.163 (0.104)	-0.171 (0.104)
$\Delta Goodwill$	3.427*** (0.691)	3.087*** (0.684)	3.054*** (0.684)	3.316*** (0.680)	3.087*** (0.670)	2.941*** (0.671)
SS	0.349*** (0.150)	0.346*** (0.148)	0.339*** (0.148)	-1.265* (0.717)	-0.772 (0.707)	-1.325* (0.708)
NN _s	0.225* (0.123)	0.211* (0.121)	0.214* (0.122)	-1.322* (0.712)	-0.838 (0.702)	-1.381** (0.703)
NS	0.222 (0.170)	0.246 (0.168)	0.234 (0.168)	-1.372* (0.721)	-0.852 (0.711)	-1.407** (0.712)
SN	0.352* (0.184)	0.331* (0.182)	0.357* (0.182)	-1.177 (0.726)	-0.695 (0.716)	-1.216* (0.717)
Communications	0.053 (0.192)	0.060 (0.190)	0.064 (0.190)	0.032 (0.184)	0.040 (0.181)	0.043 (0.182)
Cyclic Consumption	0.029 (0.129)	0.026 (0.128)	0.024 (0.128)	-0.005 (0.124)	-0.005 (0.122)	-0.010 (0.122)
Non-Cyclical Consumption	-0.025 (0.135)	-0.037 (0.134)	-0.037 (0.134)	-0.021 (0.130)	-0.032 (0.128)	-0.033 (0.128)
Basic Materials	0.035 (0.174)	0.011 (0.172)	0.040 (0.172)	0.055 (0.167)	0.032 (0.164)	0.061 (0.165)
Oil, Gas and Biofuels	0.050 (0.167)	0.049 (0.166)	0.049 (0.166)	0.032 (0.160)	0.031 (0.158)	0.031 (0.158)
Health	-0.040 (0.158)	-0.052 (0.156)	-0.045 (0.157)	-0.075 (0.152)	-0.089 (0.150)	-0.080 (0.150)
Information Technology	-0.108 (0.207)	-0.125 (0.204)	-0.121 (0.205)	-0.150 (0.199)	-0.171 (0.196)	-0.162 (0.196)
Public utility	-0.009 (0.137)	-0.026 (0.135)	-0.022 (0.135)	-0.029 (0.131)	-0.048 (0.129)	-0.043 (0.129)
Constant	-0.179 (0.184)	-0.167 (0.182)	-0.162 (0.182)			
Observations	547	547	547	547	547	547
R ²	0.112	0.085	0.097	0.130	0.098	0.115
Adjusted R ²	0.078	0.046	0.059	0.076	0.042	0.060
F Statistic	2.996*** (df = 22; 524)	2.203*** (df = 22; 524)	2.558*** (df = 22; 524)	3.486*** (df = 22; 514)	2.532*** (df = 22; 514)	3.039*** (df = 22; 514)

Note:

*p<0.1; **p<0.05; ***p<0.01

As with hedging, we investigate here whether the decision to engage in speculating activities with derivatives, or the decision to stop speculating, changes the firm's market value, for the IBrX-100 sample. We found evidence that the termination of the speculation policy slightly impacts positively the firm's market value, compared to the firm that maintains its speculation policy, given that $SS < SN$ were. Additionally, we found evidence that initiating a speculation policy negatively impacts the firm's market value, compared to firms that maintained their policy of not engaging in speculating activities with derivatives, given that $NN > NS$.

The results of Equation 13, located on page 26, are shown in Table 20. Regressions 1, 2, and 3 use variables $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ respectively. Regressions 4, 5, and 6 follow the same structure, but with year fixed effects.

Table 20: **Results of the first difference test (DerivUsage) for the IBrX-100 sample.** $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ represent three alternative measures of change in Tobin's Q that was used as a proxy for the companies' change in market value. $\Delta Size$ is the change in firm size. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. $\Delta Leverage$ is the change in leverage. $\Delta Profitability$ is the change in firm's profitability. $\Delta Growth$ is the change in growth opportunities. $\Delta Liquidity$ is the change in firm's liquidity. $\Delta Geographic Diversification$ is the change in external sales on total sales. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. $\Delta Goodwill$ is the change in firm's consumer goodwill. Industrial sector was used as the basis. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	$\Delta Q1$ OLS	$\Delta Q2$ OLS	$\Delta Q3$ OLS	$\Delta Q1$ Year Fixed Effect	$\Delta Q2$ Year Fixed Effect	$\Delta Q3$ Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Size$	-0.109* (0.059)	-0.077 (0.058)	-0.085 (0.058)	-0.120** (0.057)	-0.083 (0.056)	-0.096* (0.056)
Dividends	-0.037 (0.089)	-0.035 (0.088)	-0.043 (0.088)	-0.059 (0.085)	-0.057 (0.084)	-0.066 (0.084)
$\Delta Leverage$	-0.001 (0.004)	-0.0002 (0.004)	0.0002 (0.004)	-0.003 (0.004)	-0.002 (0.004)	-0.002 (0.004)
$\Delta Profitability$	0.362 (0.395)	0.443 (0.391)	0.324 (0.391)	0.286 (0.381)	0.360 (0.376)	0.249 (0.376)
$\Delta Growth$	-0.012 (0.017)	-0.008 (0.017)	-0.013 (0.017)	-0.011 (0.017)	-0.006 (0.017)	-0.012 (0.017)
$\Delta Liquidity$	0.037*** (0.009)	0.028*** (0.009)	0.037*** (0.009)	0.035*** (0.009)	0.026*** (0.008)	0.034*** (0.008)
$\Delta Geographic Diversification$	0.003 (0.003)	0.001 (0.003)	0.002 (0.003)	0.003 (0.003)	0.001 (0.003)	0.001 (0.003)
Exporter	0.130 (0.144)	0.113 (0.142)	0.136 (0.142)	0.124 (0.138)	0.105 (0.136)	0.129 (0.136)
Foreign Sales	-0.152 (0.108)	-0.142 (0.107)	-0.146 (0.107)	-0.178* (0.105)	-0.169 (0.103)	-0.173* (0.103)
$\Delta Goodwill$	3.459*** (0.690)	3.120*** (0.683)	3.087*** (0.683)	3.333*** (0.679)	3.104*** (0.669)	2.958*** (0.670)
HH_D	0.299** (0.132)	0.296** (0.131)	0.285** (0.131)	-1.287* (0.714)	-0.793 (0.704)	-1.352* (0.704)
NN_D	0.204 (0.125)	0.191 (0.123)	0.197 (0.123)	-1.322* (0.711)	-0.838 (0.701)	-1.379** (0.702)
NH_D	0.186 (0.178)	0.200 (0.176)	0.194 (0.177)	-1.371* (0.722)	-0.860 (0.712)	-1.412** (0.712)
HN_D	0.540** (0.228)	0.486** (0.226)	0.544** (0.226)	-1.005 (0.737)	-0.558 (0.727)	-1.050 (0.728)
Communications	0.0004 (0.196)	0.003 (0.194)	0.018 (0.194)	0.015 (0.188)	0.019 (0.185)	0.034 (0.186)
Cyclic Consumption	0.030 (0.130)	0.030 (0.128)	0.023 (0.129)	-0.010 (0.125)	-0.008 (0.123)	-0.018 (0.123)
Non-Cyclical Consumption	-0.016 (0.135)	-0.027 (0.134)	-0.029 (0.134)	-0.018 (0.130)	-0.028 (0.128)	-0.031 (0.128)
Basic Materials	0.037 (0.173)	0.013 (0.172)	0.041 (0.172)	0.055 (0.167)	0.031 (0.164)	0.059 (0.164)
Oil, Gas and Biofuels	0.038 (0.168)	0.041 (0.166)	0.036 (0.166)	0.018 (0.161)	0.020 (0.159)	0.016 (0.159)
Health	-0.039 (0.158)	-0.048 (0.156)	-0.043 (0.156)	-0.078 (0.152)	-0.089 (0.149)	-0.083 (0.150)
Information Technology	-0.105 (0.207)	-0.120 (0.205)	-0.121 (0.205)	-0.153 (0.199)	-0.172 (0.197)	-0.169 (0.197)
Public utility	-0.026 (0.137)	-0.042 (0.135)	-0.038 (0.135)	-0.039 (0.131)	-0.057 (0.129)	-0.052 (0.129)
Constant	-0.163 (0.183)	-0.149 (0.181)	-0.145 (0.181)			
Observations	547	547	547	547	547	547
R ²	0.115	0.087	0.100	0.132	0.099	0.117
Adjusted R ²	0.078	0.049	0.062	0.078	0.043	0.062
F Statistic	3.093*** (df = 22; 524)	2.272*** (df = 22; 524)	2.643*** (df = 22; 524)	3.559*** (df = 22; 514)	2.580*** (df = 22; 514)	3.109*** (df = 22; 514)

Note:

*p<0.1; **p<0.05; ***p<0.01

We investigate here whether the decision to use derivatives, or the decision to stop using it, changes the firm's market value, for the IBrX-100 sample. We found evidence that the termination of the derivative usage policy impacts positively the firm's market value, compared to the firm that maintains its derivative usage policy, given that $HH_D < HN_D$ were. Additionally, we found no evidence that initiating a derivative usage policy negatively impacts the firm's market value, compared to firms that maintained their policy of not using derivatives, given that NN_D and HN_D were not statistically significant.

Moving on with the first difference test, we now explore the results on the B3 sample. The results of Equation 11, located on page 26, are shown in Table 21. Regressions 1, 2, and 3 use variables $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ respectively. Regressions 4, 5, and 6 follow the same structure, but with year fixed effects.

Table 21: **Results of the first difference test (Hedging) for the B3 sample.** $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ represent three alternative measures of change in Tobin's Q that was used as a proxy for the companies' change in market value. $\Delta Size$ is the change in firm size. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. $\Delta Leverage$ is the change in leverage. $\Delta Profitability$ is the change in firm's profitability. $\Delta Growth$ is the change in growth opportunities. $\Delta Liquidity$ is the change in firm's liquidity. $\Delta Geographic Diversification$ is the change in external sales on total sales. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. $\Delta Goodwill$ is the change in firm's consumer goodwill. Industrial sector was used as the basis. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	$\Delta Q1$ OLS (1)	$\Delta Q2$ OLS (2)	$\Delta Q3$ OLS (3)	$\Delta Q1$ Year Fixed Effect (4)	$\Delta Q2$ Year Fixed Effect (5)	$\Delta Q3$ Year Fixed Effect (6)
$\Delta Size$	-0.068** (0.028)	-0.068** (0.028)	-0.185*** (0.029)	-0.064** (0.028)	-0.064** (0.028)	-0.182*** (0.029)
Dividends	0.023 (0.066)	0.023 (0.065)	0.057 (0.069)	0.050 (0.067)	0.052 (0.067)	0.088 (0.070)
$\Delta Leverage$	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.003)	-0.003 (0.002)	-0.002 (0.002)	-0.002 (0.003)
$\Delta Profitability$	-0.043 (0.166)	-0.136 (0.165)	-0.372** (0.174)	-0.073 (0.164)	-0.167 (0.163)	-0.403** (0.172)
$\Delta Growth$	-0.005 (0.010)	-0.007 (0.010)	-0.007 (0.010)	-0.004 (0.009)	-0.006 (0.009)	-0.006 (0.010)
$\Delta Liquidity$	0.023*** (0.009)	0.011 (0.009)	0.016* (0.009)	0.022** (0.009)	0.010 (0.009)	0.015 (0.009)
$\Delta Geographic Diversification$	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)
Exporter	0.301** (0.120)	0.310*** (0.120)	0.306** (0.126)	0.306*** (0.118)	0.316*** (0.118)	0.313** (0.124)
Foreign Sales	-0.136* (0.080)	-0.136* (0.080)	-0.122 (0.084)	-0.164** (0.079)	-0.165** (0.079)	-0.151* (0.084)
$\Delta Goodwill$	1.999*** (0.237)	1.622*** (0.236)	1.331*** (0.249)	2.022*** (0.234)	1.648*** (0.233)	1.354*** (0.246)
HH	0.151 (0.132)	0.159 (0.132)	0.233* (0.138)	0.563 (0.505)	0.556 (0.503)	0.440 (0.531)
NN	0.141* (0.076)	0.157** (0.076)	0.227*** (0.080)	0.556 (0.493)	0.553 (0.492)	0.433 (0.519)
NH	0.098 (0.161)	0.121 (0.161)	0.179 (0.170)	0.579 (0.515)	0.584 (0.513)	0.451 (0.541)
HN	0.194 (0.182)	0.230 (0.181)	0.281 (0.191)	0.622 (0.521)	0.642 (0.519)	0.504 (0.548)
Communications	-0.063 (0.189)	-0.050 (0.188)	-0.095 (0.198)	-0.049 (0.187)	-0.037 (0.186)	-0.080 (0.196)
Cyclic Consumption	-0.009 (0.087)	-0.002 (0.087)	0.028 (0.091)	-0.004 (0.086)	0.003 (0.085)	0.035 (0.090)
Non-Cyclical Consumption	-0.238** (0.113)	-0.236** (0.112)	-0.226* (0.118)	-0.210* (0.112)	-0.206* (0.111)	-0.193 (0.118)
Basic Materials	0.170 (0.111)	0.182 (0.111)	0.183 (0.117)	0.182* (0.110)	0.196* (0.109)	0.198* (0.115)
Oil, Gas and Biofuels	-0.073 (0.140)	-0.047 (0.140)	-0.062 (0.147)	-0.050 (0.139)	-0.020 (0.138)	-0.032 (0.146)
Health	-0.190 (0.129)	-0.175 (0.128)	-0.141 (0.135)	-0.193 (0.127)	-0.177 (0.127)	-0.140 (0.134)
Information Technology	-0.102 (0.204)	-0.040 (0.204)	-0.024 (0.214)	-0.111 (0.202)	-0.048 (0.201)	-0.031 (0.212)
Public utility	0.015 (0.096)	0.015 (0.096)	0.037 (0.101)	0.014 (0.095)	0.014 (0.095)	0.038 (0.100)
Constant	-0.096 (0.101)	-0.118 (0.101)	-0.219** (0.106)			
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.084	0.067	0.085	0.085	0.068	0.087
Adjusted R ²	0.068	0.051	0.070	0.062	0.045	0.064
Residual Std. Error (df = 1278)	0.981	0.979	1.031			
F Statistic	5.299*** (df = 22; 1278)	4.167*** (df = 22; 1278)	5.420*** (df = 22; 1278)	5.374*** (df = 22; 1268)	4.234*** (df = 22; 1268)	5.520*** (df = 22; 1268)

Note:

*p<0.1; **p<0.05; ***p<0.01

We investigate here, more directly, whether the decision to engage in hedging activities with derivatives, or the decision to stop using them, changes the firm's market value, for the B3 sample. We found no evidence that the termination of the hedging policy negatively impacts the firm's market value, compared to the firm that maintains its hedging policy. Both coefficients, HH and HN were not statistically significant. However, we found evidence that initiating a hedging policy negatively impacts the firm's market value, compared to firms that maintained their policy of not engaging in hedging activities with derivatives, given that $NN > NH$.

The results of Equation 12, located on page 26, are shown in Table 22. Regressions 1, 2, and 3 use variables $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ respectively. Regressions 4, 5, and 6 follow the same structure, but with year fixed effects.

Table 22: **Results of the first difference test (Speculating) for the B3 sample.** $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ represent three alternative measures of change in Tobin's Q that was used as a proxy for the companies' change in market value. $\Delta Size$ is the change in firm size. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. $\Delta Leverage$ is the change in leverage. $\Delta Profitability$ is the change in firm's profitability. $\Delta Growth$ is the change in growth opportunities. $\Delta Liquidity$ is the change in firm's liquidity. $\Delta Geographic Diversification$ is the change in external sales on total sales. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. $\Delta Goodwill$ is the change in firm's consumer goodwill. Industrial sector was used as the basis. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Size$	-0.068** (0.028)	-0.069** (0.028)	-0.186*** (0.029)	-0.064** (0.028)	-0.065** (0.028)	-0.183*** (0.029)
Dividends	0.022 (0.065)	0.021 (0.065)	0.055 (0.068)	0.049 (0.066)	0.051 (0.066)	0.087 (0.070)
$\Delta Leverage$	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.003)	-0.003 (0.002)	-0.002 (0.002)	-0.002 (0.003)
$\Delta Profitability$	-0.037 (0.165)	-0.129 (0.165)	-0.366** (0.174)	-0.069 (0.164)	-0.161 (0.163)	-0.398** (0.172)
$\Delta Growth$	-0.005 (0.010)	-0.007 (0.010)	-0.007 (0.010)	-0.004 (0.009)	-0.006 (0.009)	-0.006 (0.010)
$\Delta Liquidity$	0.022** (0.009)	0.010 (0.009)	0.015 (0.009)	0.021** (0.009)	0.009 (0.009)	0.014 (0.009)
$\Delta Geographic Diversification$	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)
Exporter	0.289** (0.120)	0.298** (0.119)	0.296** (0.126)	0.291** (0.118)	0.300** (0.118)	0.299** (0.124)
Foreign Sales	-0.127 (0.080)	-0.125 (0.079)	-0.113 (0.084)	-0.154* (0.079)	-0.153* (0.079)	-0.141* (0.083)
$\Delta Goodwill$	1.992*** (0.237)	1.615*** (0.236)	1.325*** (0.249)	2.015*** (0.234)	1.641*** (0.233)	1.348*** (0.246)
SS	0.200* (0.114)	0.225** (0.114)	0.285** (0.120)	0.599 (0.501)	0.604 (0.499)	0.475 (0.526)
NN_s	0.148* (0.077)	0.162** (0.076)	0.232*** (0.080)	0.559 (0.493)	0.555 (0.491)	0.435 (0.518)
NS	0.154 (0.139)	0.205 (0.139)	0.268* (0.146)	0.553 (0.507)	0.585 (0.505)	0.461 (0.533)
SN	-0.064 (0.142)	-0.074 (0.141)	0.014 (0.149)	0.387 (0.508)	0.359 (0.506)	0.259 (0.534)
Communications	-0.054 (0.180)	-0.044 (0.179)	-0.088 (0.189)	-0.041 (0.178)	-0.030 (0.177)	-0.071 (0.187)
Cyclic Consumption	-0.013 (0.087)	-0.006 (0.086)	0.025 (0.091)	-0.009 (0.086)	-0.001 (0.085)	0.031 (0.090)
Non-Cyclical Consumption	-0.242** (0.112)	-0.239** (0.112)	-0.229* (0.118)	-0.213* (0.112)	-0.208* (0.111)	-0.196* (0.117)
Basic Materials	0.169 (0.111)	0.182 (0.111)	0.183 (0.117)	0.181* (0.110)	0.195* (0.109)	0.198* (0.115)
Oil, Gas and Biofuels	-0.070 (0.140)	-0.044 (0.140)	-0.059 (0.147)	-0.049 (0.139)	-0.020 (0.138)	-0.032 (0.146)
Health	-0.194 (0.128)	-0.180 (0.128)	-0.145 (0.135)	-0.197 (0.127)	-0.182 (0.126)	-0.144 (0.133)
Information Technology	-0.110 (0.204)	-0.046 (0.203)	-0.030 (0.214)	-0.121 (0.201)	-0.057 (0.201)	-0.038 (0.212)
Public utility	0.011 (0.096)	0.011 (0.096)	0.033 (0.101)	0.013 (0.095)	0.013 (0.095)	0.037 (0.100)
Constant	-0.094 (0.101)	-0.116 (0.101)	-0.217** (0.106)			
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.086	0.070	0.087	0.087	0.070	0.089
Adjusted R ²	0.070	0.054	0.072	0.064	0.047	0.066
Residual Std. Error (df = 1278)	0.980	0.978	1.030			
F Statistic	5.450*** (df = 22; 1278)	4.362*** (df = 22; 1278)	5.569*** (df = 22; 1278)	5.471*** (df = 22; 1268)	4.361*** (df = 22; 1268)	5.614*** (df = 22; 1268)

Note:

*p<0.1; **p<0.05; ***p<0.01

As with hedging, we investigate here whether the decision to engage in speculating activities with derivatives, or the decision to stop speculating, changes the firm's market value, for the B3 sample. We found evidence that the termination of the speculation policy negatively impacts the firm's market value, compared to the firm that maintains its speculation policy, given that $SS > SN$ were. Additionally, we found evidence that initiating a speculation policy negatively impacts the firm's market value, compared to firms that maintained their policy of not engaging in speculating activities with derivatives, given that $NN > NS$.

The results of Equation 13, located on page 26, are shown in Table 23. Regressions 1, 2, and 3 use variables $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ respectively. Regressions 4, 5, and 6 follow the same structure, but with year fixed effects.

Table 23: **Results of the first difference test (DerivUsage) for the B3 sample.** $\Delta Q1$, $\Delta Q2$ and $\Delta Q3$ represent three alternative measures of change in Tobin's Q that was used as a proxy for the companies' change in market value. $\Delta Size$ is the change in firm size. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. $\Delta Leverage$ is the change in leverage. $\Delta Profitability$ is the change in firm's profitability. $\Delta Growth$ is the change in growth opportunities. $\Delta Liquidity$ is the change in firm's liquidity. $\Delta Geographic Diversification$ is the change in external sales on total sales. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. $\Delta Goodwill$ is the change in firm's consumer goodwill. Industrial sector was used as the basis. Standard error values shown in parentheses below the coefficients.

	Dependent variable:					
	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$	$\Delta Q1$	$\Delta Q2$	$\Delta Q3$
	OLS	OLS	OLS	Year Fixed Effect	Year Fixed Effect	Year Fixed Effect
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Size$	-0.066** (0.028)	-0.066** (0.028)	-0.183*** (0.029)	-0.062** (0.028)	-0.062** (0.028)	-0.180*** (0.029)
Dividends	0.030 (0.065)	0.029 (0.065)	0.064 (0.069)	0.058 (0.067)	0.060 (0.066)	0.096 (0.070)
$\Delta Leverage$	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.003)	-0.003 (0.002)	-0.003 (0.002)	-0.002 (0.003)
$\Delta Profitability$	-0.048 (0.166)	-0.141 (0.165)	-0.379** (0.174)	-0.081 (0.164)	-0.174 (0.163)	-0.412** (0.172)
$\Delta Growth$	-0.005 (0.010)	-0.007 (0.010)	-0.007 (0.010)	-0.004 (0.009)	-0.006 (0.009)	-0.006 (0.010)
$\Delta Liquidity$	0.023*** (0.009)	0.011 (0.009)	0.016* (0.009)	0.022** (0.009)	0.010 (0.009)	0.015* (0.009)
$\Delta Geographic Diversification$	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)
Exporter	0.318*** (0.121)	0.328*** (0.121)	0.328*** (0.127)	0.318*** (0.119)	0.328*** (0.119)	0.328*** (0.125)
Foreign Sales	-0.133* (0.080)	-0.132* (0.079)	-0.118 (0.084)	-0.159** (0.079)	-0.159** (0.079)	-0.145* (0.083)
$\Delta Goodwill$	1.997*** (0.237)	1.620*** (0.236)	1.330*** (0.249)	2.018*** (0.234)	1.644*** (0.233)	1.351*** (0.246)
HH_D	0.099 (0.090)	0.111 (0.090)	0.175* (0.095)	0.509 (0.496)	0.503 (0.495)	0.377 (0.522)
NN_D	0.158** (0.079)	0.174** (0.079)	0.245*** (0.083)	0.567 (0.493)	0.564 (0.492)	0.444 (0.519)
NH_D	0.127 (0.145)	0.177 (0.145)	0.237 (0.152)	0.518 (0.508)	0.547 (0.506)	0.417 (0.534)
HN_D	0.200 (0.172)	0.208 (0.172)	0.313* (0.181)	0.631 (0.516)	0.621 (0.515)	0.536 (0.543)
Communications	-0.025 (0.184)	-0.011 (0.184)	-0.051 (0.193)	-0.012 (0.182)	0.003 (0.181)	-0.035 (0.191)
Cyclic Consumption	-0.014 (0.087)	-0.007 (0.087)	0.023 (0.091)	-0.011 (0.086)	-0.003 (0.086)	0.029 (0.090)
Non-Cyclical Consumption	-0.227** (0.113)	-0.224** (0.113)	-0.212* (0.119)	-0.198* (0.112)	-0.192* (0.112)	-0.179 (0.118)
Basic Materials	0.178 (0.111)	0.192* (0.111)	0.194* (0.117)	0.190* (0.110)	0.205* (0.110)	0.209* (0.116)
Oil, Gas and Biofuels	-0.078 (0.140)	-0.053 (0.140)	-0.067 (0.147)	-0.055 (0.139)	-0.026 (0.139)	-0.039 (0.146)
Health	-0.190 (0.128)	-0.174 (0.128)	-0.140 (0.135)	-0.194 (0.127)	-0.177 (0.126)	-0.140 (0.133)
Information Technology	-0.111 (0.204)	-0.047 (0.204)	-0.031 (0.215)	-0.123 (0.202)	-0.058 (0.201)	-0.041 (0.212)
Public utility	0.021 (0.096)	0.021 (0.096)	0.044 (0.101)	0.023 (0.095)	0.023 (0.095)	0.048 (0.100)
Constant	-0.104 (0.101)	-0.127 (0.101)	-0.228** (0.107)			
Observations	1,301	1,301	1,301	1,301	1,301	1,301
R ²	0.084	0.067	0.086	0.086	0.069	0.088
Adjusted R ²	0.068	0.051	0.070	0.063	0.045	0.065
Residual Std. Error (df = 1278)	0.981	0.979	1.030			
F Statistic	5.330*** (df = 22; 1278)	4.198*** (df = 22; 1278)	5.466*** (df = 22; 1278)	5.415*** (df = 22; 1268)	4.266*** (df = 22; 1268)	5.573*** (df = 22; 1268)

Note:

*p<0.1; **p<0.05; ***p<0.01

We investigate here whether the decision to use derivatives, or the decision to stop using it, changes the firm's market value, for the B3 sample. We found no evidence that the termination of the derivative usage policy impacts negatively the firm's market value, compared to the firm that maintains its speculation policy, given that HH_D and HN_D were not statistically significant. Additionally, we found evidence that initiating a derivative usage policy negatively impacts the firm's market value, compared to firms that maintained their policy of not using derivatives, given that $NN_D > NH_D$.

In the next section, we performed logistic regressions in order to identify the main drivers of companies to engage in the use of derivatives, both for hedging and for speculation (or both, simultaneously) purposes.

4.4 Determinants of Derivative Usage

In this subsection we explore the test results on the determinants of derivative usage. The results of Equations 14, 15, 16, and 17, located on pages 27 and 27, on the determinants of the use of derivatives, in relation to the IBrx-100 sample, are shown in Table 24. Regression 1 presents the estimated coefficients of the forecast model on the log of a company's chance of using derivatives for the purpose of hedging. Regression 2, 3, and 4 present the same structure as regression 1, but estimate on a company's change log to perform speculation with derivative instruments, use derivatives for hedging and speculation simultaneously, or simply use derivatives, respectively.

Table 24: **LOGIT regression results for the IBrX-100 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	<i>Dependent variable:</i>			
	Hedging (1)	Speculating (2)	Both (3)	DerivUsage (4)
Size	0.407** (0.164)	0.415*** (0.128)	0.997 (0.674)	0.584*** (0.110)
Dividends	1.860*** (0.674)	-0.182 (0.348)	17.008 (5,502.602)	0.431 (0.312)
Leverage	0.025 (0.025)	-0.180* (0.104)	-0.066 (0.363)	-0.015 (0.019)
Profitability	-0.231 (3.117)	-2.428* (1.309)	0.289 (10.606)	-2.153 (1.367)
Growth	5.888*** (2.088)	-0.115** (0.051)	-0.070 (0.685)	-0.101** (0.049)
Liquidity	-1.202*** (0.355)	0.129 (0.119)	0.276 (1.254)	0.098 (0.065)
Geographic Diversification	-0.021 (0.021)	-0.020 (0.026)	-0.419 (414.009)	-0.018 (0.014)
Exporter	-1.554 (1.159)	-18.218 (746.354)	0.320 (11,900.650)	1.638** (0.834)
Foreign Sales	1.601*** (0.597)	0.440 (0.533)	0.493 (13,797.940)	1.124*** (0.409)
Goodwill	3.830* (2.076)	-0.374 (1.521)	-25.873 (30.176)	2.255* (1.296)
Communications	2.418*** (0.880)	-0.662 (0.711)	1.676 (3.891)	16.998 (832.977)
Cyclic Consumption	-2.363*** (0.758)	-0.639 (0.518)	-19.683 (5,508.199)	-1.010** (0.428)
Non-Cyclical Consumption	-1.939** (0.773)	-0.412 (0.588)	-19.258 (6,595.697)	-1.020** (0.455)
Basic Materials	0.130 (0.752)	-1.474* (0.854)	-22.330 (12,271.410)	-1.117** (0.567)
Oil, Gas and Biofuels	-1.602* (0.934)	-2.413*** (0.836)	-21.698 (6,268.632)	-2.301*** (0.651)
Health	-2.454** (1.247)	0.452 (0.589)	-19.001 (9,623.498)	0.165 (0.505)
Information Technology	-14.987 (838.385)	-17.105 (1,529.815)	-18.524 (18,116.830)	-16.271 (923.224)
Public utility	-0.112 (0.602)	-0.524 (0.504)	-2.552* (1.339)	0.078 (0.411)
Constant	-4.718*** (1.792)	-4.499*** (1.356)	-28.738 (5,502.606)	-6.374*** (1.155)
Observations	547	547	547	547
Log Likelihood	-159.472	-231.757	-23.775	-286.570
Akaike Inf. Crit.	356.944	66 501.513	85.549	611.140

Note:

* p<0.1; ** p<0.05; *** p<0.01

Looking at the results of the LOGIT tests, for the IBrX-100 sample, in Table 24, it is clear that the motivations for companies to hedge and to speculate are different, having only one point of similarity, which would be that the larger the size of companies, the greater the probabilities for both hedging and speculating with derivatives.

Regarding the motivators for hedging, as mentioned above, the size of the companies presented a statistically significant positive coefficient of 0,407, which implies that for each percentage increase in the total value of the firm's assets, there is an increase of 1,32% in the probability of hedge with derivative instruments. Dividends had a statistically significant positive coefficient of 1,860. If the company distributes dividends to its investors in the period, there is an increase of 5,43% in the likelihood of the company to engage in hedge activities with derivatives in the same period. Similar to the payment of dividends, the fact that the company presents revenues from abroad presented a statistically significant positive coefficient of 1,601, which means that if the company presents foreign revenues in the period, there is an increase of 4,24% in the company's probability hedge with financial derivative instruments in the same period. Growth Opportunities and Goodwill also had positive and statistically significant coefficients of 5,888 and 3,830, respectively, which means that for each increase in a Growth and Goodwill unit, there is an increase in the probability of hedging by 76,31% and 29,15%, respectively. Liquidity presented a statistically significant negative coefficient of 1,202, which means that for each increase in the liquidity ratio by one unit, the probability of hedging decreases by 0,27%.

Regarding the drivers for speculating with derivatives, as mentioned previously, the size of the companies presented a statistically significant positive coefficient of 0,415, which implies that for each percentage increase in the total value of the firm's assets, there is an increase of 1,66% in probability that the company will speculate with derivative instruments. Contrary to the reasons for hedging with derivatives, being a company with foreign revenues, paying dividends to investors and investing in brand intangible values were not significant to lead firms to speculate with derivatives. In addition, unlike the reasons that lead the firm to hedge, Growth Opportunities presented a statistically significant negative coefficient of 0,115, which means that for each increase in the Growth, the probability of speculating decreases by 0,98%. Similar to Growth Opportunities, Profitability presented a statistically significant negative coefficient of 2,428, which means that for each increase in a Profitability unit, there is a 0,10% decrease in the company's probability of speculating with financial derivative instruments. in the same period. Leverage also had a statistically significant negative coefficient of 0,180. For each increase in a leverage unit, the probability of speculation with derivatives is reduced by 0,92%.

Now we explored the test results on the determinants of derivative usage on the B3 Stock Exchange sample. The results of Equations 14, 15, 16, and 17, located on pages 27 and 27, on the determinants of the use of derivatives, in relation to the B3 Stock Exchange sample, are shown in table 25. Regression 1 presents the estimated coefficients of the forecast model on the log of a company's chance of using derivatives for the purpose of hedging. Regression 2, 3, and 4 present the same structure as regression 1, but estimate on a company's change log to perform speculation with derivative instruments, use derivatives for hedging and speculation simultaneously, or simply use derivatives, respectively.

Table 25: **LOGIT regression results for the B3 sample.** Industrial sector was used as the basis for the tests. Q1, Q2, and Q3 represent three alternative measures of Tobin's Q that was used as a proxy for the companies' market value. The natural logarithm of total assets was used for the Size control variable. The proxy used to capture the ability of companies to access the financial markets is the dummy dividend, which equals one, if the firm paid dividends in the current year. Leverage variable defined as long-term debt was used, divided by the equity of shareholders. To control for Profitability, the return on assets was used, defined as the ratio of net revenues to total assets. The capital expenditures on sales index was used as a proxy for Growth Opportunity. As a proxy for the firm's Liquidity, the current liquidity variable, which is the ratio between the firm's current assets and liabilities. The external sales index on total sales was used as a continuous measure of multinationality in the tests. Exporter is a dummy variable was used, which assumes a value of one, if the firm has more than 40% of its total revenue from exports and a value of 0, otherwise. Foreign Sales is a dummy variable, which assumes a value of 1, if the company has revenues from abroad; and value 0, otherwise. Goodwill is the ratio of the costs that a business incurs to market and distribute its products and services to total sales. Standard error values shown in parentheses below the coefficients.

	<i>Dependent variable:</i>			
	Hedging (1)	Speculating (2)	Both (3)	DerivUsage (4)
Size	0.449*** (0.094)	0.491*** (0.070)	1.311*** (0.457)	0.541*** (0.060)
Dividends	1.208*** (0.420)	-0.078 (0.232)	16.815 (2,692.553)	0.248 (0.197)
Leverage	0.010 (0.015)	-0.007 (0.017)	-0.057 (0.144)	-0.006 (0.011)
Profitability	2.377* (1.380)	-0.399 (0.809)	5.346 (5.614)	-0.291 (0.671)
Growth	2.684** (1.203)	-0.051* (0.028)	-0.202 (0.644)	-0.036 (0.026)
Liquidity	-0.397*** (0.150)	0.053** (0.023)	-0.711 (0.878)	0.021 (0.027)
Geographic Diversification	-0.011 (0.015)	-0.024 (0.016)	-0.024 (260.397)	-0.002 (0.003)
Exporter	-1.905** (0.922)	-15.557 (362.305)	0.088 (16,318.250)	1.496*** (0.346)
Foreign Sales	0.720** (0.360)	0.463 (0.319)	-16.839 (5,241.330)	0.242 (0.209)
Goodwill	1.271** (0.632)	0.212 (0.620)	1.668 (14.908)	0.281 (0.498)
Communications	1.451*** (0.502)	-0.716 (0.470)	-1.878 (1.996)	1.632*** (0.587)
Cyclic Consumption	-1.409*** (0.391)	-0.654** (0.275)	-18.907 (3,496.054)	-0.947*** (0.229)
Non-Cyclical Consumption	-0.930** (0.450)	-0.392 (0.360)	-21.351 (5,388.064)	-0.178 (0.285)
Basic Materials	-0.483 (0.430)	-0.625* (0.375)	-19.770 (3,800.086)	-0.443 (0.301)
Oil, Gas and Biofuels	-1.133* (0.618)	-2.083*** (0.550)	-22.336 (6,589.093)	-1.591*** (0.422)
Health	-1.931** (0.777)	0.436 (0.335)	-18.905 (7,494.528)	-0.030 (0.304)
Information Technology	-14.018 (439.586)	-0.154 (0.658)	-17.299 (13,681.470)	-0.787 (0.648)
Public utility	-0.246 (0.341)	-0.459 (0.281)	-2.337** (1.016)	-0.309 (0.235)
Constant	-5.977*** (0.843)	-5.470*** (0.604)	-31.232 (2,692.557)	-5.416*** (0.509)
Observations	1,301	1,301	1,301	1,301
Log Likelihood	-361.021	68-520.049	-33.263	-668.112
Akaike Inf. Crit.	760.042	1,078.097	104.525	1,374.224

Note:

* p<0.1; ** p<0.05; *** p<0.01

Looking at the results of the LOGIT tests, now for the B3 Stock Exchange sample, in Table 25, it becomes also clear that the motivations for companies to hedge and to speculate are different, having only one point of similarity, which would be that the larger the size of companies, the greater the probabilities for both hedging and speculating with derivatives.

Regarding the motivations for hedging with derivatives, as mentioned above, the size of the companies presented a statistically significant positive coefficient of 0,449, which implies that for each percentage increase in the total value of the firm's assets, there is an increase of 0,40% in the probability of hedge with derivative instruments. Dividends had a statistically significant positive coefficient of 1,208. If the company distributes dividends to its investors in the period, there is an increase of 0,84% in the likelihood of the company to engage in hedge activities with derivatives in the same period. Profitability also presented a statistically significant positive coefficient of 2,377, which means that for each increase in one profitability unit, there is an increase in the probability of hedging by 2,66%. Similar to the payment of dividends, the fact that the company presents revenues from abroad presented a statistically significant positive coefficient of 0,720, which means that if the company presents foreign revenues in the period, there is an increase of 0,52% in the company's probability hedge with financial derivative instruments in the same period. Growth Opportunities and Goodwill also had positive and statistically significant coefficients of 2,684 and 1,271, respectively, which means that for each increase in a Growth and Goodwill unit, there is an increase in the probability of hedging by 3,58% and 0,90%, respectively. Liquidity presented a statistically significant negative coefficient of 0,397, which means that for each increase in the liquidity ratio by one unit, the probability of hedging decreases by 0,17%.

Regarding the drivers for speculating with derivatives, as mentioned previously, the size of the companies presented a statistically significant positive coefficient of 0,491, which implies that for each percentage increase in the total value of the firm's assets, there is an increase of 0,68% in probability that the company will speculate with derivative instruments. Liquidity also had a statistically significant positive coefficient of 0,053. For each increase in a leverage unit, the probability of speculation with derivatives increase by 0,44%.

Comparing the results of Tables 24 and 25, we can draw some conclusions as to the main motivators for the use of derivatives, either for hedging or speculation, by companies. Regarding the drivers for using derivatives, the larger the size of the company, the greater the probability of engaging in derivative usage. Similarly, if the company is an exporter company, the more likely it is to use derivatives. As for the drivers for hedging with financial derivative instruments, it was evident that the size of the companies, the fact that the company distributes dividends, the amount of capital spent on growth opportunities, and if the company received revenues from abroad, makes the probability of the company to engage in hedging activities, increase. On the contrary, it became evident that the greater a company's liquidity, the less likely it is to engage in hedging activities. Regarding the motivators for speculating with derivatives, the collective results of both samples suggest that the larger the size of the company, the greater the probability of speculating with derivatives. In addition, it became evident that the greater the capital expenditures with opportunities for growth, the less likely the company is to engage in speculative

activities with derivatives. We cannot fail to emphasize here that a possible cause of divergences between the results found in the tables is the result of a lack of available information on the use of derivatives by the *Bloomberg* database. When we expanded our sample, almost half of the declared data available on the use of derivatives (214 out of 447 firm-year observations) came from the companies in the IBrX-100 sample. Although companies, after 2009, disclosure information about the usage of derivatives, apparently *Bloomberg* has been concerned with making available, so far, more complete information about the companies with the most negotiability and representativeness of the Brazilian stock market, leaving the inclusion of such data about the others less negotiable firms to a second moment.

5 Concluding Remarks

This work analysed both the impact of derivative usage on firm's market value, as well as what were the main drivers that lead companies to engage in the usage of derivatives. Tests were performed on two samples, one containing data on 59 publicly traded non-financial companies that are part of the IBrX-100 index, and the other is an expanded sample of the first, containing data on 221 publicly traded non-financial companies that are current active within the B3 Stock Exchange, both within the period from 2009 to 2019. This study contributes to complement previous studies carried out in Brazil, published by Rossi (2008) and Serafini and Sheng (2011), by focusing on the different purposes for derivative usage, as well as on analyzing the drivers for these different types of usage of derivatives. Additionally, our findings can help investors better assess companies within their portfolios to improve their returns by selecting firms that better manage their derivative usage. Also, it provides a framework that helps investors identify the drivers that lead companies to engage in derivative usage.

As proposed by Serafini and Sheng (2011), three measures were used for the Tobin Q index, as an approximation of the firm's market value, as a robustness exercise. We found evidence that firms that use financial derivative instruments, in particular for the purpose of financial speculation, have a higher market value than firms that do not use them, coinciding with the results found by Allayannis and Weston (2001). Regarding the use of derivatives for hedging purposes, our results coincide with those found by Jin and Jorion (2006) and Serafini and Sheng (2011), rejecting the hypothesis that hedging with derivatives increases the firm value of companies.

When we analyzed the use of derivatives and the market value of the firm, our results were consistent with those found by Allayannis and Weston (2001) and Rossi (2008), and divergent from those found by Serafini and Sheng (2011). The results imply that our hypothesis that using derivatives increases the firm's value is confirmed. Specifically, using derivative instruments for speculation purposes increases the company's market value. Although using derivatives for hedging or using derivatives for both hedging and speculating, simultaneously, has not been statistically significant, its signs are positive, implying that they also increase the firm value. It was observed that a negative relationship between firm size and value. Results are similar to those found by Allayannis and Weston (2001) and divergent from those found by Serafini and Sheng (2011), who found a null relationship between firm size and value, and divergent also from Mian (1996), in which larger companies would have greater access to the financial market, greater gains in scale and, therefore, a higher value. There is no clear evidence that paying dividends results in a premium on the company's market value, a result that is similar to that found by Serafini and Sheng (2011) and divergent from that found by Allayannis and Weston (2001). As for growth opportunities, the results are similar to those found by Allayannis and Weston (2001) and Serafini and Sheng (2011), where we have no obvious evidence that the amount of capital expenditures impacts the firm's market value. The results also confirm that more profitable firms have higher firm values. According to Serafini and Sheng (2011), this result suggests that more profitable firms would have greater access to investments and, with this, greater opportunities to grow. Additionally, we find that Consumer Goodwill is one of the most relevant factors in the firm's value. Firms that spend more to develop the firm's intangible assets, such as brand value and

reputation, are awarded a higher valuation by the market.

Looking at our results, it became evident that the drivers for companies to hedge and to speculate with financial derivative instruments are different, having only one point of similarity, which would be that the larger the size of companies, the greater the probabilities for hedging and speculation with derivatives. Regarding the motivators for hedging, the size of the companies, the act of distribution of dividends to its investors, presenting revenues from abroad, expending capital on growth opportunities, and expending capital on branding and reputation increases the probability of companies engaging in hedging activities. Regarding the motivators for speculating, the more capital expended on growth opportunities, the more profitable the firm, and the more levered the firm, the less probable the company to engage in speculating activities with derivatives.

Finally, the analysis carried out in this study can still be improved in future researches. The separation by the different types of derivatives instruments used by the firm, in addition to the size of each firm's derivative operations in relation to their company size are data that could help to deepen the analysis.

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