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**RALPH MELLES STICCA**

**Effects of the exchange rate on the adoption of hedge accounting: evidence from Brazil**

**ORIENTADOR: PROF. DR. SILVIO HIROSHI NAKAO**

**RIBEIRÃO PRETO (SP)**  
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**Prof. Dr. Vahan Agopyan**  
**Reitor da Universidade de São Paulo**

**Prof. Dr. André Lucirton Costa**  
**Diretor da Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto**

**Prof. Dr. Amaury José Rezende**  
**Coordenador do Programa de Pós-graduação em Controladoria e Contabilidade**

**Prof. Dr. Fabiano Guasti Lima**  
**Chefe do Departamento de Contabilidade**

**RALPH MELLES STICCA**

**Effects of the exchange rate on the adoption of hedge accounting: evidence from Brazil**

**Tese de Doutorado apresentada no Programa de Pós-Graduação em Controladoria e Contabilidade da Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto - Universidade de São Paulo, para obtenção do título de Doutor em Ciências. Aprovada em 04/12/2018. Versão Corrigida. A original se encontra disponível no Serviço de Pós-Graduação da FEA-RP/USP.**

**ORIENTADOR: PROF. DR. SILVIO HIROSHI NAKAO**

**RIBEIRÃO PRETO (SP)  
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A Deus, pela força e motivação inexplicáveis nos momentos de incerteza, dificuldade e inércia.

## EPÍGRAFE

*“Derivatives are financial weapons of mass destruction.”*

Warren E. Buffet, da Berkshire Hathaway Inc.

*“IFRSs are primarily aimed at investors and creditors. And we really need to know what you  
– the primary users of financial statements – want.”*

Ian Mackintosh (Vice-Presidente do IASB), 05/08/2011

*“Any standard that needs more than 200 interpretations has got to have a major defect.”*

Sir David Tweedie (Presidente do IASB), 06/04/2011

*“In the long run managements stressing accounting appearance over economic substance  
usually achieve little of either.”*

Warren E. Buffet

## RESUMO

STICCA, R. M. **Efeitos da variação cambial na adoção do hedge accounting no Brasil**, 78 p. Tese de Doutorado – Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto – Universidade de São Paulo, Ribeirão Preto (SP), 2018.

Com o CPC 38, a partir de 2010 as companhias brasileiras passaram a adotar as normas contábeis correspondentes ao IAS 39 no tocante à contabilidade de *hedge*, cuja divulgação é facultativa e, especificamente em relação ao *hedge* de fluxo de caixa, pode diferir a divulgação de perdas cambiais em outros resultados abrangentes (ORA) e, conseqüentemente, promover o *disclosure* de melhores resultados. Nesse cenário, por meio de modelos estatísticos o estudo investiga se a alta exposição à variação cambial em um ambiente de alta depreciação da taxa de câmbio resulta em diferimento de perdas em ORA e, em conjunto com o diferimento da tributação da variação cambial, promove a escolha da contabilidade de *hedge* para 379 companhias abertas brasileiras no período de 2010 a 2017. Os resultados evidenciam que a alta alavancagem em moeda estrangeira, a alta depreciação do câmbio e o diferimento da tributação impactam positivamente a escolha pela contabilidade de *hedge* e, conseqüentemente, reduzem a divulgação de perdas cambiais no resultado, apontando a existência de gerenciamento de resultados, já que os saldos em ORA não são corretamente interpretados pelos analistas e investidores, mesmo os mais sofisticados. O estudo contribui para as teorias de *disclosure*, de escolha contábil e de gerenciamento de resultados, e aponta para a necessidade de aprimoramento das normas contábeis relativas a instrumentos financeiros em termos de uniformidade e comparabilidade.

Palavras-chave: contabilidade de *hedge*; escolha contábil; gerenciamento de resultados.

## ABSTRACT

STICCA, R. M. **Effects of the exchange rate on the adoption of hedge accounting: evidence from Brasil.** 78 p. Thesis (PhD) – Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto – Universidade de São Paulo, Ribeirão Preto (SP), 2018.

Under Accounting Statement CPC 38, from 2010 on Brazilian companies started adopting accounting standards correspondent to IAS 39 regarding hedge accounting, whose disclosure is *optional* and, in cash flow hedge operations, may avoid losses disclosure in the income statements due to deferred values in other comprehensive income (OCI), promoting better earnings disclosure. In this scenario, by means of statistical models we investigate whether firm's financial exposure to currency risk and the high exchange rate depreciation environment promote the deferral of losses on firm's OCI and, in addition to the tax deferral on exchange gains and losses, the hedge accounting choice for 379 Brazilian listed companies between 2010-2017. Our results show that firms' high leverage in foreign currency, the high exchange rate variation on country level and the tax deferral choice influence positively the hedge accounting choice and, consequently, reduce the disclosure of losses on income statements, evidencing potential earnings management activity, since OCI's balances are not entirely understood by analysts and investors (even the most sophisticated). Our paper contributes to the disclosure, accounting choice and earnings management theories, highlighting the claim for enhancement of financial instruments accounting standards on uniformity and comparability.

Key words: hedge accounting; accounting choice; earnings management.

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## LISTA DE SIGLAS

AFS – Available-for-sale  
AOCI – Accumulated Other Comprehensive Income  
BACEN – *Banco Central do Brasil*  
B<sup>3</sup> - Brazilian Stock Exchange  
BIS – Bank for International Settlements  
BRL – Brazilian Reais  
CDS – Credit Default Swap  
CVM – *Comissão de Valores Mobiliários*  
CFC – Controlled Foreign Corporation  
COGS – Cost of goods sold  
CPC – *Comitê de Pronunciamentos Contábeis*  
CSLL – *Contribuição Social sobre o Lucro Líquido*  
DFP – *Demonstrações Financeiras Padronizadas*  
EPS – Earnings per share  
EU – European Union  
FASB – Financial Accounting Standards Board  
FRR – Financial Reporting Release  
FVOCI – Fair Value through Other Comprehensive Income  
FVR – Fair Value Reporting  
FVTPL – Fair Value through Profit and Loss  
GAAP – General Accepted Accounting Principles  
GDP – Gross domestic product  
GMM – Generalized Method of Moments  
IAS – International Accounting Standards  
IASB – International Accounting Standards Board  
IFRS – International Financial Reporting Standards  
IRPJ – *Imposto de Renda da Pessoa Jurídica*  
MP – *Medida Provisória*  
NYSE – New York Stock Exchange  
OCI – Other Comprehensive Income  
OECD - Organisation for Economic Co-operation and Development  
OLS – Ordinary Least Squares  
OTC – Over-the-counter  
P&L – Profit and Loss Statement  
ROC – Receiver Operating Characteristics  
ROE - Return on Equity  
S&P 500 – Standard and Poor’s 500  
SEC – Securities and Exchange Commission  
SEP - *Superintendência de Relações com Empresas*  
SFAS – Statement of Financial Accounting Standards  
SNC - *Superintendência de Normas Contábeis*  
UK – United Kingdom  
U.S. – United States of America  
US\$ - American Dollars  
VIF – Variance Inflating Factor

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## 1. Introduction

The popularity of commodity and financial futures have renewed the academic and financial interest in hedging theories (KRONER; SULTAN, 1993). In this context, the economic use of derivatives for company's protection of future cash flows and equities is discussed by Hughen (2010), who has called it "economic hedge", as well as by Milevsky and Prisman (1999), Lien and Metz (2001), Graham and Rogers (2002), and most recently Lin et al. (2017).

However, as one of the most economically complex types of financial contracts, derivatives create significant reporting challenges, reason why many companies using derivatives do not apply the related accounting rules correctly or consistently (CHANG et al., 2016) - 2008's financial crisis has raised economically significant and politically charged questions on the role of financial reporting for financial instruments in firm's internal management and external evaluation (RYAN, 2012).

Derivatives, retained residual securities and various other contractual and non-contractual positions created in structured finance transactions have small value and concentrated risks, due to financial leverage embedded in the positions (RYAN, 2012), deriving the rising necessity for firms to hedge their financial positions and a great challenge for standard setters to release accounting rules that promote the adequate firm's risk and earnings disclosure.

In this context, scientific research becomes relevant on hedge operations and their financial, economic, tax and mainly accounting effects, as deduced from the studies of Smith and Stulz (1985), Nance et al. (1993), Mian (1996), Graham and Smith Jr. (1999), Guay (1999), Bartram et al. (2009), and Aretz and Bartram (2010).

Accounting reporting for hedge operations, known as "hedge accounting", influences directly the disclosure of firm's outstanding financial exposure to risk and the timeliness of earnings or losses recognition, so lessons and merits of changes in the disclosure of derivative instruments and hedging activities are still debated and represent a major policy issue - prior studies have provided mixed evidences on the economic consequences of derivative instruments' recognition and disclosure (TESSEMA, 2016).

That is, under regular accounting rules, the hedged item and the derivative instrument used for hedge purposes are often accounted for differently, so that gains and losses resulting from the two instruments are not reported simultaneously in company's profit or loss, hence hedge accounting is a set of special rules designed to ensure that gains and losses on hedged

items and hedging instruments are recognized in the same period, thereby preventing earnings volatility that is not economically justified (GLAUM; KLÖCKER, 2011).

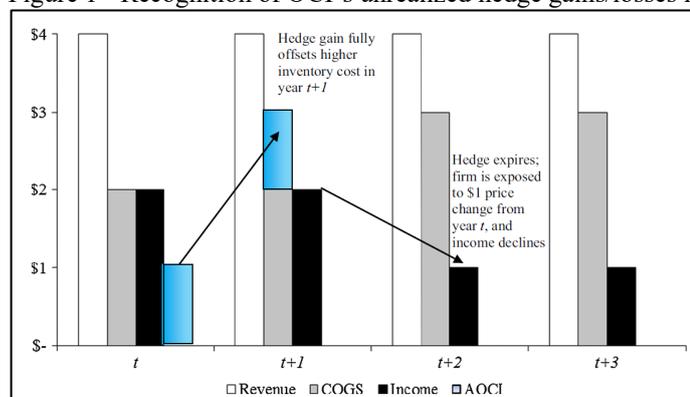
Hedge accounting rules were provided internationally until 2017 by IAS (International Accounting Standards) 39 of IASB (International Accounting Standards Board), named “Financial Instruments: Recognition and Measurement”, fully replaced by IFRS (International Financial Reporting Standard) 9 from 2018 on, as well as by SFAS (Statement of Financial Accounting Standards) 133 of FASB (Financial Accounting Standards Board), named “Accounting for Derivative Instruments and Hedging Activities”.

In Brazil, Law No. 11,638, of December 28, 2007 has changed several Articles of Law No. 6,404, of December 15, 1976 (Joint-Stock Companies' Act), effective from January 1, 2008, providing the local adoption of IFRS rules and granting the Accounting Statements Committee (*Comitê de Pronunciamentos Contábeis - CPC*) the enforcement to release the respective Accounting Standards (*Pronunciamentos Técnicos*).

In this sense, the Accounting Standard CPC 38 (also replaced by CPC 48 in accordance to IFRS 9, from 2018 on) stated the dispositions regarding hedge accounting in Brazil, defining “cash flow hedge” as the one carried out for the protection against the exposure to the variability in the cash flow that (i) is assignable to a particular risk associated to a recognized asset or liability or a highly probable foreseen transaction, and (ii) may affect the firm’s profits and losses.

Item 95(a) of CPC 38 also states that the part of the resulting gain or loss of the hedge instrument that is determined as “effective hedge” in the cash flow hedge, including the firm’s exposure to foreign currency, shall be directly recognized as other comprehensive income (OCI), which does not affect directly the company’s reported earnings.

Figure 1 - Recognition of OCI’s unrealized hedge gains/losses in the income statements



Source: Campbell et al. (2015).

Hence, according to CPC 38, firms register their cash flow hedge market value at each disclosure in an accrued form in OCI, so that when hedge expires and the protected item is realized, the firm reclassifies the unrealized OCI's gains or losses to the income statement, therefore if it is a unrealized gain, it is a sign that there will be a future loss in the protected item (CAMPBELL et al., 2015), and vice-versa, pursuant demonstrated on Figure 1.

In other words, the recognition of value changes of the hedging instrument in profit or loss is deferred to a later point in time, so they are “parked” in equity, more precisely in OCI, to be “recycled” when the hedged item affects profit or loss (GLAUM; KLÖCKER, 2011).

However, firms interested in adopting the hedge accounting are responsible for complying with all the standard requirements to assure that the carried out transactions are effectively for hedge purposes and consequently deserve such accounting treatment, but it is still **optional** to the firms, resulting in a truly **accounting choice**, including in Brazil (LOPES et al., 2011; CAMPBELL, 2015; CHOI et al., 2015).

In this scenario, like all economic activities, timely financial reporting is costly, so considering the existence of considerable discretion regarding gain and loss accruals in the income statements, managers cannot be expected to exercise discretion only in the interests of financial-statement users (RYAN, 2012), and prior research has already pointed out that managers repel losses reporting mainly due to reputation and target-beating, so companies would engage in accounting choices that provides the avoidance of accounting losses in order to disclose better results to investors and analysts (GRAHAM et al., 2005; KLEIN; MARQUARDT, 2006; ROYCHOWDHURY, 2006; GIGLER et al., 2007; LI, 2011; CHUNG et al., 2012).

Therefore, under hedge accounting choice, considering that the hedged item is not promptly identified in the firm's financial statement, the deferral of gains and losses may mislead analysts, investors and other accounting information users, as it is not clear in the accounting reporting the exact moment when OCI's deferred items are going to be reverted to the year's income statement (CHOI et al., 2015), a dichotomy that may motivate hedge accounting misuse by managers and firms and, consequently, loss avoidance through earnings management activity.

That is, since discretionary accrual choices can be used to reduce variability in earnings induced by the exploration risks, and both discretionary accruals and hedging can reduce earnings variability, firms are concerned about managing overall earnings volatility risk to some benchmark level and doing so by trading-off alternative smoothing mechanisms, leading to an “interesting avenue of future research” (PINCUS; RAJGOPAL, 2002).

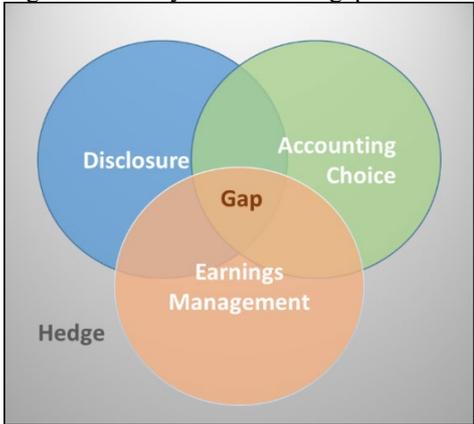
In this context, mainstream research in accounting discusses relevant information content in the disclosure of companies' earnings (BEAVER, 1968; SLOAN, 1996) and, especially, the empirical use of numeric information disclosed through financial statements as value relevance measure (BALL; BROWN, 1968), opening space for deeper studies regarding accounting choices based on verified market imperfections such as agency costs, information asymmetry and externalities affecting non contracting parties (FIELDS et al., 2001).

However, Fields et al. (2001) criticizes the limited research progress on the determinants and consequences of accounting choices due to limitations in designs and the focus on the replication of templates instead of knowledge extension. Libby et al. (2015), in the same sense, discuss the challenges for future research regarding the influence of financial reporting regulations on earnings management and accounting choice decisions, not only concerning managers, but also auditors and directors, reinforcing our study's objectives.

Studies from Adler and Dumas (1984), Marshall and Weetman (2002), Sabac et al. (2005), Richie et al. (2006), Makar and Huffman (2008), Makar et al. (2013), Ito et al. (2016), and Krapl and Salyer (2017) have analyzed the influence of firm's exposure to currency risks on disclosure and derivatives use for hedge purposes. On the other hand, Chambers et al. (2007), Hughen (2010), Lim et al. (2013), Campbell (2015), Campbell et al. (2015), and Khan and Bradbury (2016) have analyzed OCI's volatility determinants and disclosures, pointing out the relevance of such accrual in firm's accounting information quality and predictive power.

None of the abovementioned papers, however, has investigated whether the adoption of cash flow hedge accounting would intend, more than seeking for economic protection of future cash flows, to avoid disclosure of losses derived from the exchange rate effects on financial exposure to currency risk, revealing a true theoretical gap in prior research on disclosure, accounting choice and earnings management, mainly concerning hedge (Figure 2).

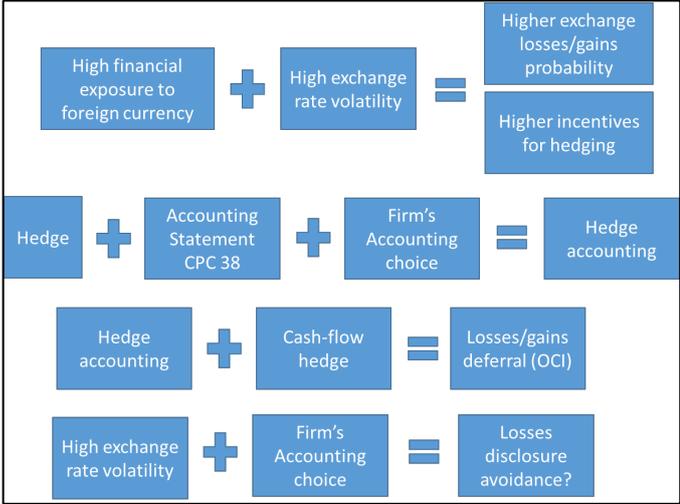
Figure 2 – Study's theoretical gap demonstration



Source: prepared by the author based on the reviewed literature.

Hence, since we expect that cash flow hedge accounting choice in an environment of firms’ high financial exposure to currency risk and high exchange rate depreciation results in deferral of losses in OCI, promoting loss avoidance activity (Figure 3), we aimed to answer the following research problem: **is hedge accounting choice being used by firms primarily to avoid the disclosure of losses in an environment of high financial exposure to currency risk and high exchange rate depreciation?**

Figure 3 – Premises coordination and research problem development



Source: prepared by the author based on the reviewed literature.

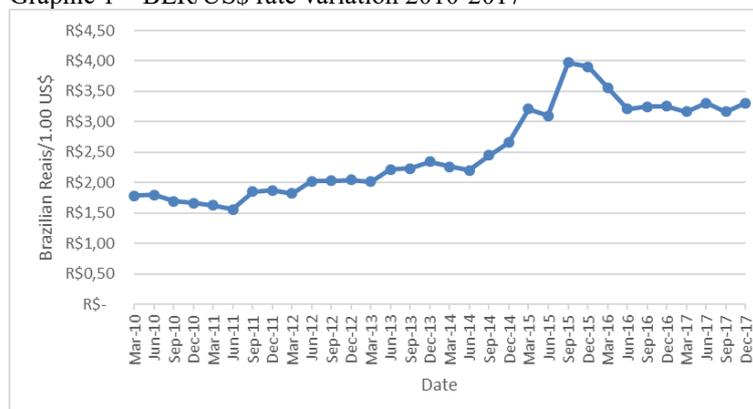
By analyzing financial data and footnotes information disclosed by 379 Brazilian listed companies through quarterly income statements (*Demonstrações Financeiras Padronizadas - DFP*) in the period 2010-2017, and validating the abovementioned premises (Figure 3), our study’s main objective is to investigate whether the deferral of exchange losses through (cash flow) hedge accounting choice is undertaken by firms with the primary purpose to avoid reporting losses in an environment of firms’ high financial exposure to currency risk combined with high exchange rate variation, such as verified in Brazil.

Regarding the country selection, decisions of firms to engage in risk management may not only be determined by firm’s characteristics, but the specificities of the country they are located in may provide additional factors that impact hedging decisions in the firm level, such as derivatives liquidity and country’s legal system, so country-specific determinants of derivatives’ use at the firm level have so far not been widely examined (ARETZ; BARTRAM, 2010). On the other hand, variation in exchange rates may not be as disconnected from economic fundamentals as previously thought (HASSAN et al., 2016).

Therefore, considering its growing importance to the global economy in the last decade as a relevant emerging economy and its leadership in South America (SANTOS et al., 2017), we chose **Brazil** as our study's object because:

- (i) hedge accounting was recently implemented by means of CPC 38 (dated as of October 2009, but enforceable from 2010 on), so research in this field is only initial and we may thus be able to capture firms' experience and adaptation (ZHANG, 2009; CHOI et al., 2015);
- (ii) hedge accounting is an accounting choice (GUERRA; GALDI, 2009; LOPES et al., 2011; PEREIRA et al., 2017);
- (iii) Brazilian currency (BRL) has experimented high depreciation periods (Graphic 1), so contrarily to other stable currency countries there is an incentive to avoid exchange losses disclosure (SABAC et al., 2005; RICHIE et al., 2006); and,
- (iv) OCI is discussed internationally since IAS 1 was first released in 1975, but it was implemented in Brazil only in July 2009 (Accounting Standard CPC 26, from 2010 on), so investors, analysts and other accounting information users are still on the disclosure learning curve (CHAMBERS et al., 2007; MAKAR et al., 2013; CAMPBELL et al., 2015; KHAN; BRADBURY, 2016).

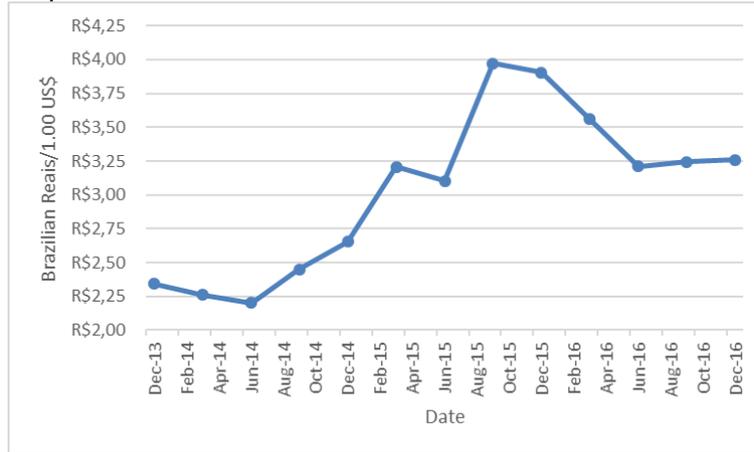
Graphic 1 – BRL/US\$ rate variation 2010-2017



Source: prepared by the author based on exchange rates published by Brazilian Central Bank (BACEN).

In the same sense, Graphic 2 details precisely the depreciation of BRL against United States Dollar (US\$) between 2014-2016, mostly due to the political instability experimented in the period concerning the Republic President's Impeachment and Car Wash (*Lava-Jato*) corruption probe, highlighting the relevance of hedging foreign exchange rate positions (assets, liabilities and future cash flows) to local companies.

Graphic 2 – BRL/US\$ rate variation 2014-2016



Source: prepared by the author based on exchange rates published by BACEN.

Just as a matter of comparison, Graphic 3 shows US\$ rate against Euro (two of the most important currency for financial and capital markets around the globe) in the same period (2014-2016)<sup>1</sup>, confirming that foreign currency variation is a greater matter for Brazilian listed companies than it seems to be for those established in strong currency countries such as US and located in the European Union (EU), were most of the prior research on hedge accounting was conducted.

Graphic 3 – US\$/Euro rate variation 2014-2016



Source: prepared by the author based on exchange rates published by The Federal Reserve.

Ratifies Brazil as our study's object the recent case of Petrobras S.A. (Petrobras), Brazilian's largest listed and state company, which as result of the high exchange rate depreciation environment abovementioned was challenged by Brazilian's Security and Exchange Commission (*Comissão de Valores Mobiliários – CMV*) on the adoption of hedge

<sup>1</sup> While US\$ rate in BRL showed a standard deviation of 10,67% in the period (2014-2016), US\$ rate in Euro showed a 4,74% standard deviation, thus less than half.

accounting and the consequent disclosure of lower exchange losses in 2015, highlighting the justification and relevance of our study.

In summary, Petrobras has informed its investors, in an announcement to the market in 2013, on the initial adoption of hedge accounting, quoting that “this mechanism initially contemplates roughly 70% of the total net debts exposed to exchange rates, protecting roughly 20% of the exports, for a seven-year term” (PETROBRAS press release, 2013).

Later, in December, 2015, a Deutsche Bank report has pointed out Petrobras’s outstanding notional hedge values as US\$ 58 billion, but due to the price and internal production of oil decrease, the continuity or not of hedge accounting would result in US\$ 21 billion in unrealized foreign exchange losses, forcing Petrobras to release a new announcement to the market ratifying that said exchange exposure would be “comfortably below the value expected for their export revenues” (ISTO É DINHEIRO, 2015).

However, after the release of financial statements of the 4<sup>th</sup> quarter of 2015, Petrobras has presented total losses of BRL 34.8 billion, which could have been even larger if the firm had not adopted hedge accounting in 2013, reaching a negative impact of BRL 71 billion on its income statement. On the same financial statements, Petrobras has presented a debt of BRL 494 billion in the end of 2015, 84% of which in foreign currency (74% in US\$), resulting in losses with exchange rate variation of BRL 60.7 billion accrued directly in equity (OCI), as demonstrated by Figure 4.

Figure 4 – Influence of hedge accounting on Petrobras’ earnings (4<sup>th</sup> quarter, 2015)

### Ajuda contábil

Como seriam os números da Petrobras sem o uso da contabilidade de hedge

■ Resultados atribuídos à empresa controladora - em R\$ bilhões

	2013	2014	2015
Resultado do exercício	23,4	-21,7	-34,8
Varição cambial diferida registrada no patrimônio líquido	-12,2	-13,9	-60,7
Reclassificação do patrimônio líquido para o resultado	0,6	1,3	6,2
Efeito tributário	3,2	4,3	18,5
Resultado do exercício sem contabilidade de hedge	15	-30	-70,8

Fonte: Petrobras, elaboração Valor



Source: *Valor Econômico* (2016) – original in Portuguese.

Petrobras’ hedge accounting disclosures lead CVM to open an administrative procedure (*Processo CVM* No. RJ-2013-7516) to investigate the use of hedge accounting under penalty of restating the financial statements from 2013 to 2015 if its adoption would have

effectively induced the firm's investors into mistake by hiding the company's effective economic situation<sup>2</sup>.

CVM has accused Petrobras to misuse foreign currency debts as hedge instruments since there would be no proof that said debts were contracted with the primary objective to protect highly probable future export transactions, so hedge accounting practice in this case was, in its economic essence, supposedly meant to avoid exchange losses in firm's financial statements (as a deferral), considering also that Petrobras was a net oil importer in the period, so the expected future cash flow would not be an income (but payments, instead).

Notwithstanding Petrobras' case regarding cash flow hedge accounting was further dismissed<sup>3</sup>, it highlights Brazil as a great opportunity for our study, since all the items mentioned in Figure 3 are expected to be present, that is, according to CPC 38 (CPC 48 from 2018 on) hedge accounting is a firm's **accounting choice** that may generate the deferral of gains and mainly losses in the cash flow hedge accounting to OCI, in its turn significantly derived from high financial exposure to foreign currency and in a scenario of high exchange rate depreciation.

Pirchegger (2006), Zhang (2009), Choi et al. (2015), Martin and Roychowdhury (2015), and Potin et al. (2016) have already analyzed hedge accounting effects on companies' disclosure of gains and losses. We, however, aimed to find significant evidence that:

- (i) the volatile environment Brazilian listed firms are inserted lead them to account for deferred losses in OCI derived from exchange rate gains and losses, which consequently implies that firm's effective earnings may have been misrepresented and mispriced, indicating a potential earnings management behavior;

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<sup>2</sup> In the course of action, in March, 2017, by means of the Notice (*Ofício*) No. 30/2017/CVM/SEP/GEA5, CVM has determined the restatement of Petrobras annual financial statements concerning 12/31/2013, 12/31/2014 and 12/31/2015 and all quarterly reports released until 2016, due to the supposedly misuse of debts in foreign currency as hedge instruments (derivatives and non-derivatives) for future export operations (hedge object) with high probabilities to occur, when in fact, according to CVM, Petrobras was using cash flow hedge accounting aiming to avoid exchange losses reporting.

Petrobras has appealed to CVM's administrative superior courts (*Superintendência de Relações com Empresas - SEP* and *Superintendência de Normas Contábeis - SNC*), arguing that there is no specific normative or accounting rule demanding the hedge instrument and the hedge object to present coincident terms, and thus there is no accounting violation if debts in foreign currency hold a longer term than the hedged export transactions, so the hedge efficiency was proved throughout the whole period involving the hedge object.

<sup>3</sup> Later, on July 2017, CVM's Collegiate (final administrative instance) has reviewed the autarchy's initial position, accepting Petrobras' explanations on the accounting practices and ratifying the improvement of internal controls regarding hedge accounting during the course of action, so the obligation to restate 2013's, 2014's, 2015's and 2016's financial statements was finally dismissed.

- (ii) the hedge accounting choice may have been used by Brazilian listed firms as an earnings management tool, aiming in this case the loss avoidance from debts written in foreign currency, since Brazil has experimented a great currency (Brazilian Reais – BRL) depreciation; and,
- (iii) the hedge accounting choice is also determined by tax aggressiveness, represented by tax-driven decisions provided exceptionally by Brazilian tax law, more precisely the option to tax gains and losses on exchange rate variations in the income statements on a deferred (cash) basis, paying taxes only at each operation's settlement.

Hence, our study is deemed relevant since it enhances the research on determinants and implications of accounting choices concerning hedge and derivatives, mainly considering the recent release of IFRS 9 (CPC 48 in Brazil), enforceable as of 2018, as well as considering that accounting standards setters such as FASB are currently being pressed to review OCI's rules in terms of disclosure improvement, since investors (even the most sophisticated ones) and analysts may not be fully assimilating the implications of unrealized gains and losses of cash flow hedges in firm's shares prices (CAMPBELL et al., 2015).

Our expected contribution to the disclosure, accounting choice and earnings management theories relies on the role played by the financial exposure to foreign currency and the exchange rate variation to hedge accounting choice concerning cash flow hedges, in addition to tax aggressive behavior regarding the choice undertaken by Brazilian firms for the deferral of tax on exchange gains and losses, adding relevant and innovative determinants to hedge accounting decisions and enhancing prior research on derivatives use and reporting such as Demarzo and Duffie (1995), Pincus and Rajgopal (2002), Barton (2001), Graham and Rogers (2002), Guerra and Galdi (2009), Donohoe (2015) and Pereira et al. (2017).

As practical contributions, we alert investors and analysts on the potential earnings management activities derived from financial exposure to foreign currency and exchange rate depreciation, widening prior research on OCI's balances mispricing such as Gigler et al. (2007), Campbell (2015) and Campbell et al. (2015), as well as indicate possible updates on the accounting standards regarding derivatives and hedge such as the obligation to disclose cash flow hedge operations using a uniform hedge accounting methodology, in the benefit of comparability.

Our study is composed by this Introduction, as well as by the prior research and hypotheses development, research design, then by our results analysis discussions and further conclusions.

## 2. Prior Research and Hypotheses Development

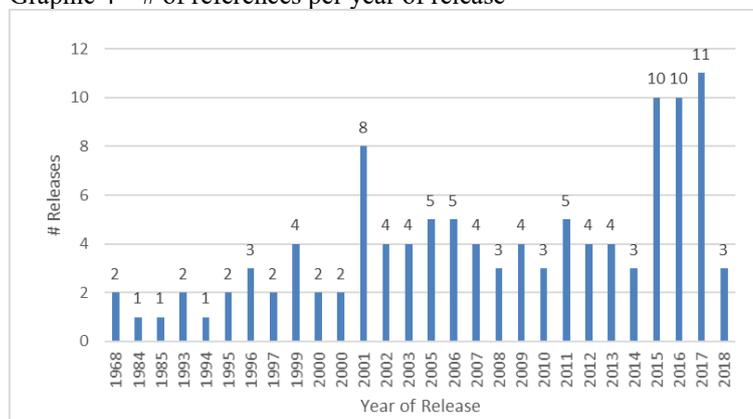
In order to support our study’s hypotheses and the proposed models, we have mapped the literature concerning “hedge”, “hedge accounting”, “other comprehensive income”, “accounting choice” and “earnings management” using the software HistCite®, selecting the most relevant papers using both Scopus® and Web of Science® databases and then reviewing a total of 112 papers, of which 96 in international journals of accounting and finance (Table 1).

Table 1 – # of references per most relevant reviewed journals

<b>Journal</b>	<b># References</b>
Review of Accounting Studies	13
Journal of Accounting and Economics	11
The Accounting Review	10
Journal of Accounting Research	8
<i>Revista de Contabilidade &amp; Finanças</i>	7
Financial Management	3
Journal of Business Finance & Accounting	3
Accounting and Finance	2
Contemporary Accounting Research	2
Foundations and Trends in Accounting	2
Others	51
<b>Total</b>	<b>112</b>

Regarding the year of release, we observed a great concentration of issues in 2001 - probably affected by the recent issuance of SFAS 133, in 1998 - and also around 2005, year of issuance of IAS 39, as per shown on Graphic 4, which also details the increasing number of releases in the past 4 years (2015-2018), with a peak of 11 papers in 2017, showing the interest and relevance of our study’s field and the ongoing development of the accounting theory.

Graphic 4 – # of references per year of release



Source: prepared by the author based on the reviewed theoretical references.

In this scenario, we have organized, reviewed and discussed the abovementioned papers in three (3) topics, developing and granting the prior research support to our three (3) study's hypotheses, at the end of each topic.

## **2.1. Financial exposure to foreign currency risk, hedge and OCI's characteristics**

### **2.1.1. Financial exposure to foreign currency risk**

Prior research has already discussed the relevance of hedge operations with financial instruments (derivatives and non-derivatives) to firms with high financial exposure to currency risk and in markets with high shares of international income, mainly written in US\$, situation which may incentive firms to choose for disclosing their foreign currency hedge operations using the hedge accounting methodology.

There are many potential sources of financial exposure to currency risk, being the most obvious one having assets or liabilities with net payment streams denominated in a foreign currency - the easiest to identify and the most easily hedged (CHAMBERLAIN et al., 1997). However, exchange-rate movements also affect expected future cash flows, and therefore the value of large multinationals, importers and exporters by changing the home currency value of foreign revenues and costs and the terms of competition (ALLAYANNIS; OFEK, 2001).

Currency is not risky just because devaluation is likely – if it was certain as to magnitude and timing, there would be no risk at all -, but because of randomness, such as unexpected exchange rate variations (ADLER; DUMAS, 1984). In this sense, according to Adler and Dumas (1984)<sup>4</sup>, for purposes of financial analysis, a reasonable measure of exposure to currency risk should meet the following criteria:

- (i) its dimension should be an amount of currency;
- (ii) it should be a characteristic of any asset or liability, physical or financial, that a given investor might own or owe; and,

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<sup>4</sup> Adler and Dumas (1984) also define two relevant terms often used and tested in the present study: exposure and hedge. The first one is defined as the amounts of foreign currency that represent the sensitivity of the future, real domestic currency (market) value of any asset to random variations in the future domestic purchasing powers of these foreign currencies at some future date. The second one may be defined as the amounts of foreign currency financial transactions required to render the future, real, domestic currency market value.

- (iii) it should be implemented in the dual sense, that is, measurement can be accomplished with available techniques and exposure can be hedged or covered with available financial instruments.

Regarding the use of foreign currency derivatives for hedging, Allayannis and Ofek (2001) found a strong association between foreign currency derivative use and firm exchange rate exposure in a sample of Standard & Poor's (S&P) 500 nonfinancial firms in 1993, suggesting that firms use derivatives as hedge rather than to speculate in the foreign exchange markets.

Allayannis and Ofek (2001) have also found evidence that a firm's financial exposure to foreign sales and trade is a very important factor that guides firm's decision on hedge and how much to hedge, as seen in the Petrobras' case discussed on Section 1<sup>5</sup>, and firms can also use foreign debt to protect themselves from exchange rate movements, so firm's exposure through foreign sales is an important determinant of its decision to use foreign debt and on the level of foreign debt.

In addition, Géczy et al. (1997) have also argued the source of foreign exchange rate exposure to be an important factor in the choice among types of currency derivatives, concluding that the likelihood of using currency derivatives is positively related to foreign-denominated debt, so the benefits of hedging are greatest and the costs lowest for firms with extensive foreign exchange rate exposure, as we argue in our study's hypotheses.

Empirical studies show that accounting concerns do matter in actual managerial decision making, so a firm that has foreign assets can hedge its balance sheet by creating an offsetting liability (i.e. foreign debt) and thus protect its equity from fluctuations caused by unexpected changes in foreign exchange rates – and due to the lack of detailed exposure information, the empirical literature has been vague in addressing whether foreign debt usage is primarily driven by operating or accounting exposures (AABO et al., 2015), ratifying the theoretical gap and relevance of our study.

Brown (2001) investigated why and how a firm manages its financial exposure to currency risk, pointing out to informational asymmetries, facilitation of internal contracting and competitive pricing as causes for hedging – how the firm hedges depends on derivative market liquidity, recent hedging outcomes, as well as exchange rate volatility, exposure volatility and

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<sup>5</sup> Aabo et al. (2015) have also discussed the use of foreign debt to hedge exchange exposure from international sales, pointing out that a firm that receives revenues in foreign currency has two ways of eliminating such positive (long) exposure by financial means: the use of financial derivatives, such as forwards contracts, futures, swaps, and options, or the use of debt denominated in foreign currency, either raising new debt (such as what he verified in Petrobras' case, concerning 2015's DFP) or changing the currency denomination of existing debt.

accounting treatment, proxies also present in our proposed models to test hedge accounting choice.

Valuing a firm with material foreign operations in the presence of exchange rate uncertainty requires information on the operating cash flows disaggregated by persistence and by currency, that is, the stock market response to exchange rate movements is sensitive to the relative magnitudes of revenues and costs denominated in foreign currency (AABO et al., 2015)<sup>6</sup> – precisely the case of Petrobras (see Section 1)<sup>7</sup>.

However, despite the existence of regulations requiring qualitative disclosures on foreign exchange risk management, major listed companies in the U.S. and the United Kingdom (UK) report less than 50% of available items of information in respect of strategy, policy and control, which indicates that companies’ managers still view said accounting information as “proprietary” (MARSHALL; WEETMAN, 2002).

Sabac et al. (2005) also argue that the effect of exchange rate movements on the net foreign currency operating cash flow has significant incremental explanatory power for returns, concluding that current General Accepted Accounting Principles (GAAP) disclosures are insufficient for valuing firms with operations in a foreign currency, highlighting the disclosure of revenues and costs by currency in the income statements as a relevant information to creditors and investors – we found difficulty to access this information regarding our sample firms to develop our models, so we used cash-flow data on exchange gains and losses instead.

Even upon implementation of SFAS 133, by examining the change in foreign currency exposure of U.S.-based multinationals, Richie et al. (2006) reported a significant decrease in exporting firms’ earnings predictability accompanied by a significant increase in earnings volatility, especially for those firms that are hedged using techniques other than operational hedges<sup>8 9</sup>.

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<sup>6</sup> Ito et al. (2016) have also investigated the relationship between Japanese firms’ exposure to exchange rate risk and their risk management, finding that firms with greater dependency on sales in foreign markets have greater foreign exchange exposure judged by the market, proposing that as higher the US\$ gross income share, the greater the foreign exchange exposure, which can be reduced by both financial and operational hedges.

<sup>7</sup> Makar and Huffman (2008) have analyzed the relationship between UK multinationals stocks returns and changes in the principal exchange rate to which each firm is most exposed, providing evidence that firms effectively use foreign currency derivatives and foreign-denominated debt to reduce currency risk associated with bilateral exchange rate to which they are most exposed.

<sup>8</sup> In the contrary sense, Krapl and Salyer (2017) analyzed the effects of fair value reporting (FVR) under SFAS 133 and IAS 39 on foreign exchange exposures of U.S. multinational firms, comparing nonfinancial multinationals with nonfinancial domestic companies in order to verify the foreign exchange exposure increase or decrease after the introduction of FVR, finding positive changes in the foreign exchange exposure information asymmetry.

<sup>9</sup> Tessema (2016) has also hypothesized that exchange rate risk exposure is lower after the implementation of SFAS 133, finding a significant decrease in exchange rate exposure in the post-SFAS 133 period for 92,393 firm-year observations.

That happens because unrealized gains/losses on foreign currency hedges are negatively related to one-year ahead stock returns, since firms do not fully hedge their underlying transactions, so investors are repeatedly surprised by firms under-hedging when said firms classify their hedges into earnings – and this under-reaction is due to incomplete disclosure of the underlying hedged transaction (MAKAR et al., 2013)<sup>10</sup>.

In conclusion, financial exposure to currency risk play an important role in firm's risk management and disclosure, and the information on the sensitivity of income and costs to foreign exchange rates, alongside with hedge instruments used to manage said risk, is very value relevant to analysts and investors, but as seen, prior research provides mixed evidence on whether the accounting standards on financial instruments have been efficient on enhancing reporting quality and reducing earnings volatility.

### **2.1.2. Hedge**

Hedge financial operations intend to ensure the neutrality of assets, liabilities and cash-flows subject to indexes such as exchange and interest rates and commodities prices, above all in emerging countries such as Brazil, with great instability periods, fast development of capital markets and increasing internationalization of local companies (LAMEIRA et al., 2005; LOPES et al., 2011).

Thus, hedge operations help companies on an efficient program for fund raising and investments, which are fundamental for their best performance (LOPES et al., 2011), deriving operations increasingly complex and large, carried out in any location where the financial intermediation takes place in safe and profitable levels in order to reduce inherent risks to such transactions (CAPELLETTO et al., 2007).

Corporate hedging is the use of off-balance-sheet instruments – forwards, futures, swaps, and options – to reduce volatility of firm value (NANCE et al. 1993), and one of the simplest ways to hedge risk is using the naive hedging strategy: to minimize exposure, an investor who is long in the spot market should sell a unit of futures today and buy the futures back when he sells the spot; then, if the spot and future prices both change by the same amount,

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<sup>10</sup> In the contrary sense, Bonetti et al. (2012) argued that upon IFRS 7 (Financial Instruments: Disclosures) implementation, the sensitive analysis on currency risk was informative for investors and has effectively lowered investor uncertainty about firms' exposure to currency risk, concluding that IFRS 7 adoption has entailed a decline in the trading volume sensitivity to currency risk - the same trading volume sensitivity decrease was reported by Linsmeier et al. (2002) upon SEC's Financial Reporting Release (FRR) No. 48 implementation.

the hedger's net position will be unchanged and he would have a perfect hedge (KRONER; SULTAN, 1993)<sup>11 12</sup>.

Smith and Stulz (1985) have already investigated (i) why do some firms hedge and others do not? (ii) Why do firms hedge some risks but not others? And (ii) why do some firms hedge their accounting risk exposure while others hedge their economic value, concluding that incentives exist within the contracting process to maximize the market value of the firm through reduction of expected (i) taxes, (ii) costs of financial distress, (iii) managerial risk aversion.

Mian (1996) has also investigated the determinants of corporate hedging decisions, finding robust evidence that larger firms are more likely to hedge, supporting the hypothesis that there are economies of scale in hedging and that information and transaction considerations have more influence on hedging activities than the cost of raising capital, so we included firm's size as a control variable in our models, in order to confirm this evidence.

Mian (1996) also concludes that hedging is uncorrelated with leverage and positively correlated with dividend yield and dividend payout, pointing out that profiles of currency-price risk hedgers differ systematically from interest-rate risk hedgers, since while the latter have higher leverage and longer debt maturities, the currency-rate risk hedgers have lower leverage and shorter debt maturities – we expect the opposite from our sample of Brazilian listed firms

Therefore, firms using a wider array of types of derivatives contracts and spreading out the amount invested in derivatives across several different derivative contracts exhibit less information risk and mispricing, so when they use derivatives, they experience a large reduction in the volatility of future returns, indicating that hedging decisions are partly motivated by the desire to reduce future income volatility (LIN et al., 2017), emphasizing the relevance of hedge accounting rules that disclose derivatives and hedged items simultaneously (GUAY, 1999).

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<sup>11</sup> For example, if the value of an American manufacturing firm that faces competition in its US markets from foreign manufacturers is inversely related to the value of dollar, it could employ off-balance-sheet instruments to hedge that exposure by (1) selling a forward contract on the foreign currency, (2) selling foreign exchange futures on the foreign currency, (3) entering into a currency swap in which it receives cash flows in dollars and pays cash flows in the foreign currency, (4) buying a put option on the foreign currency, or (5) writing a call option on the foreign currency (NANCE et al., 1993).

<sup>12</sup> Kanodia (2006) shows a very interesting and rather simple analysis regarding hedge operations and disclosure, considering an industry such as wheat farming, populated by a large number of farmers behaving as price takers. Farmers would commit resources to wheat planting on date 1, but the wheat is harvest and sold in a spot market nine months later, in the date 2, whose price is uncertain due to random shocks to wheat demand and production. Therefore, since farmers are risk averse and considering there is a futures market in wheat, farmers can hedge the spot price uncertainty and/or take speculative positions. So according to Kanodia (2006), futures price is informationally inefficient when farmers derivative positions are not disclosed, therefore the absence of hedge disclosures depresses the aggregate output of the industry, since individual firms are concerned only with their own individual payoffs and not with the aggregated phenomena, ratifying the relevance of accounting research on hedge disclosures.

Regarding foreign exchange derivatives, Bartram et al. (2009) have examined 7,319 companies in 50 countries including U.S., covering about 80% of global market nonfinancial firms, and concluded that derivatives use is significantly related to other important firm's financial characteristics such as leverage, debt maturity, holdings of liquid assets, dividends policy and operational hedges, and according to Aretz and Bartram (2010), for most nonfinancial firms the main objective of their risk-management activities consists of hedging foreign exchange rate (84% of US survey's derivatives users), highlighting the relevance of financial exposure to currency risk in our study.

According to Guay and Kothari (2003), however, even though the companies notice that the benefits of their programs with derivatives exceed costs, the derivatives are still a small part of the global risk management of large companies, showing the existence of wide space for their growth and thus for scientific research on hedge and on financial instruments disclosure.

### **2.1.3. Disclosure of hedge and financial instruments**

Prior research has already investigated the effects of hedge on information asymmetry (STICCA; NAKAO, 2013), agency costs (BEATTY et al., 2012), firm's conservatism (MARTIN; ROYCHOWDHURY, 2015; BALL et al., 2008), and accounting informativeness of earnings announcements (BATTA et al., 2016).

Specifically regarding disclosure, Lopes and Lima (2001) criticized the absence of an integrated ruling that comprehends all the specific derivatives aspects, as well as Amaral (2003), to whom the difficulty to frame derivatives accounting into traditional GAAP jeopardizes the full (voluntary) reporting in financial statements, so accounting users ignore the exact potential risks to what the firm is subjected to.

Prior research has also discussed the lack of qualitative data regarding risk exposure and risk management policy (COSTA JUNIOR, 2003; DARÓS; BORBA, 2005), even upon mandatory accounting standards (MURCIA; SANTOS, 2009; AMBROZINI, 2014; STICCA et al., 2017), finding evidence that only firm's size and profitability are associated to higher disclosures on derivatives instruments, due to the demand for more transparent accounting information to a bigger group of stakeholders and interested market financial analysts (MAPURUNGA et al., 2011).

Kanodia et al. (2000) has showed the social benefits to hedge accounting disclosures under the perspective of price efficiency in the futures market, since it provides valuable

information about firms' underlying risk exposures - without this information, the futures price market confounds information regarding firms' hedge-motivated trades with their speculative ones, making futures price inefficient, distorting the risk-sharing role of the futures market and thereby resulting in an increase in risk premiums.

Therefore, in the presence of hedge disclosures, the futures price appropriately informs production decisions in the whole industry, since considering the motivation to engage in hedge operations arises from the uncertainty in commodities price, an understanding of how producers manage such uncertainty through their hedging and production activities is essential to the debate regarding the economic consequences of hedge disclosures (KANODIA et al., 2000).

Still on the benefits of derivatives disclosure, Koonce et al. (2008) discuss whether management decisions to use them and the outcomes of those decisions affect investor's evaluations, arguing that investors infer that a decision to use a derivative that addresses an exposure of the firm implies that management took greater care in decision-making process than when a derivative was not used, even when the economic outcomes are negative.

When management describes and justifies the careful process used to make financing decisions, however, investors do not react to whether management used a derivative or not (KOONCE et al., 2008), ratifying that derivatives disclosure (hedge accounting) may be as important to investors and analysts as the protection of outstanding exposure itself (economic hedge), as proposed by Huguen (2010).

Chang et al. (2016), by investigating whether and how the complexity of derivatives influences analysts' earnings forecast properties, found evidence that said forecasts for new derivative users are less accurate and more dispersed after derivatives initiation, and the results do not appear to be driven by the economic characteristics of derivatives, but rather the financial reporting of such economic complexity, since despite their financial expertise, analysts routinely misjudge the earnings implications of firm's derivatives activity, and investors penalize firms with variance uncertainty (HEINLE; SMITH, 2017).

In this scenario, as discussed on Section 1, Brazilian accounting standards regarding the disclosure of derivatives and hedge with reference to IAS 39 were only released in 2009 (CPC 38), enforceable from 2010 on, so Brazilian firms were still on their "learning curve" when said statements were reviewed in accordance to IFRS 9, by means of the release of CPC 48, enforceable from 2018 on, hence we focused our study on a sample of Brazilian listed firms in the period between 2010 and 2017 to capture cash flow hedge accounting choice and its effects on OCI's balances, mainly the deferral of exchange losses.

### 2.1.3.1. Reporting under IAS 39 and SFAS 133

Mandatory disclosures regarding derivative instruments and hedging activities, on average, should decrease firm's market rate risk exposure, so after implementation of SFAS 133, firms should engage in more prudent risk-management activities to mitigate the potential cost of earnings volatility imposed by the standard (TESSEMA, 2016)<sup>13 14</sup>.

However, the controversy surrounding SFAS 133 adoption has centered on its effects on the volatility of reported income induced by marking to market firms' derivative positions (since such volatility would reflect the true economic state of the firm)<sup>15</sup>, thus considering derivatives create new risks that are poorly understood, providing information on the market value changes of firms' derivative positions will make firms' risks characteristics more transparent to investors (KANODIA, 2000).

Regarding earnings volatility, Beneda (2016) examined the information content of reported earnings under SFAS 133 and IAS 39 for firms that use hedge accounting vs. firms that do not, presenting a positive association between firms reported earnings, lower earnings volatility and firm value for firms that use hedge accounting, but not for other firms, claiming that the reduced earnings volatility and required disclosures associated with hedge accounting under both accounting standards are significant in increasing the transparency of earnings.

Zhang (2009), on the other hand, point out to the reduction of the speculative use of derivatives under SFAS 133, as the exposure to interest rate, foreign currency rate and commodities price drops significantly for the speculators and not for the hedgers upon the

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<sup>13</sup> Regarding IAS's adoption, Ashbaugh and Pincus (2001) have investigated whether the variation in accounting standards across national boundaries has an impact on the ability of financial analysts to forecast firms' earnings accurately, and whether analyst forecast accuracy changes after firms adopt IAS, concluding that prior to adopting IAS, the extend of differences in countries disclosure and measurement policies is positively associated with analysts' earnings forecast errors, which have decreased after IAS's adoption.

<sup>14</sup> Tessema (2016) also provides evidence that the decrease in market rate risk exposure is lower when the level of product market competition is higher, suggesting that new accounting standards have unintentionally forced firms in competitive industries to engage in significant risk-taking, so that more disclosure in risk-management may change the incentives to manage firm's risk in undesirable ways if firms face the threat of entry in their products markets.

<sup>15</sup> In this sense, Kanodia (2006) highlights that "under the new standard [SFAS 133], firms are required to account for derivatives as assets and liabilities and measure them at fair market value. Fluctuations in fair market value are recorded as gains or losses in the income statement (or comprehensive income). To the extent that derivatives are used as hedging instruments the gains or losses on derivatives are offset by corresponding gains or losses on the underlying assets, liabilities or future transactions whose cash flows are being hedged. However, [SFAS 133] ED 162-B allowed such offsets to be recorded only under very stringent verifiability conditions. These conditions were somewhat relaxed in response to industry pressure, but still exclude many genuine hedging activities such as cash flow hedges. Industry leaders point out that most derivatives transactions are used for hedging of external financial risks arising from interests rates, currency exchange rates, commodity and equity prices. They argued that the non-recognition of offsetting effects would lead to a significant increase in the volatility of reported income which is not reflective of the true risks undertaken by firms".

adoption of the accounting standard, because hedge accounting, by making the companies' exposure to risk transparent, turns hedge choice the "first best option" as a relationship without the presence of asymmetric information.

Hope (2003) ratifies that the usefulness of accounting standards enforcement, such as IAS 39 and SFAS 133, is greater in environments in which firms are allowed to choose among a larger set of accounting methods - such as the accounting for hedge operations<sup>16</sup>.

However, even though the use of hedge accounting seems to lower firm's earnings volatility, as per discussed by Zhang (2009), Glaum and Klöcker (2011), Beneda (2016), and Lin et al. (2017), it remains unclear the effects of earnings volatility on OCI, regarding the deferred gains and losses motivated by the cash flow hedge accounting choice.

Pirchegger (2006) has already analyzed the firm's incentives for using cash flow hedge accounting based on the agency theory, discussing the effects of two combined variables: (i) the benefits of practicing hedge compared to not doing so, and (ii) in the first case, the benefits of using hedge accounting instead of not using it, concluding that the companies will choose hedge accounting if, and only if, the benefits of the reduction of the exposure to risk are larger than the costs to do it, so since hedge accounting adds even more report costs to the company, financial operations accounting control would bring no benefit to the firm.

Focusing on Brazilian listed firms, more recently Potin et al. (2016) have investigated the effects of hedge accounting on information quality, financial instruments disclosure and information asymmetry, finding a negative interaction between the use of hedge accounting and the equity's value relevance, a positive interaction between hedge accounting and net income's value relevance, and a negative influence of hedge accounting on net income informative characteristic.

As conclusion, Potin et al. (2016) have conjectured that the Brazilian market may be interpreting hedge accounting as an *earnings management* mechanism instead of a risk management solution, whose statistical evidences we expected to find in our research.

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<sup>16</sup> "The fundamental problem in accounting for hedging relationships is that two transactions, the hedged item and the hedging instrument, are economically linked to each other. With hedging, changes in the value (or in the cash flows) of the hedged item will be compensated by reciprocal changes in the hedging instrument. If general accounting principles are applied, the two transactions have to be measured on an item-by-item basis. Under the current set of recognition and measurement rules the offsetting gains and losses are often recognised in different periods. Also, the hedging instrument is usually a derivative financial instrument and must therefore be recognised at fair value through profit or loss. The hedged item, on the other hand, will often be accounted for differently ('mixed measurement model'). It may be measured at cost or at fair value through other comprehensive income, or it may not be recognised at all if the company hedges risks associated with forecast transactions. Such 'accounting mismatches' lead to economically unjustified earnings volatility. To avoid these problems, IAS 39 provides two methods of hedge accounting, fair value and cash flow hedge accounting, as exceptions to the general accounting rules" (GLAUM; KLÖCKER, 2011).

### 2.1.3.2. Reporting under IFRS 9

Our sample period embraces the years of 2010-2017, thus our hypotheses, models and results regarding hedge accounting choice must be restricted to IAS 39's and CPC 38's dispositions. However, since IFRS 9 (CPC 48 in Brazil) has substituted IAS 39 for periods started on 2018, we have also analyzed the implications of the new standard to our study's conclusion.

In this scenario, Hoang and Ruckes (2017) point out that standard setters move increasingly toward further disclosure to add transparency on a firm's risk management practices, mentioning the publication of IFRS 9 on July 2014 to replace IAS 39, which may further increase the information provided to users of financial statements.

IFRS adoption's primary objectives are to enhance reporting quality and to improve the comparability of financial statements across countries, concluding, though, that research into effects of IFRS adoption on contracting, stewardship, decision-making and auditing is still in its infancy, since very few studies in this area have been published (DE GEORGE et al., 2016)<sup>17</sup>.

In this context, IFRS 9 was indeed developed to reduce complexity in accounting for financial instruments under its precedent, IAS 39, which has been very criticized by users for its unclear and inconsistent rationale for classifying and measuring financial instruments: IAS 39 brought four categories for classification of debt instruments, while IFRS 9 comprehends three measurement categories, and classification and measurement depends on the business model and contractual cash flow characteristics of the financial assets, being considered more "principle-based" than IAS 39 (PETCHCHEDCHOO; DUANGPLOY, 2017)<sup>18</sup>.

Petchchedchoo and Duangploy (2017) ratifies that IAS 39 is considered rule-based, complex and inconsistent between financial and nonfinancial items, whilst IFRS 9 develops a new model, enabling firms to better reflect their risk management activities in their financial statements - IFRS 9 still considers hedge accounting as *optional*, but it widens the choices of

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<sup>17</sup> Overall, "although the literature is making progress, research conducted across a variety of dimensions is required before researchers can claim to have a decent understanding of the mechanisms based on which IFRS affect the various facet of business" (DE GEORGE et al., 2016).

<sup>18</sup> Classification categories for financial assets under IAS 39 are held-to-maturity, loans and receivables, fair value through profit and loss (FVTPL) and AFS. These were replaced in IFRS 9 with categories that focus on the assets' measurement, namely amortized cost, fair value through other comprehensive income (FVOCI) and FVTPL, therefore based on the contractual cash flow characteristics and the firm's business model.

hedging instruments, as well as simplifies hedge accounting and makes it easier to apply with much flexibility and yet more judgment exercised<sup>19</sup>.

As main innovations, IFRS 9 allows entities to designate non-derivative financial assets and liabilities (accounted for as FVTPL) as hedging instruments, including a sort of instruments to be classified as hedged items, which would not have been qualified under IAS 39, such as future contracts.

On the other hand, FVTOCI investments in equity under IFRS 9 refer to instruments not held for trade, whose fair value change could be attributed to foreign exchange risk or equity price risk exposure and whose changes in the hedging instrument's fair value are also accounted for in OCI, differently from IAS 39 (PETCHCHEDCHOO; DUANGPLOY, 2017).

Onali and Ginesti (2014) have already investigated the market reaction to IFRS 9's pre-adoption in European listed firms and have found an overall positive reaction to its introduction, particularly beneficial to shareholders of firms in countries with weaker rule of law and a smaller divergence between local GAAP and IAS 39, so investors perceive IFRS 9 as shareholder-wealth enhancing and are confident with its ability to address the problems inherent to IAS 39 implementation, supporting that stronger comparability across accounting standards is beneficial to international investors, and outweighs the costs of poorer firm-specific information.

Onali et al. (2017) have also concluded that IFRS 9 adoption is largely affected by firm-specific factors associated with information quality and information asymmetry – in particular, lower information asymmetry and higher information quality have a positive effect on market-adjusted returns -, providing empirical evidence that, contrary to a quite common view, IFRS adoption may not improve accounting quality for firms with low liquidity and high information asymmetry (i.e. small firms with concentrated ownership structure).

Therefore, since under CPC 48 (and IFRS 9) cash flow hedge accounting remains an *accounting choice* for firms, with some developments if compared to the revoked standards (CPC 38 and IAS 39), even though our study has targeted the 2010-2017 period in Brazil, we would expect little change in our hypotheses and results from 2018 on – on the contrary, since IFRS 9 is more flexible than IAS 39 (PETCHCHEDCHOO; DUANGPLOY, 2017; ONALI;

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<sup>19</sup> IFRS 9 has maintained the current three types of hedging relationships: (a) Fair Value Hedge; (b) Cash flow Hedge; and (c) Net Investment Hedge; and hedge effectiveness is still measured in IFRS 9 with inefficiencies recognized in profit or loss and documentation is still required to be maintained - both IAS 39 and IFRS 9 require formal documentation on the economic relationship between the hedged item and the hedging instrument, as well as on firm's risk management objective and strategy. Notwithstanding, IFRS 9 does not require the 80%/125% range to prove hedge effectiveness and only requires prospective assessment.

GINESTI, 2014), we expect more Brazilian listed companies to engage in hedge accounting choice from 2018 on.

#### **2.1.4. OCI's characteristics**

Considering our study's interest on deferred exchange losses generated by cash flow hedge accounting, OCI becomes an important proxy for hedge accounting study, an accrual that according Khan and Bradbury (2016) is, on average, more volatile than earnings and presents as main adjustments asset revaluations, foreign currency translations and cash flow hedges, and few adjustments for available-for-sale securities and employee pension benefits.

Chambers et al. (2007), however, provide evidence in the post-SFAS 130 period that OCI is priced based on a dollar-for-dollar basis as it is predicted by theory for transitory income items, documenting that investors price mainly two OCI's components, foreign currency translation adjustment and unrealized gains/losses on available-for-sale securities, not finding significant evidence on cash flow hedge adjustments.

Hughen (2010) has examined the behavior of firms followed by accounting treatment alteration of the hedge derivatives due to second disclosure of financial statements (resulting from errors in the deployment of hedge accounting)<sup>20</sup> and concluded that hedge accounting is beneficial to the investors, as it enables the earnings volatility reductions associated to FVR, which would have been used by managers aiming to reduce the firm's risk and, consequently, to maintain the abilities of target beating.

In the same sense, Antônio et al. (2018) have analyzed derivatives users and non-users in Brazil in the 2006-2014 period and have concluded that analysts' earnings per share (EPS) forecasts errors are larger for companies that do not use derivatives financial instruments, suggesting that for companies adopting IFRS analysts are able to include different types of derivatives in their forecasts, predicting earnings smoothing behavior.

However, despite Hughen's (2010) and Antônio et al.'s (2018) conclusions, the investors and analysts do not seem to benefit with hedge accounting and mainly OCI's deferred values, supporting our study's hypothesis in the sense that the use of cash flow hedge accounting is leading accounting information users to error, jeopardizing the objectivity aimed

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<sup>20</sup> Firms would choose between maintaining the stability of the economic gains (but increasing the volatility of accounting earnings) or maintaining the stability of the accounting earnings (and experiencing increase in the volatility of the company's economical earnings), concluding that the historical ability of companies in earnings target beating is positively associated to the probability to replace economic gains for accounting ones, due to the hedge accounting deferral in OCI.

by accounting principles with the use of a uniform current cost measure (LOPES; LIMA, 2001) and not allowing an outsider to infer the firm's financial position if the firm is less than entirely hedge (GIGLER et al., 2007).

In this same sense, Lim et al. (2013) have analyzed the accounting choice behind the retroactive reclassification of financial assets that were measured at fair value (and thus accounted for in OCI) to amortized costs by banks under IAS 39<sup>21</sup>, which would potentially avoid recognizing the unrealized fair value losses and thereby increase its income and regulatory capital during market downturn, and have identified that reclassification choice reduced analyst earnings forecast accuracy and increased forecast dispersion one year following the reclassification.

Campbell et al. (2015) have also analyzed the investors' and market analysts' behavior regarding unrealized losses in OCI due to firms' cash flow hedge, since even though previous studies have showed that they are directly associated with future gains, the expectations of the investors and analyst do not seem to anticipate this association, as:

- (i) the analysts do not properly incorporate unrealized cash flow hedge gains and losses in the estimate from 2 to 3 years ahead;
- (ii) the analysts correct their prediction errors only long time after the hedge has expired, occasion in which the investors promote the price correction; and,
- (iii) the analysts and investors may better process information about cash flow hedge when the managers choose to disclose and provide internal predictions (voluntary disclosure).

Therefore, the disclosure of cash flow hedge is incomplete and costly for users to process, as they (i) are presented in a disaggregated and inconsistent manner in several explanatory notes, (ii) fail in specify when the hedge will be reclassified into the income statement, and (iii) fail to demonstrate the alterations in the market value of the hedged transactions and items (CAMPBELL et al., 2015).

In this context, both SEC and FASB have positioned in the sense that the investors may not be fully assimilating the implications of unrealized gains and losses of the cash flow

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<sup>21</sup> "Given the discretion in non-derivative financial asset reporting afforded by the amendment to IAS 39, a question of interest is whether banks use its discretion to unbiasedly communicate the assessment of their ability and intention to hold such assets for the foreseeable future or to accomplish their earnings and capital management objectives. If banks faithfully communicate such information, then reclassification of their non-derivative financial assets following the amendment should benefit users of financial statements in assessing the future performance of banks. Alternatively, if banks distort this information to accomplish other objectives (such as capital or earnings management), then the reclassification of financial assets adds noise to the information available to users of financial statements" (LIM et al., 2013).

hedges in the company's shares prices, so even the most sophisticated investors<sup>22</sup> fail to incorporate OCI's information regarding cash flow hedge in their company's profitability forecasts, reason why FASB is currently debating OCI's disclosure, considering that investors could benefit of an improved manner of disclosure firm's cash flow hedges (CAMPBELL et al., 2015).

In addition, Campbell (2015) points out the existence of little evidence on whether cash flow hedge disclosures are useful in predicting firm's probability or on how investors price this information, since prior literature generally concludes that OCI's components are positively associated with profitability and firm's value, but in contrast, he concludes that current period unrealized cash flow hedge gains/losses are negatively associated with future profitability and firm's value, indicating that cash flow hedge has fundamentally different persistence and valuation implications than other OCI's components, explaining why prior studies have difficulty in interpreting the value relevance of OCI and why managers prefer not to report OCI on the face of income statements.

Campbell (2015) also concluded that the only component of OCI related to one-or-two-year ahead stock returns is unrealized cash flow hedge gain/losses, thus this component is unique, in that the complexity of these transactions and the complexity and incompleteness of their related disclosures result in investors under-reaction at the disclosure date, as they do not immediately price the implications of unrealized cash flow hedge gains/losses, again accordingly to our study's main assumptions and hypotheses.

In the same sense, Bratten et al. (2016) have examined whether fair value adjustments included in OCI predict future bank performance, finding that they can predict earnings both 1 and 2 years ahead; however, while net unrealized gains and losses on available-for-sale (AFS) securities are positively associated with future earnings, net unrealized gains and losses on derivative contracts classified as cash flow hedge are negatively associated with future earnings, the same association we expect to verify in our study's models.

That is, despite OCI's items being often considered to be transitory - both FASB and IASB view the lack of persistence as a key OCI's characteristic to support the bypassing the income statements - Easton and Zhang (2017) showed that a significant portion of OCI, namely unrealized gains and losses from available-for-sale (AFS) debt securities, is non-transitory, so

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<sup>22</sup> Kalay (2015) define "sophisticated investors" as investors who devote more time and attention to their investments and are more proficient in analyzing investment-related information. Differences in sophistication can arise from heterogeneity in investors' opportunity cost of time and in their ability to acquire and analyze information.

the mixing of historic cost and fair value accounting leads to market mispricing of stocks, ratifying Collins and Hribar (2000) conclusions that the market systematically overprices (underprices) the accrual (cash flow) component of earnings.

In summary, one would argue that the transitory characteristic of OCI's balances generated by cash flow hedge accounting should not be a research problem since it enhances the timeliness of gains and losses in the income statements, but as demonstrated by prior research, much on the contrary, OCI's balances are not being duly understood by investors and analysts, even the sophisticated ones, and their ability to predict future earnings is proved to be questionable, leading to firm's mispricing and thus opening space to earnings management activity, as proposed by us in our study's overall hypotheses.

### **2.1.5. Hypothesis 1's statement**

Facing the prior research on the effects of firm's financial exposure to currency risk and the influence of the volatile exchange rate environment in the company's earnings reporting, as well as on the disclosure of derivatives and hedge instruments and its effects on OCI's balances, discussed on this Section 2.1, we formulate our primary hypothesis ( $H_1$ ):

*$H_1$  – Firm's high financial exposure to currency risks and the high exchange rate depreciation environment result in the deferral of exchange losses on firm's OCI.*

By testing  $H_1$  we expect to find significant evidence that the volatile environment Brazilian listed firms are inserted lead them to account for deferred losses in OCI derived from exchange rate variation on debts written in foreign currency, which consequently implies that firm's effective earnings in the sample period (2010-2017) have been misrepresented, indicating potential earnings management behavior and leading investors and analysts to misprice firm's actual earnings.

However, according to prior research (CHAMBERS et al., 2007; KHAN; BRADBURY, 2016), OCI's balances may be affected by other accounting choices and standards aside cash flow hedge accounting, so if we confirm  $H_1$ , we need to move forward toward our main objective, that is, to prove that OCI's losses deferral is mainly motivated by loss avoidance and earnings management activities, through hedge accounting choice.

## 2.2. Loss avoidance, earnings management and accounting choice

### 2.2.1. Loss avoidance

Timely financial reporting is costly: at the country level there are costs of developing and operating complex institutions such as independent audit professions, independent and effective judicial systems to enforce securities contracts and laws and various monitoring mechanisms (analysts, ratings agencies, short sellers, press), and in the company level there are costs of installing and operating information systems and accounting controls, as well as management and board time and internal and external auditing, so under the existence of considerable discretion on gain and loss accruals, managers cannot be expected to exercise discretion only in the interests of financial-statement users. (RYAN, 2012).

Prior research<sup>23</sup> has already pointed out that managers report losses mainly due to reputation and target-beating, so companies would engage in accounting choices that provides the avoidance of accounting losses in order to disclose better results to investors and analysts.

Accounting income, and losses in particular, are relevant in determining security valuations, bankruptcy probabilities and abandonment options, as well as accounting earnings and losses are inputs in contracting, shareholders litigations, dividend policy, market listing standards and regulatory inquiries, so by improving the understanding of how losses are generated, users and practitioners can better interpret the meaning of accounting losses (KLEIN; MARQUARDT, 2006).

In this sense, Roychowdhury (2006) already found evidence consistent with managers manipulating real activities to meet annual analysts' forecasts and mainly to avoid reporting annual losses, such as price discounts to temporarily increase sales, overproduction to report lower costs of goods sold (COGS) and reduction of discretionary expenditures – and the presence of debt was proved to be positively associated with real activities manipulation.

Regarding reported losses on derivatives, Gigler et al. (2007) have argued that the application of mark-to-market accounting creates a mixed-attribute problem<sup>24</sup>: for instance,

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<sup>23</sup> Despite Li (2011) argues that loss persistence is underestimated by investors, who do not penalize loss firms sufficiently for their poor performance and do not fully distinguish the differences in loss persistence (instead appear to assume that all losses are transitory), the author highlights that in general loss avoidance is important to managers (DE GEORGE et al., 1999 apud LI, 2011; GRAHAM et al., 2005) and is rewarded by investors (BROWN; CAYLOR, 2005 apud LI, 2011).

<sup>24</sup> Whereby some items are marked to market, while others are carried at their historical cost. Gigler et al. (2007) also points out an example where this mixed-attribute problem arises: the application of SFAS 133 to cash flow

when a derivative position being used as hedge is marked to market but the item creating exposure is unaccounted for, it is unclear how outsiders would interpret any reported gains or losses on the derivatives in assessing a firm's financial viability.

Chung et al. (2012) have also examined how investors respond to a new announcement about derivative-related losses when relevant information necessary to fully assess the impact of such losses on the firm's overall profitability is not available until a later date, concluding that incomplete disclosure actually exacerbates, rather than mitigates, investors' mispricing of derivative-related losses.

In addition, Chung et al. (2012) argue that to properly price derivative-related losses, investors need to differentiate "over-hedged" firms from "non-over-hedged" ones, because only those losses in excess of offsetting gains from underlying assets denominated in a foreign currency adversely affect overall profitability, since such losses should be offset by corresponding gains from those contracts or assets, also highlighting the "mixed-attribute" of cash flow hedge accounting.

In summary, under hedge accounting choice the hedged item is not promptly identified in the firm's financial statement and it is not clear the exact moment when OCI's deferred items are going to be reverted, so the deferral of losses may mislead analysts, investors and other accounting information users (CHOI et al., 2015), therefore firms may be more concerned about managing overall earnings volatility risk to some benchmark level by using trading-off alternative earnings management tools, such as smoothing mechanisms (PINCUS; RAJGOPAL, 2002), to avoid the reporting of losses.

### **2.2.2. Earnings management**

Regarding the incentives for discretionary accounting practices, whose factors are commonly established through agency theory and political costs theory, in general, managers exercise discretion when choosing from alternative depreciation methods, inventory-costing methods, or pension plan actuarial assumptions, so managers' selection will obviously influence the level of firm's reported earnings (LAMM-TENNANT; ROLLINS et al., 1994).

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hedges, since while the gains or losses arising from price fluctuations on the derivative are reported in income (or OCI), any change in value of the forecasted transaction is not recognized until its realization in the future. However, the study's findings have pointed out that even though mark to market firms report a large loss on derivatives, outsiders rationally undo the reported loss and overestimate the financial condition of the firm by more than they do in a historical cost regime, so the reporting of an impending derivative loss by a distressed firm can actually lead outsiders to infer that the firm is in a better financial position than what they would have inferred under the silence associated with historical cost accounting (GIGLER et al., 2007).

In this scenario, Lamm-Tennant and Rollins (1994) have pointed out as major area for accounting choice studies the timing and recognition of realized gains and losses, arguing that an income-smoothing test would be an alternative approach since accounting choice may be used to reduce earnings fluctuations rather than to maximize or minimize reported earnings, an expectation that also guides our study's hypotheses.

Dechow et al. (1995), on the other hand, have argued that earnings manipulations are primarily attributable to accruals that reverse in the year following, concluding that the power of models for detecting earnings management is relatively low regarding economically plausible magnitudes, so future research that develops models that generate better specified and more powerful tests will further enhance the ability to detect earnings management, which we expect to accomplish with our models.

Sloan (1996), however, argues that the persistence of earnings performance is shown to depend on the relative magnitudes of the cash and accrual components of earnings, and questions the extent to which the lower persistence of earnings performance attributable to the accrual component of earnings is due to earnings management.

In the same line, Roychowdhury (2006) criticizes the drawing of inferences on earnings management by analyzing only accruals, pointing to future research on alternative methods for earnings managements besides operational decisions and accruals management, the same as Kothari (2001), who claimed for better models of discretionary accruals and better tests on accounting research for capital markets, highlighting the relevance of our study's models.

Graham et al. (2005) have surveyed financial executives in order to determine the key factors that drive decisions related to reported earnings and have concluded that because of the severe market reaction to missing earnings target (viewed by firms as the key metrics for outsiders, even more than cash flows), firms are willing to sacrifice economic value in order to meet a short-run earnings target<sup>25</sup> - the so-called "earnings smoothing", preferred by 78% of the surveyed executives.

In this scenario, Guthrie et al. (2011) have evaluated, in the context of an accounting choice provided by SFAS 159 (The Fair value Option for Financial Assets and Financial Liabilities), the extent of opportunistic election of the fair value option in order to manage current earnings and future earnings, suggesting that earnings management is a plausible

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<sup>25</sup> The authors point out in their study's conclusions that managers want to meet or beat earnings benchmarks to (i) build credibility with the capital market; (ii) maintain or increase stock price; (iii) improve the external reputation of the management team; and (iv) convey future growth prospects (GRAHAM et al., 2005).

explanation for only a small number of individual firms, so “one avenue for future research is to further investigate the election of financial instruments from a valuation perspective”.

Regarding derivatives use, Barton (2001) has examined its effects on earnings management behavior, affirming that managers can use derivatives to reduce the volatilities of earnings and cash flow arising from changes in foreign exchange rate and other risk factors, suggesting that derivatives lessen their incentive to reduce earnings volatility through regular earnings management devices, so managers do use them as partial substitutes to smooth earnings and to reduce agency costs, income taxes and information asymmetry.

Choi et al. (2015) have also investigated the effects of SFAS 133 in the companies' earnings management upon the use of derivatives for hedging purposes, concluding that the use of derivatives with the purpose of hedge became less effective for earnings smoothing, first due to the strict rules for documenting the risk management strategy and the effectiveness of hedge, reducing the flexibility and the discretion of the managers, second because firms could reduce the volatility of the earnings through the management of income recognition timeliness, which under SFAS 133 ceased being possible.

Choi et al.'s (2015) assumptions seem to be opposite to our study's hypotheses, but we must consider (a) the effects of CPC 38 (CPC 48 from 2018 on) on Brazilian listed firms regarding hedge accounting documentation, as well as (b) SFAS 133's accounting choice regarding cash flow hedge, which seems to be the most relevant in terms of earnings management activities for managers and firms engaged in hedge accounting as a whole.

In this scenario, Dechow et al. (2010) address two relevant questions regarding empirical studies on earnings smoothing: does the smoothness of firm's earnings reflects variation in informativeness about fundamental performance? And, most important, when managers have accounting choices that can influence smoothness, such as cash flow hedge accounting, do they make choices that result in greater earnings smoothness?

Regarding the first question we found in prior research mixed-evidence on whether earnings smoothing affects performance informativeness, being positively, such as in Hughen (2010) and Antônio et al. (2018), being negatively, such as in Gigler et al. (2007), Campbell (2015) and Campbell et al. (2015). Hence, besides addressing the first question in our model, in the following topic we discuss probable answers to Dechow et al.'s (2010) second query on hedge accounting choice determinants, among which we believe loss avoidance (earnings management) is considered.

### 2.2.3. Accounting choice

Fields et al. (2001) define “accounting choice” as any decision whose primary purpose is to influence (whether in form or substance) the output of an accounting system through private means, including not only financial statements published according to GAAP, but also fiscal statements and regulatory registries<sup>26</sup>.

Such choices, according to Fields et al. (2001), besides increasing consistency and comparability problems, are also used by managers for their own benefit, for managing earnings and consequently shares prices, forcing contracting parties and regulating bodies to promote optimal reduction of the discretion level of the disclosure of accounting information - even though past works have verified that accounting choices may not affect or affect little the shares prices.

In this context, Bartov and Bodnar (1996) have stated that a fundamental question in accounting research is how accounting choices are made by managers, pointing out that value-maximizing managers have incentives to choose more informative accounting techniques to reduce the degree of information asymmetry among market participants.

However, improved disclosure by the firm is also associated with costs, such as preparation and proprietary ones (BARTOV; BODNAR, 1996), thus the equation is only valid where the expected benefit of additional disclosure is offset by the expected costs of making said disclosure.

Dechow et al. (2010) also argues that when making choices that affect reported earnings, a manager’s objective function can include multiple, and perhaps competing objectives, which could be related to compensation or debt contract provisions, litigation risk, proprietary costs, or incentives to influence stock price. For that matter, managers choose a set (or portfolio) of accounting choices, not just one, that determine earnings, which suggests that they might have flexibility to tailor individual elements of the set to different objectives (DECHOW et al., 2010).

Regarding hedge accounting choice, Demarzo and Duffie (1995) have anticipated that hedge improves informativeness of corporate earnings as a signal of management ability and

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<sup>26</sup> Fields et al. (2001) also discuss the importance of imperfect and incomplete markets, as in those complete and perfect there is no relevance for financial disclosures and there is no demand for accounting and regulation, classifying the previously mentioned imperfections in:

- (i) contracting - accounting choices suffer influence from one or more firm’s contract arrangements (efficient contract perspective);
- (ii) information asymmetry - accounting choices and their influence in shares prices; and,
- (iii) externality - influence of regulators in accounting choices.

projects quality by eliminating extraneous noise, showing that managers and shareholders incentives depend on the accounting information made available by the firm. In addition, alternative accounting standards can substantially affect equilibrium hedging and the information effect of hedging implies that hedging policy can have a real effect on the firm's value, so standard hedge accounting can improve firm's future investment decisions (DEMARZO; DUFFIE, 1995)<sup>27</sup>.

Gietzmann and Ireland (2005) have also analyzed firms' accounting choices in correlation with strategic disclosures, arguing that accounting choice is a novel variable that recent theory suggests may interact with both cost of capital and timely disclosure, the latter being determinant for lower companies' cost of capital, concluding that there is a significant, positive relationship between accounting choice and cost of capital, that is, the higher the discretion, the higher the firm's cost of capital.

Melumad et al. (1999), on the other hand, have analyzed whether the hedge accounting methods prescribed by SFAS 133 influence the manager's hedge decision, showing that under no-hedge accounting, the hedge choice is different from the optimal economic hedge the firm would make under symmetric and public information<sup>28</sup>, also ratifying our study's hypotheses.

Lins et al. (2011), on the other hand, examined the impact of fair value reporting (FVR) on firm's risk management policies, finding evidence that firms are more likely to be affected if they seek to use risk management to reduce the volatility of earnings relative to cash flows and if they operate in countries where accounting numbers are more likely to be use in contracting, such as we expect to verify in Brazil.

In the same line, Chen et al. (2013) discuss whether FVR affects managers hedging decisions in the context of derivatives, arguing that this is an area where the use and alleged benefits and costs of fair value accounting have been especially controversial and the economic consequences of any distortion of managerial decisions (e.g., not engage a hedge position despite economic good reasons) can be significant, since managers likely consider both economic and accounting factors when they make hedging decisions<sup>29</sup>.

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<sup>27</sup> That is, under full disclosure, hedge positions have real effects primarily to the extent that they act as a signal and reveal private information known to the manager; alternatively, if hedge positions are not disclosed as per standard hedge accounting, hedging has a more direct impact on the riskiness of firm's profits (DEMARZO; DUFFIE, 1995).

<sup>28</sup> According to the authors, an asset's price at any point of time is a public information, but information on the asset's quantity and mainly the hedge instrument chosen by the firm can be conveyed only through earnings disclosure, so long-term shareholders prefer fair-value accounting, while short-term shareholders may prefer either fair-value hedge accounting or no-hedge accounting at all (MELUMAD et al. 1999).

<sup>29</sup> Chen et al. (2013) ratifies Hughen (2010) when point out that hedging with appropriate derivative instruments can reduce firm's risk exposure – an economically desirable outcome. The authors set an example where a manager expects to purchase oil in the future and forecasts that oil price will increase, so the manager wants to lock in an

Chen et al. (2013) conclusions are relevant since they found evidence that managers are more likely to forgo an economically desirable hedging opportunity when both the economic impact and the FVR impact information is disclosed than when only the economic impact information is presented, ratifying Hughen's (2010) findings regarding the undesirable volatility generated by hedge accounting to managers, mainly under SFAS 133 and IAS 39.

Chen et al. (2014), on the other hand, found empirical evidence that the magnitude of hedging-purpose derivatives usage is positively associated with the better internal corporate governance, but negatively associated with the enforcement of accounting standards related to hedge accounting disclosure, due to complexity and mainly costs derived from such reporting (CHEN et al., 2014), ratifying the abovementioned conclusions.

Hedge accounting choice determinants were also discussed by Guerra and Galdi (2009), Stent et al. (2017), Hoang and Ruckes (2017), and Pereira et al. (2017), providing significant and positive statistic correlation between the adoption of hedge accounting and firms' size and long term debt, since said characteristics may affect the company's choice to engage in hedge operations and to disclose them under hedge accounting rules.

Glaum and Klöcker (2011), however, by analyzing the application of hedge accounting and its influence on hedging behavior in German and Swiss nonfinancial corporations, have concluded that the accounting rules influence company's hedging behavior, and not the opposite – their paper's title (“when the tail wags the dog”) seems to be an open critic to this behavior<sup>30</sup>.

As result, Glaum and Klöcker (2011) have verified that more than 90% of sampled companies use derivatives to hedge financial risks, whilst only 72% of those companies apply hedge accounting, suggesting that hedge accounting rules do indeed influence the hedging behavior of many nonfinancial companies (some even reported that accounting fully determines

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agreed-upon purchase price, entering into a derivative contract to achieve such goal. If the manager does not hedge the price risk, he/she would have to purchase the oil at a future market and will be subjected to volatility, so hedging benefits increase with increasing volatility of the hedged item. However, reporting derivatives using FVR may result in additional earnings volatility on the financial statements, which would probably ponder manager's benefit of engaging in hedging activities, since reporting volatile earnings might be considered undesirable (CHEN et al., 2013).

<sup>30</sup> The authors have summarized very clearly the “dilemma” to be faced by firms and managers regarding hedge accounting's choice: “Given the standard's restrictive and rigid rules, companies can either implement the risk management strategies they consider economically optimal, forgo hedge accounting and accept earnings volatility, or apply hedge accounting to reduce earnings volatility, but accept sub-optimal risk management strategies. In both cases, firm value is likely to suffer” (GLAUM; KLÖCKER, 2011).

it), mainly amongst those with higher leverage, more dispersed ownership and which pursue selective and profit-oriented hedging policies.

In this context, we found in prior research disaggregated evidence on the determinants of disclosure of financial exposure to currency risk, of derivatives and hedge, of OCI, as well as of accounting choices and earnings management behavior, so we proposed to add as determinants of hedge accounting choice the financial exposure to currency risk and the volatile environment concerning exchange rates, whose effects in OCI's balances were already addressed and tested in our study's  $H_1$ .

#### **2.2.4. Hypothesis 2's statement**

Prior research on earnings management and accounting choice discussed on this Section 2.2 have already conveyed evidence on hedge accounting determinants (GUERRA; GALDI, 2009; STENT et al., 2017; HOANG; RUCKES, 2017; PEREIRA et al., 2017). We, however, investigate whether the accounting choice on the adoption of hedge accounting in Brazil, more precisely concerning cash flow hedge for debt transactions in foreign currency, is motivated by the high financial exposure to currency risk coordinated with high depreciation of exchange rates, which leads us to our second hypothesis ( $H_2$ ):

*$H_2$  – Firm's high financial exposure to currency risks and the high exchange rate depreciation environment result in firm's choice for cash flow hedge accounting.*

By testing  $H_2$  we expect to find evidence that cash flow hedge accounting choice may have been used by Brazilian listed firms as an earnings management tool, aiming to avoid losses derived from debts written in foreign currency, which have been accounted for in OCI, since Brazil has experimented a great BRL depreciation in the sample period (2010-2017) as per already demonstrated by Graphic 1 and Graphic 2, whilst strong currencies such as US\$ and Euro remained more stable (Graphic 3).

However, aside a volatile exchange rate environment, Brazil also holds some other relevant specificities regarding exchange gains and losses, such as the choice regarding the deferral (or not) of tax levy on such gains and losses, which might represent firm's tax aggressiveness behavior and, combined with hedge accounting choice, also earnings management activity.

## **2.3. Tax-driven choice, tax aggressiveness and tax deferral on exchange gains/losses**

### **2.3.1. Tax-driven choice and tax aggressiveness**

Aggressive financial reporting is upward earnings management that may or may not be within the confines of GAAP and aggressive tax reporting manipulation of taxable income through tax planning that may or may not be considered fraudulent tax evasion, so understanding the extent to which financial and tax reporting aggressiveness are positively related is important to both Internal Revenue Service (IRS) and SEC, which incur in additional costs to prevent loss of tax revenue and to ensure the quality of earnings, respectively (FRANK et al., 2009).

In this scenario, Frank et al. (2009) found a strong, positive relation between financial and tax reporting aggressiveness, suggesting that insufficient costs to offset basic financial and tax reporting incentives, such as nonconformity between financial accounting standards and tax law, allow firms to manage book income upward and taxable income downward in the same reporting period. In addition, investors do not fully incorporate the information in discretionary accruals into stock price (FRANK et al., 2009), consistent with Campbell's (2015) findings and with our study's hypotheses.

Most recently, Lennox et al. (2013) have found the opposite results by analyzing U.S. public firms during the 1981-2001 period: tax aggressive firms are less apt to fraudulently manipulate their financial statements, as well as fraud firms are less tax aggressive. Committing fraud reduces the benefit from undertaking aggressive tax positions under one perspective because it is hard to report high book incomes when reporting low taxable incomes, since this would call the attention of tax authorities (LENNOX et al. 2013).

In Brazil, aside fraudulent tax behavior, we expect to find positive relationship between financial aggressiveness (loss avoidance through hedge accounting choice) and tax aggressiveness, that is, choices provided by law that would avoid volatile taxable income regarding financial exposure to foreign currency exchange rate.

Mian (1996), on tax determinants of hedging, has already argued that in addition to progressivity in the tax schedule (as per analyzed by Nance et al., 1993), which would apply to a very narrow range of pre-tax income, other aspects of the corporate tax structure can also influence hedging decision, such as tax shields (tax loss carry-forwards and foreign tax credits).

In addition, Lamm-Tennant and Rollins (1994) have also tested a tax-based variable regarding to accounting choices derived from tax legislation, more precisely, the "fresh-start"

option for insurers in the calculation of their tax provision for GAAP purposes, concerning the deduction for the increase in policy reserves - Dechow et al. (2010) also point out tax regulations as a determinant of earnings quality, affecting the firm's accounting choices.

Graham and Smith Jr. (1999) have presented a measure for convexity in corporate tax functions in order to provide more precise estimates of the potential tax savings arising from hedging, concluding that although in extreme cases the savings appear substantial, for approximately 75% of the studied firms there is little tax-based incentives to hedge – we expect the opposite in our study's sample firms.

Prior research has also concluded that tax rate depresses the firm's hedging motives, so in response to an increase in the tax rate the firm not only trades less actively in futures markets, but also the trading volume fluctuates more (LIEN; METZ, 2001), but firms' incentive to use hedge as means of increasing financial expenses is positively related to the marginal rate of the income tax, indicating that the use of financial instruments results is a choice and may measure the speculative activity instead of hedging (GRAHAM; ROGERS, 2002).

Empirical research has also have tested whether the interest tax deductions and reduction of tax liabilities affect the extent of corporate hedging with derivatives, finding evidence that tax benefits resulting from hedging add approximately 1.1% to firm's value (GRAHAM; ROGERS, 2002) – U.S. companies have experimented a 3.6 to 4.4 percentage points reduction in the effective tax rate in a 3-years term after started a derivatives program, which would have resulted in an average reduction of US\$ 10.69 million per firm in the corporate taxes (DONOHOE, 2015).

In conclusion, after testing firm's exchange losses deferral on OCI ( $H_1$ ), as well as the determinants for hedge accounting choice in the scenario of high financial exposure to currency risk and high exchange rate variation ( $H_2$ ), evidencing a potential earnings management (loss avoidance) activity, we also add a tax-driven variable to our models, expecting to find a positive relation between financial and tax aggressiveness activities for hedging companies in Brazil.

### **2.3.2. Tax deferral on exchange gains/losses**

Brazilian Corporate Income Tax (*Imposto de Renda da Pessoa Jurídica* - IRPJ) system in Brazil has its foundation in Decree-Law No. 1,598, of December 26, 1977<sup>31</sup>, issued right

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<sup>31</sup> In 1999, Brazil gave an important step towards transparency of IRPJ rules by issuing the "IRPJ Regulations", a Decree (No. 3,000, of March 26) which compiled all previous rules regarding income tax, applicable to both natural persons and legal entities (companies), still in force.

after the Law No. 6.404, of 1976 (Joint-Stock Companies' Act) in order to adapt the previous tax provisions to the current corporate ruling. However, IRPJ system undergone major reform in 1995 due to the sensitive change in the internal monetary policy - institution of the Brazilian Real (BRL) as official currency -, which brought inflation rates under control, eliminating the legal obligation of running "monetary correction" (indexing) of financial statements, with tax relevant related impacts.

Still in 1995, Brazilian law has definitively adopted the model of taxation on worldwide income, reaching Brazilian firms' profits overseas by means of controlled and associate companies established in any other country. In 1996, Law No. 9,430, of December 27, ratified the "internationalization" of Brazilian rules by incorporating transfer pricing methods, providing special treatment to commercial relationship between Brazilian companies and those situated in tax havens and tax privileged regimes, applying the international model of Controlled Foreign Corporation (CFC) rules<sup>32</sup>.

In this sense, IRPJ calculation basis for companies in Brazil, alongside with the Social Contribution on Net Profits (*Contribuição Social sobre o Lucro Líquido – CSLL*), may be assessed by two main methods: (i) real profit<sup>33</sup> or (ii) presumed profit, whose election is as general rule discretionary. However, the real profit method is mandatory for companies: (i) whose total annual revenues in the prior year exceed BRL 78,000,000.00; (ii) which have income or gains obtained abroad, excluded exportation operations; (iii) which are financial institutions, and factoring companies; or (iv) which are entitled to specific tax benefits and exemptions.

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<sup>32</sup> Most recently, Law No. 12,249, of June 11, 2010, brought thin capitalization rules into Brazilian tax legislation, limiting interests' deduction by local companies, as well as Law No. 12,973, of May 13, 2014, has adapted IRPJ rules in order to merge accounting ruling changes provided by the Brazilian adoption of IFRS (Law No. 11,638/07).

<sup>33</sup> Under the real profit method, tax is calculated on an annual or quarterly basis on profits before taxes, adjusted in accordance with the provisions of the applicable tax law. Any tax losses incurred in the tax period may be carried forward and offset against taxable income earned in subsequent periods, up to a limit of 30% of the taxable profit of each subsequent period (general rule). On the other hand, there are revenues and expenses not considered in the IRPJ calculation basis, such as dividends and participations in other companies assessed by the invested equity's value, which shall be deducted from the profits before tax, as well as donations, punitive fines, taxes under administrative or judicial discussion and directors' gratification, which shall be added to the profits before tax (non-deductible). If the company opts for payment based on yearly profits (the most common and generally adopted system), said profits will be calculated from the profit-and-loss statement drawn up in December, covering the results for the entire calendar year, but the tax must be pre-paid monthly. The monthly pre-payment may be reduced or suspended if the taxpayer has accounting evidence that the pre-paid value until that month exceeds the tax value calculated with basis on the real profit. IRPJ rate is 15% (fifteen percent) on the real profit basis, plus an additional on profits above BRL 20,000.00 per month on a 10% (ten percent) rate. In addition, companies bear an additional cost of 9% (nine percent) on profits assessed by IRPJ purposes, regarding the Social Contribution on Net Profits (CSLL), instituted by Law No. 7,689, of December 15, 1988, totaling net profits' taxation on a 34% (thirty four percent) rate.

Companies that opt for the “real profit” calculation basis (or are legally obligated to) are subjected to a very specific regime for assessing exchange rate gains or losses in their tax returns.

As general rule, IRPJ Regulations provide that in the net profit for tax purposes, the company must include all accruals concerning monetary variations due to exchange rates or interests, so all gains are taxed, and all losses are deductible without limitation on the real profit basis assessment. As a logical outcome of the accrual method, monthly accrued gains and losses on assets and liabilities indexed to foreign currency derive taxable basis volatility to companies, notwithstanding the underlying financial operation’s term or settlement conditions.

In this scenario, Provisional Measure (MP) No. 2,158-35, of August 24, 2001, provided an alternative regime where companies are entitled to opt for taxing their gains (and deduct their losses) only at the assets or liabilities final settlement (“cash basis”).

The option is made each calendar year and it is irrevocable for the whole period, allowing the companies to exclude from the real profit basis the exchange rate gains derived from assets and liabilities still not settled, as well as obligating them to add to the real profit basis the exchange losses derived from the same non-settled assets and liabilities, remaining taxable or deductible at each assessment period only the effective realized gains and losses, respectively.

In this sense, said “alternative regime” has major impacts in the company’s results for tax purposes and it is only viable to firms subjected to high financial exposure to foreign currency, and in a high exchange rate depreciation environment, thus we expect that its adoption would also affect firm’s hedge accounting choices, representing a tax aggressive behavior.

### **2.3.3. Hypothesis 3’s statement**

As shown above, in line with the conclusions deducted from Nance et al. (1993), Lamm-Tennant and Rollins (1994), Mian (1996), Graham and Rogers (2002), Dechow et al. (2010) and Donohoe (2015), we propose to test the influence of a tax-driven decision to Brazilian companies regarding the deferral of taxes on exchange rates gains and losses in the cash flow hedge accounting choice, as a proxy of tax aggressiveness.

So as another innovation to prior research, we investigate whether firm’s tax-driven decisions, such as the option for accounting gains and losses in exchange rate variations derived from accruals written in foreign currency in the income statements by their cash basis (tax

deferral), is determinant for firm's hedge accounting choice, which leads us to our third hypothesis ( $H_3$ ):

*$H_3$  – Firm's choice concerning tax deferral on exchange gains and losses derived from financial exposure to currency risk and exchange rate depreciation contributes to firm's choice on cash flow hedge accounting.*

By testing  $H_3$  we expect to find evidence that cash flow hedge accounting choice is also determined by tax-driven decisions provided exceptionally by Brazilian tax law, more precisely the decision to tax gains and losses on exchange rate variations in the income statements on a deferred basis, paying income tax (IRPJ and CSLL) only at the settlement of each financial asset or liability written in foreign currency.

### **3. Research design**

Tests of corporate hedging motives may be plagued by various empirical challenges and limitations, since most empirical studies face significant endogeneity and identification problems of variables, describing different dimensions of corporate financial policy and strategy that are hard to address - the effects of some variables on risk management are more complex than typically considered and a detailed understanding of the underlying structural parameters is required in order to capture them properly in empirical analyses (ARETZ; BARTRAM, 2010).

However, we designed our research model to test the same behavior captured by Glaum and Klöcker (2011) in Brazilian firms, adding new and relevant variables to Guerra and Galdi's (2009), Pereira et al.'s (2017) and Santos et al.'s (2017) studies in order to test the effects of high exchange rate variation environment and the impact of hedge accounting on OCI's balance and volatility, also testing tax-driven decisions for foreign exchange rate gains and losses accounting in accordance with Mian's (1996), Lamm-Tennant and Rollins' (1994), Graham and Smith Jr.'s (1999), Lien and Metz's (2001), Graham and Rogers's (2002) and Donohoe's (2015) findings.

Regarding our data collection, Mian (1996) has pointed out that the lack of publicly available information on corporate hedging activity severely limited previous empirical research in this area in the 1990's, so previous empirical work on hedging (and hedge accounting) has relied primarily on survey-based data.

Recent changes in financial accounting standards have mandated that all entities disclose off-balance-sheet financial instruments in financial statement footnotes (MIAN, 1996), but, despite the effort for greater disclosure of quantitative and qualitative information under IFRS, there is still much to develop in that direction, as companies are not required to disclose either notional values of derivatives or the gains and losses with said operations (SANTOS et al, 2017).

Nonetheless, we chose to use financial data available in the software Economatica® - such as firm's total assets, net profits, financial expenses, return on equity (ROE), OCI's balances<sup>34</sup> and liabilities in foreign currency (short and long term) -, gathering the outstanding information, mainly tax deferral and the hedge accounting options, on companies' financial statements footnotes quarterly issued and available on CVM's website.

Our sample was initially comprised by 649 listed companies with any available data in Economatica® database from 2010 to 2017, further resulting in 525 nonfinancial and non-insurance companies listed in the Brazilian Stock Exchange (B<sup>3</sup>) within the research period, which embraced 4 quarters<sup>35</sup> of each year from 2010 to 2017, totaling 32 time-observations and 16,800 initial observations. We did not exclude data from outliers values, hence we used a *winsorization* method (at 3%). After excluding absent data (dependent, independent and control proxies) and companies with less than 4 observations in the 2010-2017 period, we reached 379 listed companies and 7,634 total observations (unbalanced panel), as per detailed on Table 2.

Table 2 – Sample description and total observations

	2010-2017
Listed companies – Economatica® database	649
(-) financial and insurance companies	124
(=) Initial sample	525
(-) companies with absent data for proxies	103
(-) companies with less than 4 observations in the period	43
(=) Final sample <sup>1</sup>	379
<sup>1</sup> Total of 7,634 firm-observations	

We focused our analysis on nonfinancial companies, dismissing financial ones, aligned with the reviewed prior research on financial exposure to currency risk and hedge

<sup>34</sup> Since we were not able to access firm's cash flow hedge balances at Economatica® database and the values presented in firm's footnotes were not reliable, we chose to use OCI's total balances.

<sup>35</sup> Kothari (2001) highlights that the interest in time-series properties of quarterly earnings arises mainly because they are seasonal in many industries because of the seasonal nature of their main business activity, as well quarterly earnings are timelier, since firms are required to estimate annual operating expenses and allocate these costs to quarterly periods – and there are four times as many quarterly earnings observations as annual earnings observations.

(ALLAYANNIS; OFEK, 2001; BATRAM et al., 2009; ARETZ; BATRAM, 2010; GLAUM; KLÖCKER, 2011; KRAPL; SALYER, 2017), as well as considering the restrict applicability of cash flow hedge accounting to banks, insurance companies and other financial companies.

Further on, we have organized our final sample observations by Type of Industry, considering the tags “Agroindustry”, “Commerce”, “Industry”, “Services” and “Others” (Table 3), which shows a preponderance of listed companies in the services sector (56.60%), including energy, oil and gas, followed by the industry sector (19.79%), also using them as control proxies to our model estimations.

Table 3 – Total observations by Type of Industry

<b>Industry</b>	<b>Freq.</b>	<b>Freq. %</b>
AGRO. (Agroindustry)	546	7.15%
INDUS. (Industry)	1,511	19.79%
SERV. (Services)	4,321	56.60%
OTHERS	1,256	16.45%
<b>Total</b>	<b>7,634</b>	<b>100.00%</b>

We have also surveyed data related to US\$ rate in BRL for the same period (2010-2017), based on BACEN’s official releases<sup>36</sup>, considering only the sale’s price regarding the last business day of each of the analyzed quarters, which is the same rate to be used by the firms in order to close their financial statements in each calendar-quarter.

In this scenario, based on the prior research reviewed and on the innovations we propose in our study aiming to fill the theoretical gap pointed out on Section 1, we tested our hypotheses  $H_1$ ,  $H_2$  and  $H_3$  pursuant the following newly designed equations for multivariate regressions:

$$AOCI_{it} = \alpha + \beta_1 DEBTFX_{it} + \beta_2 CASHFX_{it} + \beta_3 FXVAR_t + \beta_4 ROE_{it} + \beta_5 SIZE_{it} + \varepsilon \quad (1)$$

$$HA_{it} = \alpha + \beta_1 DEBTFX_{it} + \beta_2 CASHFX_{it} + \beta_3 FXVAR_t + \beta_4 ROE_{it} + \beta_5 SIZE_{it} + \varepsilon \quad (2)$$

$$HA_{it} = \alpha + \beta_1 DEBTFX_{it} + \beta_2 CASHFX_{it} + \beta_3 FXVAR_t + \beta_4 TAXDEF_{it} + \beta_5 ROE_{it} + \beta_6 SIZE_{it} + \varepsilon \quad (3)$$

<sup>36</sup> BACEN’s website, available in: <http://www4.bcb.gov.br/pec/taxas/port/ptaxnpsq.asp?id=txcotacao>, accessed on November 24, 2017.

Variables' names, descriptions and what they should represent to our models (proxies) are demonstrated on Table 4, showing each proxy's theoretical basis considering prior empirical research, which supports their use in different models than ours, considering that our study's innovations rely on the new combination of the variables and mainly on the proposed dependent and interest ones.

Table 4 - List of research model's variables and their use in prior

Type	Name	Description	Proxy	Support in prior research
Dependent	$AOCI_{it}$	Accumulated Other Comprehensive Income disclosed by company $i$ on period $t$	Deferred losses	Chambers et al. (2007); Bratten et al. (2016)
	$HA_{it}$	Dummy – annual option for cash flow hedge accounting by company $i$ on period $t$ (1 when present, 0 otherwise)	Accounting choice	Dechow et al. (1995); Pincus and Rajgopal (2002); Gietzmann and Ireland (2005); Lins et al. (2011); Guthrie et al. (2011); Lim et al. (2013); Potin et al. (2016); Beneda (2016); Chang et al. (2016); Santos et al. (2017); Moura et al. (2017)
	$DEBTFX_{it}$	Total Debt in foreign currency (short and long terms) disclosed by company $i$ on period $t$	Financial exposure to currency risk	Chamberlain et al. (1997); Géczy et al. (1997); Guay (1999); Allayannis and Ofek (2001); Makar and Huffman (2008); Ryan (2012); Aabo et al. (2015); Chang et al. (2016); Lin et al. (2017)
Interest	$CASHFX_{it}$	Exchange gains and losses in the cash flow statement disclosed by company $i$ on period $t$	Exchange gains/losses	Klein and Marquardt (2006); Campbell et al. (2015)
	$FXVAR_{it}$	Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period $t$	Exchange rate variation	Allayannis and Ofek (2001); Makar and Huffman (2008); Bonetti et al. (2012); Tessema (2016)
	$TAXDEF_{it}$	Dummy – annual option for the tax deferral (cash basis) on exchange gains/losses company $i$ on period $t$ (1 when present, 0 otherwise)	Tax-driven accounting choice	Lamm-Tennant and Rollins (1994); Mian (1996); Pincus and Rajgopal (2002); Frank et al. (2009); Lennox et al. (2013)
Control	$ROE_{it}$	Net profit or loss/total equity of company $i$ on period $t$	Total gains/losses	Hope (2003); Campbell et al. (2015)
	$SIZE_{it}$	Total Asset (LN) of company $i$ on period $t$	Size	Bartov and Bodnar (1996); Géczy et al. (1997); Hope (2003); Gietzmann and Ireland (2005); Roychowdhury (2006); Klein and Marquardt (2006); Lim et al. (2013); Kalay (2015); Chen et al. (2014); Aabo et al. (2015); Potin et al. (2016); Beneda (2016); Chang et al. (2016); Moura et al. (2017)
	$CRISIS$	Dummy – 1 for period $t$ between 2015-2016, 0 otherwise	Economic Crisis	Beisland (2010); Dahrouge and Saito (2013); Sabbaghi and Sabbaghi (2018); Shahzad et al. (2018)

Source: prepared by the author based on the reviewed literature.

Variables' descriptive statistics are detailed on Table 5. We maintained ROE's signs (negative and positive) in the sample (min. of -1.3) since negative ROE is an object of our interest in this research design. On the other hand, considering that the variables CRISIS (1 for period from 2015 to 2016 and 0 for other periods) and SERV. (1 for companies comprehended in this sector and 0 for not) are dummies, Table 5 also demonstrates that said proxies affected 28.9% and 56.6% respectively of the total sample.

Table 5 – Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
<b>AOCI</b>	7,634	-2216.439	32786.21	-138531	98322
<b>HA</b>	7,634	0,0693	0,2540	0.0	1.0
<b>FXVAR</b>	7,634	0.9221	0.2779	0.44539	1.3795
<b>TAXDEF</b>	7,634	0.763	0.4252	0.0	1.0
<b>DEBTFX</b>	7,634	307823.8	885145.1	0.0	4434342
<b>CASHFX</b>	7,634	1714.186	7193.5860	0.0	37959
<b>SIZE</b>	7,634	13.4152	3.0099	4.1	17.3
<b>ROE</b>	7,634	0.0286	0.3660	-1.3	1.0
<b>CRISIS</b>	7,634	0.2890	0.4533	0.0	1.0
<b>AGRO.</b>	7,634	0.0715	0.2577	0.0	1.0
<b>INDUS.</b>	7,634	0.1979	0.3985	0.0	1.0
<b>SERV.</b>	7,634	0.5660	0.4957	0.0	1.0
<b>OTHERS</b>	7,634	0.1645	0.3708	0.0	1.0

<i>AOCI<sub>it</sub></i>	<i>Accumulated Other Comprehensive Income disclosed by company i on period t</i>
<i>HA<sub>it</sub></i>	<i>Annual option for cash flow hedge accounting by company i on period t</i>
<i>DEBTFX<sub>it</sub></i>	<i>Total Debt in foreign currency (short and long terms) disclosed by company i on period t</i>
<i>CASHFX<sub>it</sub></i>	<i>Exchange gains and losses in the cash flow statement disclosed by company i on period t</i>
<i>FXVAR<sub>it</sub></i>	<i>Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period t</i>
<i>TAXDEF<sub>it</sub></i>	<i>Annual option for the tax deferral on exchange gains/losses company i on period t</i>
<i>ROE<sub>it</sub></i>	<i>Net profit or loss/total equity of company i on period t</i>
<i>SIZE<sub>it</sub></i>	<i>Total Asset (LN) of company i on period t</i>
<i>CRISIS</i>	<i>Dummy – 1 for period t between 2015-2016, 0 otherwise</i>

As shown in Table 5, cash flow hedge accounting (HA) was verified in around 7% of the total 7,634 sample observations, so just as a matter of comparison, Table 6 shows that hedge accounting choice (including other types than cash flow, such as FVTPL) was present in around 13% of the total observations (7,634), showing a rather low percentage of Brazilian companies using the methodology in the studied period of 2010-2017.

Table 6 – Descriptive statistics - HA Cash Flow and HA Total

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
HA (Cash Flow)	7,634	0.0693	0.2540	0	1
HA Total	7,634	0.1313	0.3377	0	1

We ran the normality test (Table 7) considering all variables, and except for the variables TAXDEF, CRISIS and SERV., our variables do not follow a normal distribution,

which is an expected result when it comes to companies' financial data such as accumulated other comprehensive income (AOCI) and total assets (SIZE).

Table 7 – Normality test

Variable	Obs.	W	V	z	Prob>z
<b>AOCI</b>	7,634	0.68019	1259.243	18.967	0.0000
<b>HA</b>	7,634	0.99814	7.316	5.288	0.0000
<b>FXVAR</b>	7,634	0.93859	241.793	14.583	0.0000
<b>TAXDEF</b>	7,634	0.99957	1.689	1.393	0.0819
<b>DEBTFX</b>	7,634	0.55033	1770.572	19.873	0.0000
<b>CASHFX</b>	7,634	0.6633	1325.754	19.104	0.0000
<b>SIZE</b>	7,634	0.8651	531.15	16.674	0.0000
<b>ROE</b>	7,634	0.73233	1053.942	18.494	0.0000
<b>CRISIS</b>	7,634	0.99962	1.501	1.079	0.1404
<b>AGRO.</b>	7,634	0.99653	13.659	6.947	0.0000
<b>INDUS.</b>	7,634	0.99912	3.45	3.29	0.0005
<b>SERV.</b>	7,634	0.99998	0.068	-7.158	1.0000
<b>OTHERS</b>	7,634	0.99881	4.685	4.104	0.0000

*AOCI<sub>it</sub>* Accumulated Other Comprehensive Income disclosed by company *i* on period *t*

*HA<sub>it</sub>* Annual option for cash flow hedge accounting by company *i* on period *t*

*DEBTFX<sub>it</sub>* Total Debt in foreign currency (short and long terms) disclosed by company *i* on period *t*

*CASHFX<sub>it</sub>* Exchange gains and losses in the cash flow statement disclosed by company *i* on period *t*

*FXVAR<sub>it</sub>* Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period *t*

*TAXDEF<sub>it</sub>* Annual option for the tax deferral on exchange gains/losses company *i* on period *t*

*ROE<sub>it</sub>* Net profit or loss/total equity of company *i* on period *t*

*SIZE<sub>it</sub>* Total Asset (LN) of company *i* on period *t*

*CRISIS* Dummy – 1 for period *t* between 2015-2016, 0 otherwise

Hence, considering the absence of normality in our sample, we ran the Spearman correlate test (Table 8) and no multicollinearity among the variables was identified, so we did not take any of them out of our model. Table 8 also shows expressive correlation between variables CRISIS and FXVAR, as well between SIZE and DEBTFX, which seems explainable, on the first case, as we have chosen the periods of crisis (CRISIS) by the exchange tax rate (FXVAR) highest depreciation period, and on the second case, as according to our study's supporting theory, it was expected that the greatest the firm's size, the highest its leverage in foreign currency (MIAN, 1996).

Table 9 shows the Variance Inflating Factor (VIF) considering all variables, whose mean (1.69) ratify the absence of multicollinearity among the variables, so not only we did not need to exclude any of our model's variables, but also our model seems accurate for our statistical analysis whatsoever.

Our equations' statistic tests and results are properly analyzed and discussed in the Section 3.

Table 8 – Spearman correlate test

	AOCI	HA	FXVAR	TAXDEF	DEBTFX	CASHFX	SIZE	ROE	CRISIS	AGRO.	INDUS.	SERV.	OTHERS
<b>AOCI</b>	1												
<b>HA</b>	0.0634*	1											
<b>FXVAR</b>	-0.0692*	0.0676*	1										
<b>TAXDEF</b>	-0.0069	0.1822*	0.0748*	1									
<b>DEBTFX</b>	-0.0568*	0.3010*	0.0302*	0.2180*	1								
<b>CASHFX</b>	-0.0276*	0.1544*	0.0534*	0.0907*	0.3828*	1							
<b>SIZE</b>	-0.0460*	0.2717*	0.0770*	0.4316*	0.5278*	0.2921*	1						
<b>ROE</b>	-0.0276*	0.0465*	-0.0676*	0.0284*	0.0604*	0.0104	0.0652*	1					
<b>CRISIS</b>	-0.0385*	0.0453*	0.6770*	0.0440*	0.0211	0.0327*	0.0323*	-0.0641*	1				
<b>AGRO.</b>	-0.006	0.0319*	0.0163	0.0399*	0.1992*	0.1736*	0.1020*	-0.0238*	0.0047	1			
<b>INDUS.</b>	0.0518*	0.0086	0.0109	0.0147	0.1065*	0.0845*	-0.1505*	0.0079	0.0075	-0.1379*	1		
<b>SERV.</b>	-0.0419*	0.0154	-0.001	-0.0976*	-0.1113*	-0.1894*	0.017	0.0424*	0.0014	-0.3170*	-0.5673*	1	
<b>OTHERS</b>	0.0045	-0.0520*	-0.0216	0.0869*	-0.1042*	0.0417*	0.0681*	-0.0485*	-0.0132	-0.1232*	-0.2204*	-0.5068*	1

\* Correlation significant at 5%

Table 9 - Independent and control variables' VIF

Variable	VIF	1/VIF
FXVAR	2.05	0.486832
CRISIS	2.04	0.49106
SERV.	1.97	0.508103
DEBTFX	1.93	0.51752
CASHFX	1.79	0.55802
INDUS.	1.78	0.56156
AGRO.	1.43	0.698327
SIZE	1.19	0.839311
ROE	1.04	0.964982
<b>Mean VIF</b>	<b>1.69</b>	

$AOCI_{it}$	Accumulated Other Comprehensive Income disclosed by company $i$ on period $t$
$HA_{it}$	Annual option for cash flow hedge accounting by company $i$ on period $t$
$DEBTFX_{it}$	Total Debt in foreign currency (short and long terms) disclosed by company $i$ on period $t$
$CASHFX_{it}$	Exchange gains and losses in the cash flow statement disclosed by company $i$ on period $t$
$FXVAR_{it}$	Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period $t$
$TAXDEF_{it}$	Annual option for the tax deferral on exchange gains/losses company $i$ on period $t$
$ROE_{it}$	Net profit or loss/total equity of company $i$ on period $t$
$SIZE_{it}$	Total Asset (LN) of company $i$ on period $t$
CRISIS	Dummy – 1 for period $t$ between 2015-2016, 0 otherwise

## 4. Results discussion

### 4.1. Hypothesis 1: AOCI as dependent variable

Before running our Equation 1, we ran several tests in order to verify the most adequate and accurate model, so Table 10 presents the Breusch-Pagan/Cook-Weisberg test, whose results point to the existence of heteroscedasticity, both with and without our control variables, so we chose to use the robust model to test our model with AOCI as dependent variable.

Table 10 - Breusch-Pagan/Cook-Weisberg test

<b>Independent variables</b>	
chi2	4942.65
Prob>Chi2	0.000
H0: constant variance	
<b>Independent and control variables</b>	
chi2	5161.37
Prob>Chi2	0.000
H0: constant variance	

In addition, Table 11 (Panel diagnosis) results point to the use of a panel regression as more appropriated than an Ordinary Least Square (OLS) regression to run our Equation 1, both in its fixed and aleatory effects, also presenting the aleatory effect model as most adequate.

Table 11 - Panel diagnosis

<b>Independent variables</b>	
Chow test	
F	16.85
Prob. F	0.000***
Breusch and Pagan Lagrangian multiplier test	
chibar2	15941.82
Prob. Chibar2	0.000***
Cluster-Robust Hausman Test	
Chi2	2.33
Prob. Chi2	0.8024
<b>Independent and control variables</b>	
Chow test	
F	16.85
Prob. F	0.000***
Breusch and Pagan Lagrangian multiplier test	
chibar2	15554.67
Prob. Chibar2	0.000***
Cluster-Robust Hausman Test	
Chi2	11.38
Prob. Chi2	0.1812

Therefore, to test our proposed model we chose to run our Equation 1 using a panel regression considering its aleatory effects, robust method, first with the Interest variables only and then adding the Control ones, whose results are presented on Table 12.

Since AOCI is a financial value collected from firms' *equity*, the deferred *losses* accounted for present a **negative sign**, that is, the lowest the value, the highest the deferred losses, our variable of primary interest. Thus, as per our  $H_1$ , we expect that the highest DEBTFX, FXVAR and ROE, as well the lowest CASHFX – since it brings the cash effects of the deferred exchange losses -, the lowest AOCI should be.

Table 12 – Panel regression – aleatory effects

Dependent Variable	AOCI					
Independent Variables	Coef.	Z	P-value	Sign.	Expected sign	Obtained sign
DEBTFX	-0.009	-3.47	0.001	***	-	-
CASHFX	0.443	2.08	0.038	**	+	+
FXVAR	-12006.670	-3.69	0.000	***	-	-
ROE	-1387.270	-1.80	0.072	*	-	-
SIZE	136.175	0.29	0.770	N.S.		
CRISIS	1696.262	1.26	0.209	N.S.		
AGRO.	-5731.788	-0.70	0.482	N.S.		
INDUS.	397.593	0.13	0.899	N.S.		
SERV.	-3747.273	-1.69	0.090	*		
CONS.	11093.480	1.55	0.122	N.S.		
R squared	0.0393					
Prob. chi2	0.0002					
N (Obs.)	7,634					
N (Groups)	379					

\* *OTHERS* omitted due to collinearity.

$AOCI_{it}$	Accumulated Other Comprehensive Income disclosed by company $i$ on period $t$
$DEBTFX_{it}$	Total Debt in foreign currency (short and long terms) disclosed by company $i$ on period $t$
$CASHFX_{it}$	Exchange gains and losses in the cash flow statement disclosed by company $i$ on period $t$
$FXVAR_{it}$	Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period $t$
$ROE_{it}$	Net profit or loss/total equity of company $i$ on period $t$
$SIZE_{it}$	Total Asset (LN) of company $i$ on period $t$
$CRISIS$	Dummy – 1 for period $t$ between 2015-2016, 0 otherwise

As per shown in Table 12, considering the statistical significance of variables DEBTFX and FXVAR (at 1%), as well as CASHFX (at 5%) and ROE (at 10%), as well as their obtained values, we confirm  $H_1$  in terms that the firm's financial exposure to exchange rate (DEBTFX) cumulated with a high depreciation exchange rate environment (FXVAR) such as Brazil, result in company's deferred losses in AOCI, which consequently implies higher ROE, as an evidence of potential earnings management activity.

However, still according to Table 12, despite our expectation, control variables SIZE and CRISIS were not statistically significant in our model's specification, and among the Industry variables, only SERV. presented itself as significant, but only at 10%.

Moving forward, Table 13 presents the Wooldridge test for autocorrelation in panel data, pointing to the existence of first order autocorrelation, which would be expected, considering AOCI is a company's financial accrual, whose values depend on the previous ones.

Table 13 - Wooldridge test for autocorrelation in panel data

<b>Independent variables</b>
F(1.378) = 234.175
Prob > F = <b>0.0000***</b>
H0: no first order autocorrelation
<b>Independent and control variables</b>
F(1.378) = 234.129
Prob > F = <b>0.0000***</b>
H0: no first order autocorrelation

Therefore, we ran again our panel regression considering the Generalized Method of Moments (GMM), robust method, as per shown on Table 14, with a lagged dependent variable as an independent one.

Table 14 – GMM – robust

<b>Dependent Variable</b>	<b>AOCI</b>			
<b>Independent Variables</b>	<b>Coef.</b>	<b>Z</b>	<b>P-value</b>	<b>Sign.</b>
AOCI L1.	0.562	80.66	0.000	***
DEBTFX	-0.009	-18.07	0.000	***
CASHFX	0.335	14.20	0.000	***
FXVAR	-4630.919	-2.27	0.023	**
ROE	-1878.093	-4.03	0.000	***
SIZE	284.044	0.93	0.353	N.S.
CONS.	1663.423	0.34	0.734	N.S.
Prob. Chi2	0.000			
N (Obs.)	6,463			
N (instruments)	384			

<i>AOCI<sub>it</sub></i>	<i>Accumulated Other Comprehensive Income disclosed by company i on period t</i>
<i>DEBTFX<sub>it</sub></i>	<i>Total Debt in foreign currency (short and long terms) disclosed by company i on period t</i>
<i>CASHFX<sub>it</sub></i>	<i>Exchange gains and losses in the cash flow statement disclosed by company i on period t</i>
<i>FXVAR<sub>it</sub></i>	<i>Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period t</i>
<i>ROE<sub>it</sub></i>	<i>Net profit or loss/total equity of company i on period t</i>
<i>SIZE<sub>it</sub></i>	<i>Total Asset (LN) of company i on period t</i>

This new test has enhanced CASHFX and ROE significance (at 1%), maintaining the same observed signs, reducing, however, FXVAR significance (5%). And when we include the control variables Type of Industry and CRISIS (Table 15), FXVAR has its significance reduced again (10%). However, since we have found significative correlation between both variables (FXVAR and CRISIS - Table 8), which represent the same phenomena, GMM results with control variables still support the confirmation of our  $H_1$ .

Table 15 – GMM – robust – with control variables type of industry and CRISIS

Dependent Variable	AOCI			
	Independent Variables	Coef.	Z	P-value
AOCI L1.	0.563	75.69	0.000	***
DEBTFX	-0.009	-26.30	0.000	***
CASHFX	0.345	14.42	0.000	***
FXVAR	-1784.177	-1.79	0.073	*
ROE	-1860.665	-3.97	0.000	***
SIZE	261.655	0.88	0.376	N.S.
CRISIS	-2257.431	-4.09	0.000	***
CONS.	-84.878	-0.02	0.984	N.S.
Prob. chi2	0.0000			
N (Obs.)	7,634			
N (instruments)	385			

\* *AGRO., INDUS., SERV. and OTHERS omitted due to collinearity.*

*AOCI<sub>it</sub>* Accumulated Other Comprehensive Income disclosed by company *i* on period *t*  
*DEBTFX<sub>it</sub>* Total Debt in foreign currency (short and long terms) disclosed by company *i* on period *t*  
*CASHFX<sub>it</sub>* Exchange gains and losses in the cash flow statement disclosed by company *i* on period *t*  
*FXVAR<sub>it</sub>* Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period *t*  
*ROE<sub>it</sub>* Net profit or loss/total equity of company *i* on period *t*  
*SIZE<sub>it</sub>* Total Asset (LN) of company *i* on period *t*  
*CRISIS* Dummy – 1 for period *t* between 2015-2016, 0 otherwise

In conclusion, considering the statistical significance of variables DEBTFX, CASHFX, ROE and CRISIS, as well as their obtained signs (the highest DEBTFX, CRISIS and ROE, and the lowest CASHFX, the lowest AOCI), we confirm  $H_1$ , finding statistically significant evidence that firm's high financial exposure to currency risk (DEBTFX) in a high depreciation exchange rate environment (FXVAR/CRISIS) such as Brazil, results in company's deferred exchange losses in AOCI, which consequently implies higher ROE, evidencing potential earnings management activity and, mainly, loss avoidance behavior.

#### 4.2. Hypothesis 2: HA as dependent variable

Since HA is a dummy (0 for not present and 1 for present), we used a logistic regression to run our Equation 2, first with the variables of Interest (Table 18 – Appendix), then with the Control ones, as shown on Table 16. We expected that the highest the firm's DEBTFX, FXVAR, ROE and SIZE, the highest HA would be (1 – accounting choice), as per our hypothesis  $H_2$ . On the other hand, we again expected CASHFX to be inversely proportional to HA.

According to Table 16's results, the model is statistically significant in whole, despite the R-square of approximately 16%, which seems appropriate for a theoretical prediction model if considered a Receiver Operating Characteristic (ROC) curve above 0.7 (0.797), with 7,122 of the observations correctly classified (93,29%), so in addition to the

results of the Stepwise Model (Table 19 – Appendix), ran for the sake of comparison and robusticity, we conclude that the model is accurate to predict the obtained results of the dependent variable (HA).

Table 16 – Logistic regression – with control variables type of industry and CRISIS

<b>Dependent Variable HA</b>						
<b>Independent Variables</b>	<b>Coef.</b>	<b>Z</b>	<b>p-value</b>	<b>sign.</b>	<b>Expected sign</b>	<b>Obtained sign</b>
DEBTFX	0.000	2.91	0.004	***	+	+
CASHFX	0.000	3.54	0.000	***	-	+
FXVAR	0.8746	3.64	0.000	***	+	+
ROE	-0.0870	-0.45	0.650	N.S.	+	N.S.
SIZE	0.5084	12.96	0.000	***	+	+
CRISIS	-0.4861	-3.43	0.001	***		
AGRO.	-0.6914	-3.11	0.002	***		
INDUS.	0.9484	6.27	0.000	***		
SERV.	-0.1804	-1.29	0.196	N.S.		
CONS.	-10.9631	-17.54	0.000	***		
Pseudo R-sq		0.1608				
Mean VIF		1.69				
Prob>X <sup>2</sup>		0.000				
ROC curve		0.797				
N. (obs.)		7,634				
N. (correctly classified)		7,122				
Correctly classified		0.9329				

\* OTHERS omitted due to collinearity.

$HA_{it}$	Annual option for cash flow hedge accounting by company <i>i</i> on period <i>t</i>
$DEBTFX_{it}$	Total Debt in foreign currency (short and long terms) disclosed by company <i>i</i> on period <i>t</i>
$CASHFX_{it}$	Exchange gains and losses in the cash flow statement disclosed by company <i>i</i> on period <i>t</i>
$FXVAR_{it}$	Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period <i>t</i>
$ROE_{it}$	Net profit or loss/total equity of company <i>i</i> on period <i>t</i>
$SIZE_{it}$	Total Asset (LN) of company <i>i</i> on period <i>t</i>
$CRISIS$	Dummy – 1 for period <i>t</i> between 2015-2016, 0 otherwise

As per verified on Table 16, we found statistically significant evidence that firm's high financial exposure to currency risk (DEBTFX) cumulated with an environment of high exchange rates variation (FXVAR) such as Brazil stimulates companies to opt for the cash flow hedge accounting methodology, confirming our hypothesis  $H_2$ . On the other hand, we found that variables such as SIZE play an important role in the cash flow hedge accounting choice, coherent with the supporting theory (MIAN, 1996).

However, despite our expectations, CASHFX (significant at 1%) did not present a positive relationship with HA, maybe considering that the cash effect of the exchange gains and losses is not directly linked to the accrued losses on the income statements and, consequently, on OCI's balances. In addition, ROE was not significant in our model, also despite our expectations, mainly because we were not able to isolate the exchange rate effect (gains and

losses), which is a limitation already discussed by the supporting theory (RICHIE et al., 2006; AABO et al., 2015).

### 4.3. Hypothesis 3: HA as dependent variable and TAXDEF as independent variable

Table 17 presents the logistic regression of Equation 3, adding the variable TAXDEF, which represents the tax levy on exchange gains and losses at a cash basis, as per previously discussed.

Table 17 – Logistic regression – with control variables type of industry, CRISIS and TAXDEF

Dependent Variable HA						
Independent Variables	Coef.	Z	p-value	sign.	Expected sign	Obtained sign
DEBTFX	0.0000	2.87	0.004	***	+	+
CASHFX	0.0000	3.84	0.000	***	-	+
FXVAR	0.8582	3.56	0.000	***	+	+
TAXDEF	1.3863	5.93	0.000	***	+	+
ROE	-0.0756	-0.40	0.692	N.S.	+	N.S.
SIZE	0.4845	11.54	0.000	***	+	+
CRISIS	-0.4800	-3.38	0.001	***		
AGRO.	-0.5816	-2.63	0.009	***		
INDUS.	1.0403	6.81	0.000	***		
SERV.	-0.1377	-0.98	0.326	N.S.		
CONS.	-11.9245	-17.09	0.000	***		
Pseudo R-sq		0.1738				
Mean VIF		1.69				
Prob>X <sup>2</sup>		0.000				
ROC curve		0.8009				
N. (obs.)		7,634				
N. (correctly classified)		7,126				
Correctly classified		0.9335				

\* OTHERS omitted due to collinearity.

$HA_{it}$	Annual option for cash flow hedge accounting by company $i$ on period $t$
$DEBTFX_{it}$	Total Debt in foreign currency (short and long terms) disclosed by company $i$ on period $t$
$CASHFX_{it}$	Exchange gains and losses in the cash flow statement disclosed by company $i$ on period $t$
$FXVAR_{it}$	Natural logarithm (LN) of the price in BRL for sale of US\$ disclosed by BACEN on period $t$
$TAXDEF_{it}$	Annual option for the tax deferral on exchange gains/losses company $i$ on period $t$
$ROE_{it}$	Net profit or loss/total equity of company $i$ on period $t$
$SIZE_{it}$	Total Asset (LN) of company $i$ on period $t$
CRISIS	Dummy – 1 for period $t$ between 2015-2016, 0 otherwise

By adding TAXDEF to our model, we still expected that the highest the firm's DEBTFX, FXVAR, ROE and SIZE, HA adoption would be present (1), as well as that TAXDEF option is significantly correlated to HA adoption, as per our hypothesis  $H_3$ .

According to Table 17's results, by including TAXDEF in the model, the R-square increased to approximately 17%, enhancing the model's ROC curve (0.8009), with 7,126 of the

observations correctly classified (93,35%), so in addition to the Stepwise Model (Table 20 – Appendix) results, we also conclude that the after including the variable TAXDEF, our model is still accurate to predict the obtained results of the dependent variable (HA).

Table 17's results, in addition to our analysis provided on Section 4.2, give us statistically significant evidence to accept our hypothesis  $H_3$ , since we found that TAXDEF option strongly correlated to HA adoption at a 1% significance level, which leads us to the conclusion that the tax regime to which the firm is subjected regarding exchange rate gains and losses (cash basis x accrual basis) is a determinant to cash flow hedge accounting decision, an innovation of our study that is supported by prior research on other tax aggressiveness and tax-driven accounting decisions (NANCE et al., 1993; LAMM-TENNANT; ROLLINS, 1994; MIAN, 1996; GRAHAM AND ROGERS, 2002; FRANK et al., 2009; DECHOW et al., 2010; LENNOX et al., 2013; DONOHOE, 2015).

## 5. Conclusions

Derivatives play a relevant role in the financial and capital markets worldwide, so firms may count on predictability by hedging their cash flows and equities (BENEDA, 2016; LIN et al., 2017), but due to their economical and reporting complexity (CHANG et al., 2016), they have been a great challenge to accounting standards issuers (TESSEMA, 2016), deriving the issuance of IFRS 9 (CPC 48 in Brazil), designed to reduce information asymmetry (ONALI; GINESTI, 2014; PETCHCHEDCHOO; DUANGPLOY, 2017).

Specifically concerning cash flow hedge accounting, it is an *accounting choice* that provides deferrals in OCI (GLAUM; KLÖCKER, 2011; CAMPBELL et al., 2015; CHOI et al., 2015), avoiding the reporting of *losses*, relevant to managers and rewarded by analysts and investors (PINCUS; RAJGOPAL, 2002; KLEIN; MARQUARDT, 2006; ROYCHOWDHURY, 2006; LI, 2011; CHUNG et al., 2012), who fail, however, to price OCI's deferred balances appropriately (LIM et al., 2013; GIGLER et al., 2007; CAMPBELL, 2015; CAMPBELL et al., 2015; BRATTEN et al., 2016; EASTON; ZHANG, 2017).

In this scenario, we found statistically significant evidence that both the high level of financial exposure to currency risk and the volatile exchange rate environment Brazilian listed firms are inserted lead them to account for deferred exchange losses in OCI, so we can conclude that firm's effective earnings in the sample period (2010-2017) have been misrepresented, indicating a potential earnings management (loss avoidance) behavior, in the same line as CVM's claim against Petrobras.

We also found evidence that the high level of financial exposure to currency risk and the volatile exchange rate environment Brazilian listed firms are inserted resulted in the cash flow hedge accounting choice for firms in the period of 2010-2017, so we can conclude that this accounting choice may have been used by Brazilian listed firms, instead of seek for transparency and accounting information quality, as an earnings management tool, aiming to avoid losses derived from debts written in foreign currency, which have been accounted for in OCI.

Lastly, we found evidence that cash flow hedge accounting choice in Brazil is also determined by tax-driven decisions provided exceptionally by Brazilian tax law, more precisely the decision to tax gains and losses on exchange rate variations on a deferred (cash) basis, paying income tax (IRPJ and CSLL) only at the settlement of each financial asset or liability written in foreign currency, which may indicate a tax aggressive behavior combined with earnings management.

Our study has some limitations regarding the availability of Brazilian firms' financial data at public databases such as Economatica® and Thomson Reuters®, for example the option for adopting cash flow and other types of hedge accounting and for differing income tax on a cash basis, which we collected manually in firm's income statements footnotes, as well as the disaggregated balances of cash flow hedge accounting in firm's reported OCI. Nonetheless, we add relevant and innovative determinants to hedge accounting decisions to the accounting theory, enhancing prior research on derivatives use and reporting such as Demarzo and Duffie (1995), Pincus and Rajgopal (2002), Barton (2001), Graham and Rogers (2002), Guerra and Galdi (2009), Donohoe (2015) and Pereira et al. (2017).

On the other hand, our study contributes to disclosure, accounting choice and earnings management theories by discussing the role of financial exposure to foreign currency and the exchange rate variation to hedge accounting choice, also proposing a tax-driven proxy to measure tax aggressiveness and suggesting updates on the accounting standards such as the obligation to disclose cash flow hedge under an uniform methodology, to avoid investors and analysts mispricing.

For future research, we suggest testing the effects of the changes in the international hedge accounting standards - IFRS 9 (CPC 48 in Brazil), enforceable from January 2018 on – to a sample with 2018 observations in order to check whether our findings and conclusions stand solid after the recent hedge accounting standards update.

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## Appendix

Table 18 – Logistic regression

<b>Dependent Variable HA</b>				
<b>Independent Variables</b>	<b>Coef.</b>	<b>Z</b>	<b>p-value</b>	<b>sign.</b>
DEBTFX	0.0000	2.42	0.016	**
CASHFX	0.0000	3.94	0.000	***
FXVAR	0.3586	2.06	0.039	**
ROE	-0.0566	-0.30	0.763	N.S.
SIZE	0.4224	11.91	0.000	***
CONS.	-9.2318	-16.78	0.000	***
Pseudo R-sq		0.13		
Mean VIF		1.37		
Prob>X <sup>2</sup>		0.000		
ROC curve		0.7717		
N. (obs.)		7,634		
N. (correctly classified cases)		7,174		
Correctly classified		0.9397		

Table 19 – Stepwise model

<b>Dependent Variable HA</b>				
<b>Independent Variables</b>	<b>Coef.</b>	<b>Z</b>	<b>p-value</b>	<b>sign.</b>
DEBTFX	0.0000	2.43	0.015	**
CASHFX	0.0000	3.93	0.000	***
FXVAR	0.3617	2.09	0.037	**
SIZE	0.4220	11.9	0.000	***
CONS.	-9.2319	-16.77	0.000	***
Pseudo R-sq		0.13		
Prob>X <sup>2</sup>		0,000		
N. (obs.)		7,634		
LR test		0.7635		

Table 20 – Stepwise model – with TAXDEF

<b>Dependent Variable HA</b>				
<b>Independent Variables</b>	<b>Coef.</b>	<b>Z</b>	<b>p-value</b>	<b>sign.</b>
DEBTFX	0.0000	2.78	0.005	***
CASHFX	0.0000	4.36	0.000	***
SIZE	0.3761	10.01	0.000	***
TAXDEF	1.3539	5.85	0.000	***
CONS.	-9.4592	-16.48	0.000	***
Pseudo R-sq		0.1416		
Prob>X <sup>2</sup>		0,000		
N. (obs.)		7,634		
LR test		0.168		