Revista de Educação e Pesquisa em Contabilidade
Journal of Education and Research in Accounting

Periódico Trimestral, digital e gratuito publicado pela Academia Brasileira de Ciências Contábeis | Available online at www.repec.org.br

REPeC, Brasília, v. 14, n. 2, art. 8, p. 257-278, Apr./Jun. 2020 | DOI: http://dx.doi.org/10.17524/repec.v14i2.2552 | ISSN 1981-8610

The relevance of the fair value of derivatives in financial institutions after the adoption of IFRS

Mara Jane Contrera Malacrida
https://orcid.org/0000-0002-1157-6799 | *E-mail: maracont@usp.br*

Nadia Alves de Sousa
| *E-mail: nadiasousa@uol.com.br*

Alan Diógenes Góis (*in memorian*)

Abstract

Objective: This study analyzes whether the change in the fair value of derivatives, associated with the adoption of IFRS, has an impact on the market value of Brazilian and global financial institutions in the period between 2005 and 2015.

Method: The research is empirical-analytical and, for the analysis of the proposed models, we used the panel data technique and performed fitness tests for the sake of better estimation. The 20 Brazilian financial institutions with shares traded on BM&FBOVESPA were selected. For the other countries, the institutions in the *Bloomberg* database were analyzed, totaling 140 jurisdictions and 1,853 financial institutions.

Results: The results showed that it cannot be affirmed that the change in the fair value of derivatives, associated with the adoption of IFRS, affects the market value of Brazilian financial institutions. For the global sample, a relevant relationship was found, at the level of 10%, and it can be stated that the change in the fair value of derivatives, associated with the adoption of IFRS, affects the market value of global financial institutions.

Contributions: This study contributes to an understanding of the role of derivatives and the adoption of IFRS in the market value of Brazilian and global financial institutions, which is relevant given their importance and associated risks.

Key-words: derivatives, international accounting, IFRS, accounting information.

Published in Portuguese and English. Original Version in Portuguese.

Received in 2/4/2020. Ask to Revise on 2/21/2020. Resubmitted on 4/16/2020. Accepted on 6/8/2020 by Dra. Márcia Martins Mendes De Luca (Assistant Editor) and by Dr. Gerlando Augusto Sampaio Franco de Lima (Editor). Published on 6/28/2020. Organization responsible for the journal: Abracicon.

1. Introduction

In 2008, Brazil and the world were the stages for some of the most serious cases of misuse of derivative financial instruments. The companies that most suffered from the consequences of this use include Sadia and Aracruz Celulose in Brazil, which are important companies in the Brazilian capital market. According to a Relevant Fact disclosed by Sadia S.A. on September 25, 2008, the company estimated losing around 760 million reais due to the settlement of foreign exchange derivative positions. Similarly, on November 3, 2008, Aracruz Celulose S.A. disclosed estimated losses up to that moment equal to 2.13 billion dollars with the liquidation of the same type of operations. The losses were so severe that the companies were later incorporated and today are no longer traded on the stock exchange in their original form.

According to the *Bank for International Settlements* (BIS), (2009), the sharp currency devaluation observed in Latin America after mid-September 2008 resulted in large losses for some of the largest companies in Brazil and Mexico. In Mexico, losses with derivatives reached 4 billion dollars in the fourth quarter of 2008 while, in Brazil, where official values have not yet been released, the expected losses amount to at least 25 billion dollars.

In addition to the great losses that occurred in the Latin American derivatives market during the 2008 crisis, other financial "catastrophes" had already occurred due to the improper[1] use of these instruments since the 1980s. According to Hull (2016), in 1995, the operations of Nick Leeson overthrew a 200-year-old British bank, Barings; in 1994, the operations of Robert Citron led Orange County, a city in California, to lose about 2 billion dollars. John Rusnak's U$ 700 million losses for Allied Irish Bank became known in 2002. In 2006, the Amaranth *hedge fund* lost U$ 6 billion due to the risks of the operations carried out by Brian Hunter. In 2008, Jérôme Kerviel lost more than 7 billion dollars trading stock exchange index futures for Société Générale. The huge losses of UBS, Shell and Sumitomo also resulted from the activities of a single individual.

Lima and Lopes (2001) highlight that the increase in operations using these financial instruments, associated with crises of internationally renowned institutions, put these products under the scrutiny of financial institutions and regulators around the globe. All these losses cannot be considered a rule against the entire derivatives system though. This is a market that trades amounts exceeding trillions of dollars and caters very well to the needs of those who use them properly. Reports of disastrous operations are but a small portion of operations involving these instruments, but they nevertheless need to be treated with special attention (Hull, 2016).

Allayannis and Weston (2001) found significant evidence that the use of derivative contracts for the purpose of *hedging*, and not speculation, can motivate an increase in the company value, as this strategy is used to mitigate risks inherent to the business and thus minimize the volatility of the company's income.

1 ". . . derivatives can be used for *hedge* or for speculation. In other words, they can be used to reduce risks or to take them. Most losses occurred because the derivatives were misused." (Hull, 2016, p. 884)

Therefore, from the perspective of *value relevance*, movements in the fair value of derivatives, as well as their purpose, which is directly associated with the risk of operations, can constitute a relevant value, that is, their fluctuations can affect the companies' market value. According to Scott (2012), there are some reasons that may justify the change in investor behavior that comes from reactions to the accounting data that companies disclose. These reasons include the fact that market agents hold expectations regarding the future performance of the company and the accounting data are a source of information to estimate this performance. In addition, the disclosure of accounting information may affect these agents' expectations if they differ from their projections. Investors also review their expectations and assess risks in addition to earnings projections. Lopes and Walker (2012) found this relationship for accounting figures in Brazilian companies. The change in the value of fixed assets affected not only the stock price of the investigated companies but also their returns in the pre-adoption period of IFRS in Brazil.

In addition, the adoption of IFRS by financial institutions around the world may have provided better quality information about the derivatives and, thus, may assist the information users' decision-making and the better risk perception of these institutions. Van Tendeloo and Vanstraelen (2005) list the benefits of adopting IFRS as the ability for investors to make better informed financial decisions, which ultimately results in reduced company risk and lower cost of capital.

One can note, however, how catastrophic the use of derivative instruments can be without proper planning, knowledge and governance mechanisms. The result could be even more relevant if companies whose financial statements contain a significant share of financial instruments misused them, which could happen to banks. The mismanagement of these instruments in a highly volatile macroeconomic scenario can generate such large losses that they are capable of putting the global financial system at risk. Nevertheless, it is expected that institutions with greater experience in operations involving derivative financial instruments (about 75% of all derivative transactions in the world in 2015 were carried out by financial institutions, according to data from BIS, 2016) have a greater and better structure to manage such operations and are not that exposed to risks of significant losses.

Therefore, the main motivation of this research is the importance of income from derivatives for financial institutions and how sensitive these results can be to market fluctuations.

Based on the context explained above, this study aims to analyze whether the change in the fair value of derivatives, associated with the adoption of IFRS, has an impact on the market value of Brazilian and global financial institutions.

In this sense, the research hypothesis is that the change in the fair value of derivatives, associated with the adoption of IFRS, has a significant (relevant) impact on the market value of financial institutions.

This study aims to contribute to an understanding of the role of derivatives and the adoption of IFRS in the market value of Brazilian and global financial institutions, which is relevant given their importance and associated risks. In addition, the specific analysis of Brazilian banks permits exploring a sector usually excluded from research, because it has very peculiar characteristics, allowing us to identify the relevance of both the fair value of derivatives and the adoption of IFRS for these institutions.

The results showed that, for the Brazilian sample, the research hypothesis was weakly accepted, given that the interactive variable *IFRS X Der* in the complete model was significant, but with an immaterial coefficient. Hence, it cannot be affirmed that the change in the fair value of derivatives, associated with the adoption of IFRS, has an impact on the market value of Brazilian financial institutions. This result can be explained by the fact that the Brazilian standard for financial institutions already considered fair value aspects and broad dislosure of derivative and financial *hedging* instruments long before the convergence. For the global sample, the results evidenced, at a 10% significance level, that the research hypothesis was accepted, given that the interactive variable *IFRS X Der* in the complete model was significant with an expected coefficient and sign, i.e., it can be affirmed that the change in the fair value of derivatives, associated with the adoption of IFRS, negatively affected the market value of the global financial institutions. This result may be related to the increased volatility of the companies' income after the adoption of IFRS, resulting from the variation in the fair value of the derivatives.

2. Theoretical Platform

2.1 International Financial Reporting Standards – IFRS

The adoption of IFRS is one of the ways to break the information asymmetry and improve the accounting information because, through this GAAP, the information becomes more detailed and gains quality and, thus, favors the decision-making of economic agents.

In this sense, Barth, Landsman and Lang (2008) concluded in their research that companies that adopted IFRS improved the quality of their accounting information and provide greater relevance to their results. Thus, the authors attributed these facts to the better quality of financial reporting provided by the adoption of IFRS. For Byard, Li and Yu (2011), the adoption of IFRS has improved the environment for market analysts, as better quality information can provide more accurate recommendations from these professionals.

For Daske, Hail, Leuz and Verdi (2008), the effects of the adoption are stronger in countries where the differences between local GAAP and IFRS are greater. In addition, we note the lack of research that considers Latin American companies, which represents one of the contributions of this study.

In Brazil, the convergence with the International Financial Reporting Standards was achieved by the publication of Law 11.638 on December 28, 2007. Moreover, convergence in Brazil did not happen as harmoniously for financial institutions as in European countries, despite the fact that the Brazilian Central Bank was one of the first Brazilian institutions to manifest interest in the conversion. The Brazilian regulatory characteristic (*civil law*) made the process long and bureaucratic for non-financial companies and, for financial companies, there was an aggravating factor: the Central Bank did not permit the full adoption of IFRS and the entities under the supervision of this body have not yet fully converged, although they are also required to disclose in IFRS. Bacen has not yet adopted some standards and, therefore, the financial institutions use their own GAAP, which combines IFRS principles and specific instructions issued by the regulator (Cosif).

According to Lima (2016), the Brazilian institutional environment poses challenges to the existence of the economic benefits associated with the adoption of IFRS: (i) legal tradition based on *code law*, which is characterized by the active participation of the State in the accounting standardization process, which contributes to a less transparent environment; (ii) the low legal *enforcement*; (iii) companies using private and subsidized financing, as opposed to public issue markets; and (iv) accounting standards historically related to fiscal determinations (at the start of the transition period to the IFRS); and (v) poor protection of creditors (Araujo & Funchal, 2009); and (vi) inefficiency of the justice system (Anderson, 1999).

2.2 Derivative Financial Instruments

The origin of the derivatives is uncertain, but it is believed that they arose even in antiquity due to the need to speed up and enhance the safety of commodity trading. These instruments were created as risk transfer agreements without the transfer of the main asset (Carvalho, 1999).

In their modern form, derivatives are the financial instruments created to mitigate risks and have represented an important evolution in the capital market. Nevertheless, their use goes far beyond the containment of risks by market agents, and can also be used to take risks, which flees from their original proposal.

According to Souza (2014), derivatives are the most used tools by companies for the management of their financial risks. They play a role far beyond risk mitigators though, and may be the very source of risk.

Financial institutions, in particular banking institutions, are exposed to various financial risks due to the nature of their operations. To manage these risks, the banks use derivative financial instruments, which are considered the most efficient tools for this end. In addition to using derivatives to reduce exposure to financial risks, institutions can also conduct arbitrage and speculation operations with these instruments (Venkatachalam, 1996).

For the large investor Warren Buffet, derivatives are a weapon of mass destruction, but they have great utility to protect companies against financial risks if used intelligently (personal communication, June 17, 2015)[2]. The clever use cited by Buffet could be translated as the use of derivatives for *hedging* structures, which would be done to reduce the volatility of the company's results, and not for leverage and exposure to risks as would happen in speculation strategies.

According to Hull (2016), speculation with derivatives gives life to the market, but it must be done by companies constituted for this purpose, never by companies active in the real economy.

From the companies' perspective, in particular financial institutions, the accounting records of derivative financial instruments should always be registered at their fair value. In this respect, IAS 39, IFRS 9 and Bacen Circular Letter Nr. 3.082/2002 (which represented a significant change at the time) do not present divergences in the treatment. All of the above standards stipulate that these instruments have to be recorded in the companies' balance sheets at their fair value. For Souza (2014), however, the fair value record is not sufficient to show the risks associated with these instruments.

Derivatives can be assets or liabilities for the institutions, depending on their fair value, and their income can be accounted for in a specific line in the income statement for the year (DRE) or in the balance sheet, if they are accounted for as *hedge accounting*, reducing the volatility of the company's income and eliminating the accounting asymmetry of the net equity[3] (Chiqueto, 2014). Not every *hedge* can be accounted for as *hedge accounting* though. To receive the *hedge accounting* treatment, the operation needs to comply with the requisites of the standard. In addition, the entity may choose not to designate the derivatives as *hedge accounting*. In this case, the risks are protected, but the volatility remains in the income.

Thus, derivatives that are not designated for *hedge accounting* are accounted for in the same way as derivatives for the purpose of speculation (Chiqueto, 2014).

2 Note: In an interview with AFRWeekend on June 17, 2015, Warren Buffet described derivatives as "*weapons of mass destruction*" and further completed: "*derivatives, lend themselves to huge amounts of speculation*". . . "*That does not mean they cannot be used intelligently. We use them in our utility operation in terms of hedging input costs, for some short term contracts, converting fixed to floating rates for fixed income investments and foreign exchange, they serve a useful purpose but do have that mass destruction potential*".

3 Accounting asymmetry: asset object affects the NE and the corresponding derivative affects the income.

Hedge accounting is an optional practice and both IAS 39 and the Central Bank Standard require restrictive conditions for its adoption. According to Chiqueto (2014), entities need incentives for this accounting choice. One such incentive may be the intention to eliminate volatility from the income to increase the price of the company's shares. Another reason may be the favoring of analysts ' expectation to avoid negative stock price reactions.

Nevertheless, one can realize how sensitive the companies' income can be to the choices involving derivatives, whether to take risks or even to protect themselves against risks and prevent this from affecting their income. Therefore, this research aims to seek evidence that this important line in the financial statements can influence the market value of banks in Brazil and the world, that is, the derivatives are expected to be a relevant value.

2.3 *Value Relevance* and Derivatives

Accounting information, when relevant, can change the beliefs of economic agents and thus influence the market value of companies, as this information can give signals about the future economic benefits these agents may have access to (Almeida, 2010).

According to Ohlson (1995), accounting information is relevant to determine the company value, and some relevant value events can affect expected future income as opposed to the current income, that is, accounting values incorporate some relevant value events only after a time interval.

In addition, for Barth, Beaver and Landsman (2001), a book value is considered relevant if it associates a prediction with market values. In addition to defining the relevance of accounting information for the company's market value, Dalmácio, Lima, Martins, and Rezende (2011) argue that the initial milestone of research on the role of accounting information in capital markets was the work of Ball and Brown (1968), in which they investigated the existence of the relationship between accounting profit and stock price and verified that the accounting figures were able to offer information to the capital market. Beaver *et al*. (1979), based on the studies of Ball and Brown (1968), found a positive correlation between changes in accounting income and stock prices.

In this context, accounting information is extremely important, given that accounting is an instrument for breaking information asymmetry between the market agents (managers, investors, analysts, creditors, regulators, among others) (Scott, 2012).

According to Lima (2013), accounting information is one of the main mechanisms for breaking the information asymmetry and contributes to the investors' decision-making process. This happens when one party has more access to information than the other and this leads to increased risk, influencing the probability of losses for this investor.

According to Silva (2013), the adoption of IFRS enabled an increase in the informational content and this fact is useful for analysts, shareholders, regulators, and executives. Particularly the analysts play an important role in the capital market, as they provide information on the performance of the companies they monitor, which may contribute to reducing the information asymmetry between the agents. When the IFRS were adopted, these professionals gained access to more useful accounting information for their forecasts, as the level of disclosure increased, also according to Silva (2013). In this context, investors gained access to more accurate and therefore more useful forecasts in the decision-making process.

In addition to profit, accounting data, such as the income from derivatives, can influence the market value of the company, as operations with these instruments represent a challenge for accounting itself (Lima and Lopes, 2001) and can significantly affect the company's profit (Galdi and Pereira, 2007). In their research, Koonce, Miller, and Winchel (2015) found that choices involving derivatives in a company and their regulation influence investors' reactions.

The fair value accounting of derivative financial instruments is an important foundation of IFRS, but it may be related to the increased volatility of the companies' income and this may represent a risk to investors, which could affect the market value of these companies (Chiqueto, 2014).

Venkatachalam (1996) verified the usefulness of derivative instruments in the banks' risk management and found that changes in the fair value of these instruments help explain changes in the companies' market value. In addition, the author found that, on average, banks use derivatives to reduce the risk of items on their balance sheets, but a significant number of institutions may have used these instruments to take additional risks, rather than reduce the risk through *hedging* strategies.

Changes in the companies' market value may be associated with the market agents' perceived risk and this risk may be associated with the volatility of the companies' income. Some studies appoint that profit volatility is negatively associated with companies' market value, such as Allayannis and Weston (2001).

2.4 Aspects of Basel III on Risk and Derivatives

One of the biggest financial events of recent decades, the global financial crisis (or *sub-prime* crisis) brought to the foreground an issue of extreme relevance for the capital market: the importance of financial institutions and the consequent need for proper management of their financial instruments, especially derivatives.

According to Hellmann, Murdock and Stiglitz (2000), over the past two decades, the frequency of banking system crises has been growing significantly, and these crises are important not only for the devastation they cause in a particular institution, but throughout the economy. Prudential regulation (Basel agreements) is intended to protect the global banking system against this type of problem.

In his work, Moshirian (2011) cites the role of the *sub-prime* crisis as a trigger for the profound changes in the financial sector in the world, especially with regard to the regulation and monitoring of risks inherent in the sector.

In response to these institutions' fragility in the face of the crisis, the BIS has developed a new set of capital and risk requirements, through the Basel Committee, for banks around the globe. This new phase of the Basel requirements became known as the Basel III Agreement.

This agreement is a set of new measures to strengthen the regulation, supervision, and risk management of the global banking sector. The new measures basically aim: to improve the ability of the financial sector to absorb shocks arising from economic stress; to improve risk management and governance and to strengthen the transparency of the sector's disclosures (BIS, 2015). For Bacen (2017), Basel III is intended to improve the ability of financial institutions to absorb shocks.

For Stiglitz (1993), regulation can present positive aspects for the market, reducing the possibility of events that could compromise the stability of the financial system, if it is well planned.

3. Method

3.1 Sample

Financial institutions from several countries were selected for the study. The Brazilian sample consists of the 20 financial institutions with shares traded on BM&FBOVESPA, from 2005 to 2015. The mandatory disclosure in IFRS by these institutions began in 2010. Thus, the period permits an analysis of the derivatives' *value relevance* before and after the institutions' adoption of the IFRS. The data were collected in the Bloomberg database, in Explanatory Notes to the financial statements published by the institutions available on the BM&FBOVESPA website and in the IR of each company. All the financial data of the banks in the Brazilian sample were collected in *reais*.

For the other countries, the world banks present in the *Bloomberg* database were analyzed with data referring to the period from 2005 to 2015. The period was chosen due to the deadline for the adoption of the International Financial Reporting Standards (IFRS) by most countries. All financial data were collected in dollars for the banks of the world sample. Financial institutions from 140 jurisdictions were analyzed, totaling 1,853 financial institutions.

The segregation into two samples (Brazilian banks and banks from other countries) aims to verify whether the change in the fair value of the derivatives linked to the adoption of IFRS is relevant specifically for the financial institutions in Brazil compared to those of other countries.

3.2 Model and Variables

This theoretical-empirical research uses the multivariate panel data analysis technique with robust errors for all models. In addition, Chow's F-test, the Breusch-Pagan and the Hausman test were performed to verify the fitness of these models.

As this is a *value relevance* study, the impact of the accounting variables Earnings per Share (EPS) and Book Value per Share (BVPS) on the Stock Price (P) of the financial institutions in the sample was investigated. To assess the derivatives' relevance, as well as the impact (relevance) of the adoption of IFRS, the change in the Fair Value of these instruments (*Der*) and the *dummy* variable for the adoption of IFRS were considered for the institutions of the two samples. To assess whether the change in the fair value of the derivatives associated with the adoption of IFRS (joint analysis) is relevant, the interaction of the two variables *Der* X IFRS was considered.

The breakdown of each variable can be checked in Table 1 below.

Table 1
Research Variables

Variable	Symbol	Definition	Expected Sign	Source Brazil/World	Authors
		Dependent			
Price	Price	Quote of Main Asset on Local Exchange in reais/dollars	+	Bloomberg	Collins, Maydew, and Weiss (1997)
		Independent			
Earnings per Share	EPS	Net Profit divided by the amount of outstanding shares	+	Bloomberg	Collins, Maydew, and Weiss (1997)
Net Equity per Share	BVPS	Average Net Equity divided by the amount of outstanding shares	+	Bloomberg	Collins, Maydew, and Weiss (1997)
Δ Fair Value of Total Derivatives	Der	Δ Fair Value of Total Derivatives ((Result with Derivatives)$_t$ - (Result with Derivatives)$_{t-1}$)	-	Explanatory Notes/ Bloomberg	Allayannis and Weston (2001)
IFRS	IFRS	Accounting system used for the production of information (*dummy* 1 for IFRS and 0 for other systems)	+	Explanatory Notes/ Bloomberg	Barth, Landsman and Lang (2008)
IFRS X Δ Fair Value of Total Derivatives	IFRS X Der	Interactive Variable	-	Calculated	Allayannis and Weston (2001)
		Control			
Firm Size	Siz	ln (Total Assets)	+	Bloomberg	Collins, Maydew, and Weiss (1997)
Basel index	Basel	Capital Index	+	Bloomberg	Scott (2012).
Monitoring by Analysts	Analysts	Number of analysts monitoring the company	+	Bloomberg	Carrete, Tavares and Yamaguchi (2014)
Crisis	Crisis	Sub-prime financial crisis (*dummy* 1 for the year 2008 and 0 for the remaining years of the samples)	-	Carvalho, Flores, Silva and Weffort (2016)	Carvalho, Flores, Silva and Weffort (2016)
Common Law Legal System	ComL	Legal System based on Common Law classification (*dummy* 1 for Common Law)	+	Does not apply/ JuriGlobe (2015)	Ali and Hwang (2000)
Civil Law Legal System	CivL	Legal System based on Civil Law classification (*dummy* 1 for Civil Law)	-	Does not apply/ JuriGlobe (2015)	Ali and Hwang (2000)
Mixed Law Legal System	MixL	Legal System based on Mixed Law classification (*dummy* 1 for Common Law and 0 for Civil Law)	-	Does not apply/ JuriGlobe (2015)	Ali and Hwang (2000)

Obs.: prepared by the authors.

Based on the models proposed by Venkatachalam (1996), Collins, Maydew and Weiss (1997) and Barth, Beaver and Landsman (2001), the panel data analyses for the Brazilian and global banks were developed based on the following equation:

$$P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \beta_4 IFRS_{it} + \beta_5 (IFRS_{it} \times Der_{it}) \sum_{1}^{n} \beta_n \, Controle_{it} + \mu_{it} \qquad (1)$$

Where:

- P_{it} = Closing Price of company i's Stock on the Local Exchange at the end of year *t*.
- EPS_{it} = Earnings per Share of company *i* in year *t*.
- $BVPS_{it}$ = Book Value per Share of company *i* in year *t*.
- Der_{it} = Variation in the Fair Value of company i's Total Derivatives in year *t*.
- $IFRS_{it}$ = *Dummy* variable for IFRS Adoption in company *i* in year *t*.
- $IFRS_{it}$ x Der_{it} = Interactive variable of IFRS adoption and Variation in the Fair Value of company i's Derivatives.
- *Control* = Firm Size, Basel Index, Monitoring by Analysts (number of analysts monitoring the company), and Crisis at time *t*. Additionally, for the global banks, the legal system (*Civil Law*, *Common Law* and *Mixed Law*) was considered.

According to Collins, Maydew, and Weiss (1997), some of the changes in firm value are due to variations in the company size over time. Another control variable of the model is the Basel Index, which represents the banks' degree of leverage. This variable was used because investors adjust their expectations to risk and the Basel index was used as a measure of this risk for financial institutions (Scott, 2012).

In addition, monitoring by analysts was used, because the analysts' recommendations may influence the market value of the companies that are more monitored, given that the market can react to their recommendations, taking into account that these agents act to increase the market efficiency (Carrete, Tavares & Yamaguchi, 2014).

Another important point was to consider the global financial crisis as a *dummy* variable for the year 2008, the summit of the crisis, to isolate the effects this event brought about for the companies' value. According to Carvalho, Flores, Silva, and Weffort (2016), the year 2008 represented a period of macroeconomic crisis, with a strong impact on the world economy after the news on the collapse of the bank Lehman Brothers.

For the world model, in addition, the legal system the companies are exposed to in their country of origin was considered. Taking into account that the regulatory environment significantly influences corporate governance, Goldschmidt, Licht, and Schwartz (2005) suggest that each country's legal standard may have an impact on the trajectory of governance systems and that, depending on the legal system, some countries tend to protect investors more and others to protect creditors more. Bushman and Smith (2003) state in their survey of studies involving the relevance of accounting information and corporate governance that *Common Law* countries are often *market-oriented* and offer high protection to non-controlling shareholders. In contrast, *civil law* countries are *bank-oriented* and offer low protection to non-controllers. In addition, Ali and Hwang (2000) concluded that *bank-oriented* countries present less relevant accounting reports than *market-oriented countries.* Therefore, we will analyze the type of legal system in each country where each institution is located, considering the classification of legal systems by *JuriGlobe - World Legal Systems* (research group of Law professors from the University of Ottawa), classified into *Civil Law* (or *Code Law*), *Common Law*, *Muslim Law*, *Customary Law* and *Mixed System*.

To verify the results, the following models were tested, based on the baseline *value relevance* model and the progressive inclusion of the variables proposed in this study, according to Table 2, as follows:

Table 2
Multivariate Models

Model	Type	Brazil Effect	World Effect
Model 1	Baseline	Fixed	Random[1]
Model 2	Der	Fixed	Fixed
Model 3	Der + IFRS	Random[1]	Fixed
Model 4	Der x IFRS (Interactive)	Random[1]	Fixed
Model 5	Complete (Includes Controls)	*Pools*[2]	Random[1]

Obs.: considers the Result of each bank's total derivatives.
[1] With robust errors, random effects were more appropriate, as the Hausman test showed no significance. In addition, with fixed effects, the dummy variable "IFRS" would be excluded.
[2] The F tests of Chow and Breusch-Pagan demonstrated *Pools* as the best model specification.
Description of the models used:

Model 1: $P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \mu_{it}$

Model 2: $P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \mu_{it}$

Model 3: $P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \beta_4 IFRS_{it} + \mu_{it}$

Model 4: $P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \beta_4 IFRS_{it} + \beta_5 (IFRS_{it} \times Der_{it}) + \mu_{it}$

Model 5: $P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \beta_4 IFRS_{it} + \beta_5 (IFRS_{it} \times Der_{it}) + \beta_6 Tam_{it} + \beta_7 Analise + \beta_8 Basel_{it} + \beta_9 Crise_{it} + \mu_{it}$

Model 5 (world): $P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \beta_4 IFRS_{it} + \beta_5 (IFRS_{it} \times Der_{it}) + \beta_6 Tam_{it} + \beta_7 Analise + \beta_8 Basel_{it} + \beta_9 Crise_{it} + \beta_{10} ComL_{it} + \beta_{11} CivL_{it} + \mu_{it}$

Model 1 is in accordance with the *Value Relevance* literature. In Model 2, the Result of Total Derivatives was added to analyze whether derivatives have relevant information content(*value relevant*), that is, whether it affects the market value of financial institutions, in addition to the variables of the Baseline Model. In Model 3, the *dummy* of the IFRS adoption was included to verify the relevance of the entry of the new accounting model in the results, that is, if the adoption of IFRS impacts the institutions' market value. In addition, Model 4 considers the interactive variable (IFRS X Change in the fair value of derivatives) to verify the relevance of the interaction of IFRS adoption and the Fair Value of Derivatives in the market value of those institutions. In Model 5, the Full model is considered, with the inclusion of control variables.

4. Results

4.1 In Brazil

The results presented in section 4.1 were obtained from the analysis of the sample of banks in the world between 2005 and 2015, based on the models presented in section 3.2.

The descriptive statistics of the variables used are presented below.

Table 3
Descriptive statistics of model variables in Brazil

Variable	Obs	Mean	Standard Deviation	Minimum	Maximum
Price	173	11.78	9.20	0.13	34.48
EPS	190	1.87	2.99	(9.40)	21.43
BVPS	189	11.27	13.34	0.22	131.78
Der	162	(196.593)	2,872,624	(22,800,000)	10,100,000
Size	207	9.48	2.21	3.99	14.15
Analysts	142	7.94	7.62	–	23
Basel	187	0.18	0.05	0.05	0.38

We can perceive the limited availability of data from the number of observations. In addition, the behavioral range of the *Der* shows how these values can be volatile, demonstrated by the high standard deviation. Despite a high standard deviation and great range for the variable of interest, outliers were not treated for the Brazilian sample, due to the limited availability of data.

The Pearson correlation table of the variables is presented below.

Table 4
Correlation of the Variables of the General Model in Brazil

Variable	Price	EPS	BVPS	Der	IFRS	Size	Analysts	Basel	Crisis
Price	1								
EPS	0.6509	1							
	0***								
BVPS	0.6676	0.5969	1						
	0***	0***							
Der	-0.0906	-0.0268	-0.0104	1					
	0.3071	0.7575	0.905						
IFRS	0.1049	0.1523	0.1818	-0.1482	1				
	0.1697	0.0359**	0.0123**	0.0598*					
Size	0.5999	0.1123	0.1125	-0.1387	0.1987	1			
	0***	0.124	0.1234	0.0872*	0.0041***				
Analysts	0.8054	0.6055	0.1672	-0.1198	0.2798	0.8523	1		
	0***	0***	0.0634*	0.1664	0.0007***	0***			
Basel	-0.0389	0.1709	0.0515	0.0635	-0.1337	-0.1106	-0.1936	1	
	0.6283	0.0254**	0.5039	0.4597	0.0681*	0.1318	0.0292**		
Crisis	-0.204	-0.0259	-0.0794	0.0158	-0.3464	-0.0099	-0.0169	0.0568	1
	0,0071***	0.7227	0.2776	0.8414	0***	0.8871	0.8414	0.44	

* 10% significance, * * 5% significance, * * * 1% significance

All correlations were calculated considering the entire time series. Although the correlation matrix expresses the linear relationship between the variables of the models, this analysis does not exhaust the measure of influence among them. This does not guarantee either that the signs of the correlations are maintained in the multivariate analysis.

We can observe the positive correlation between the variables *EPS* and *BVPS* and the *Price* of the banks in the sample, indicating how these values can be Relevant Values. In addition to these, the *Size* of the company and the number of analysts who monitor it also showed a considerable correlation with the *Price*. The Financial *Crisis* of 2008 also showed influence on the *Price*. The variable of interest *Der* showed no significant correlation. The adoption of *IFRS*, then, was correlated with *EPS* and *BVPS*, which may indicate changes in these values after the adoption. There was no influence on the *Price* in the correlation matrix though.

4.2 Multivariate Models

The results of the analysis are presented in Table 5 below.

Table 5
Results of the Model in Brazil

Variable	Fixed 1	Fixed 2	Random 3	Random 4	Pols 5
	0.5771	0.2438	0.7101	0.6870	0.3490
EPS	0.4679	0.2214	0.3927	0.4084	0.6681
	0.2352	0.2883	0,0706*	0,0925*	0.6117
	0.3546	0.2665	0.4787	0.4597	0.2497
BVPS	0.1610	0.1505	0.1221	0.1225	0.2120
	0.0426**	0.0968*	0.0001***	0.0002***	0.2636
		-0.0000	-0.0000	0.0000	0.0000
Der		0.0000	0.0000	0.0000	0.0000
		0.0361**	0.0001***	0.0003***	0.0003***
			-1.7284	-1.4949	-3.2861
IFRS			0.8766	0.8639	1.1424
			0.0486**	0.0835*	0.0151**
				-0.0000	-0.0000
IFRS X Der				0.0000	0.0000
				0***	0.0003***
					1.4924
Size					0.5063
					0,0133**
					0.4028
Analysts					0.1223
					0.0072***
					16.9009
Basel					9.3882
					0.0993*
					-6.6141
Crisis					1.0629
					0.0001***
	7.2879	9.1924	7.1940	7.1329	-10.2280
Constant	1.6662	1.3887	1.7282	1.6984	5.7578
	0.0005***	0***	0***	0***	0.1033
N	165	122	122	122	95
R^2	0.1416	0.0834	–	–	0.8310
R^2 *overall*	0.5346	0.2930	0.3453	0.4229	–
R^2 *between*	0.7299	0.5071	0.6074	0.6832	–
R^2 *within*	0.1416	0.0834	0.0758	0.0945	–
F	3.1804*	7.0292***	–	–	739.2860***
χ^2	–	–	68.4506***	237.9121***	–

* 10% significance, * * 5% significance, * * * 1% significance
1st line of the variable: coefficient
2nd line of the variable: standard error
3rd line of the variable: *p-value*

The obtained results confirm the *value relevance* literature for the Baseline Model, as *BVPS* was significant and positively related to the *Price*. This relationship loses relevance though when all variables (including controls) are added.

All variables of interest were significant and related to the *Price*. The coefficients are very small though. The *Der* variable exerted a neutral influence on the Price (when the coefficient was observed). The model presents this variable as significant and positively correlated with the Price though. This result can be considered an indication that Brazilian banks use derivatives to reduce risk (Venkatachalam, 1996), reducing the profit volatility (Allayannis and Weston, 2001).

The adoption of *IFRS* had a negative and relevant influence on the *Price*, corroborating Lima (2016), in that the Brazilian institutional environment imposes challenges on the existence of economic benefits associated with the adoption of IFRS. Another important point to consider is that the Central Bank has not yet permitted the full adoption of IFRS by financial institutions, causing these institutions to use their own GAAP, which combines the IFRS principles and specific instructions issued by the regulator.

Analysts and *Size* exert great influence on *Price* and *Crisis* exerted negative influence on the Price, as expected. *Basel* also presented a significant value coefficient on the *Price*, which can signal that investors are risk-averse.

Analyzing the interaction between *IFRS* x *Der*, a neutral influence on the Price is verified (when the coefficient is observed), although the model presents this variable as significant and negatively correlated with the Price, as expected. This relationship can be explained by the fact that the Brazilian standard for financial institutions already considered fair value aspects and broad evidence of derivatives and financial *hedging* instruments long before the convergence. This confirms the assertion by Daske Hail, Leuz, and Verdi (2008) that the effect of the IFRS adoption is greater in countries whose local GAAP are more distant from IFRS.

Overall, the research hypothesis was weakly accepted for the Brazilian sample, given that the interactive variable *IFRS X Der* in the complete model was significant, but with an immaterial coefficient, that is, it cannot be affirmed that the change in the fair value of derivatives, associated with the adoption of IFRS, influenced the market value of the Brazilian financial institutions.

4.3 In the World

The results presented in section 4.3 were obtained from the analysis of the sample of banks in the world between 2005 and 2015, based on the models presented in section 3.2.

In Table 6, below, the Descriptive Statistics of the variables used in the global sample are shown:

Table 6
Descriptive Statistics of the Variables in the Global Model

Variable	Obs	Mean	Standard Deviation	Minimum	Maximum
Price	15.471	1.61	1.70	-2.09	6.32
EPS	14.030	-0.42	1.29	-3.05	2.63
BVPS	13.268	8.42	0.03	8.41	8.70
Der	1.575	2.41	2.32	-2.23	7.29
Size	15.792	7.41	2.24	2.47	13.04
Analysts	20.383	3.45	7.63	–	66.00
Basel[1]	11.552	0.011	0.79	-0.01	83.35

[1]Original data were used in the descriptive statistics before the treatment for outliers.

As noticed, much more data are available than the Brazilian sample but, for the data with Derivatives, the number of *missing values* is highly relevant. The irregular availability of data in the global sample is another limitation of this research. In addition, in view of the range of the behavior of the values and high standard deviations, treatments for outliers were performed in the global sample.

Table 7 below presents the Pearson's Correlation coefficients of the variables.

Table 7

Correlation of the Variables of the General Model in the World

Variable	Price	EPS	BVPS	Der	IFRS	Siz	Analysts	Basel	Crisis	Common Law	Civil Law
Price	1										
EPS	0.7024	1									
	0.0***										
BVPS	0.4079	0.4028	1								
	0.0***	0.0***									
Der	0.1896	0.2046	0.0042	1							
	0.0***	0.0***	0.8715								
IFRS	-0.0974	-0.014	0.0218	0.3321	1						
	0.0***	0.0969*	0.012**	0.0***							
Size	0.0423	0.0304	0.0195	0.3834	0.1452	1					
	0.0***	0.0***	0.025**	0.0***	0.0***						
Analysts	0.0232	0.0132	-0.0569	0.5527	0.1683	0.5137	1				
	0.0***	0.1178	0.0***	0.0***	0.0***	0.0***					
Basel	-0.0984	-0.1119	0.033	-0.0471	0.0987	-0.1068	-0.1007	1			
	0.0***	0.0***	0.0***	0.1183	0.0***	0.0***	0.0***				
Crisis	-0.0169	-0.0086	0.0057	0.0441	-0.0181	-0.0246	-0.0221	-0.0402	1		
	0.035**	0.309	0.5144	0.0805*	0.01***	0.0***	0.0***	0.0***			
Common Law	0.316	0.2233	-0.0672	0.2435	-0.4227	-0.2438	-0.104	-0.0999	0	1	
	0.0***	0.0***	0.0***	0.0***	0.0***	0.0***	0.0***	0.0***	1		
Civil Law	0.1882	0.1868	0.2153	0.234	0.3499	0.0549	0.0249	0.0519	0	-0.5277	1
	0.0***	0.0***	0.0***	0.0***	0.0***	0.0***	0.0***	0.0***	1	0.0***	

* 10% significance, * * 5% significance, * * * 1% significance

The correlations of the variables of the global sample were also calculated considering the entire time series. This analysis does not exhaust the measure of influence between the variables either and this does not guarantee either that the signs of the correlations will be maintained in the multivariate analysis.

It can be observed that, like in the Brazilian sample, the variables *EPS* and *BVPS* are positively correlated with the *Price* for the sample banks, indicating that the values are Relevant Values. In addition, all other variables were largely correlated with the *Price*, including the *Der*.

The adoption of *IFRS* was correlated with *EPS*, *NES*, and *Der*. In addition, it exerted influence on the *Price*, which may signal that the adoption of *IFRS* affected the market value of the companies in the sample. The correlation was small and negative though.

It is important to emphasize that for the analysis of the Brazilian sample as well as for the world sample, we cannot accept or reject the research hypothesis based on the analysis of the correlation matrix only. This analysis is a step in the exploration of the data and is intended to signal the individual behavior and the linear relationship between the variables of the models.

4.3.1 Multivariate Models

The results of the analysis of the Model in the global sample are presented below.

Table 8
Results of the General Model in the World

Variable	Random 1	Fixed 2	Fixed 3	Fixed 4	Random 5
EPS	0.2999	0.1367	0.1356	0.1358	0.3778
	0.0125	0.0344	0.0343	0.0343	0.0349
	0.0000***	0.0001***	0.0001***	0.0001***	0.0000***
BVPS	5.7282	3.0582	3.0489	3.0402	9.9140
	0.9037	1.0096	1.0101	0.9976	2.2299
	0.0000***	0.0026***	0.0027***	0.0025***	0.0000***
Der		-0.0270	-0.0282	-0.0148	0.0744
		0.0148	0.0148	0.0170	0.0264
		0.0676*	0.0584*	0.3870	0.0049***
IFRS			0.1605	0.2427	0.2174
			0.1073	0.1325	0.1309
			0.1356	0.0678*	0.0969*
IFRS X Der				-0.0269	-0.0618
				0.0284	0.0328
				0.3443	0.0598*
Size					0.0243
					0.0154
					0.1157
Analysts					-0.0011
					0.0048
					0.8132
Basel					-0.0000
					0.0000
					0.9401
Crisis					-0.2785
					0.0847
					0.0010***
CivL					1.1049
					0.1420
					0.0000***
ComL					1.2007
					0.1883
					0.0000***
Constant	-46.5020	-24.0190	-24.0240	-23.9829	-82.9189
	7.6116	8.4988	8.5019	8.4007	18.8045
	0.0000***	0.0049***	0.0050***	0.0045***	0.0000***
N	10.903	1.293	1.293	1.293	924
R^2	–	0.0361	0.0383	0.0393	–
R^2 *overall*	0.5032	0.4904	0.4843	0.4745	0.6063
R^2 *between*	0.5912	0.5579	0.5377	0.5215	0.6261
R^2 *within*	0.0379	0.0361	0.0383	0.0393	0.0605
F	–	8.7708***	7.2686***	5.8838***	–
χ^2	689.7238***	–	–	–	519.3324***

* 10% significance, * * 5% significance, * * * 1% significance
1st line of the variable: coefficient
2nd line of the variable: standard error
3rd line of the variable: *p-value*

To mitigate the impact of the *outliers*, continuous variables were *winsorized* in their highest and lowest percentiles at 1%. In addition, for better estimation, the Box-Cox transformation was carried out (Fávero, 2016).

The obtained results confirmed the *value relevance* literature for the Baseline Model, as *EPS* and *BVPS* were significant and positively related to the *Price*. This relationship is maintained in all models.

All variables of interest were significant and related to the *Price*. The variable *Der* was significantly and positively correlated with the Price, presenting an inverse to expected sign. This result indicates that banks around the world have generally used derivatives to reduce the risk (Venkatachalam, 1996), reducing the profit volatility (Allayannis and Weston, 2001).

The adoption of IFRS had a positive influence on the *Price*, corroborating Barth, Landsman, and Lang (2008), who concluded in their research that companies that adopted IFRS improved the quality of their accounting information and provide more relevance to their results.

Crisis and the Legal model (*CivL* and *ComL*) influence the *Price* and the *Crisis* exerted a negative influence on the *Price*, as expected. *Basel* also presented a significant value coefficient on the *Price*, which can signal that investors are risk-averse.

Analyzing the interaction between *IFRS* x *Der*, a significant and negative influence on the Price is verified, as expected. This relationship may not be clear though, as *Der* presented a positive sign and the adoption of IFRS may have worsened its relationship with the *Price.* This result may derive from the fact that many countries are included in the global sample and the effect of adopting IFRS may be distinct in each legislation.

Thus, at a 10% significance level, the research hypothesis was accepted for the global sample, given that the interactive variable *IFRS X Der* in the complete model was significant with the expected coefficient and sign, i.e., it can be affirmed that the change in the fair value of the derivatives, associated with the adoption of the IFRS, negatively influenced the market value of the global financial institutions. This result may be related to the increased volatility of the companies' income after the adoption of IFRS, resulting from the change in the fair value of the derivatives, as explained by Allayannis and Weston (2001).

4.4 Summary of Results

In Table 9, a summary of the results can be observed, considering the research hypothesis for the samples in Brazil and worldwide.

Table 9
Summary of Results in Brazil and the World

General Model in Brazil				
$P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \beta_4 IFRS_{it} + \beta_5 (IFRS_{it} \times Der_{it}) + \beta_6 Tam_{it} + \beta_7 Analise + \beta_8 Basel_{it} + \beta_9 Crise_{it} + \mu_{it}$				
Hypothesis	**Expected Sign of β[b]**	**Sign of β_5[b]**	***p-value***	**Result**
H_1	–	Null	0.0003***	Rejected
General Model in the World				
$P_{it} = \beta_0 + \beta_1 LPA_{it} + \beta_2 PLA_{it} + \beta_3 Der_{it} + \beta_4 IFRS_{it} + \beta_5 (IFRS_{it} \times Der_{it}) + \beta_6 Tam_{it} + \beta_7 Analise + \beta_8 Basel_{it} + \beta_9 Crise_{it} + \beta_{10} ComL_{it} + \beta_{11} CivL_{it} + \mu_{it}$				
Hypothesis	**Expected Sign of β[b]**	**Sign of β_5[b]**	***p-value***	**Result**
H_1	–	–	0.0598*	Not Rejected

For the Brazilian sample, the research hypothesis was weakly accepted, given that the interactive variable *IFRS X Der* in the complete model was significant, but with an immaterial coefficient, that is, it cannot be affirmed that the variation in the fair value of derivatives, associated with the adoption of IFRS, had an impact on the market value of the Brazilian institutions. For the global sample, the research hypothesis was accepted, at a 10% significance level, given that the interactive variable *IFRS X Der* in the complete model was significant with an expected coefficient and sign, i.e., it cannot be affirmed that the change in the fair value of derivatives, associated with the adoption of IFRS, negatively impacted the market value of the global financial institutions.

5. Final Considerations

This study aimed to investigate the *value relevance* relationship of the fair value of derivative financial instruments and whether this relationship has changed with the adoption of International Accounting Standards for financial institutions in Brazil and worldwide.

Through empirical analysis, we sought to verify whether the change in the fair value of derivatives, associated with the adoption of IFRS, had an impact on the market value of Brazilian and global financial institutions. To estimate the models, the panel data technique was used and adequacy tests were performed for the sake of better inference.

For the Brazilian sample, the research hypothesis was weakly accepted, given that the interactive variable *IFRS X Der* in the complete model was significant, but with an immaterial coefficient. Hence, it cannot be affirmed that the change in the fair value of derivatives, associated with the adoption of IFRS, has an impact on the market value of Brazilian financial institutions.

This result can be explained by the fact that the Brazilian standard for financial institutions already considered fair value aspects and broad evidence of derivatives and financial *hedging* instruments long before the convergence, confirming the statement by Daske, Hail, Leuz and Verdi (2008) that the effect of adopting IFRS is greater in countries whose local GAAP is further from IFRS.

Considering the Brazilian sample, the low availability of data in Brazil makes the empirical research difficult. The Brazilian capital market is still small and few companies are publicly traded, especially banks. Only 20 banks made up the sample, and the liquidity of the stock price of these banks is very low. Only 4 of these 20 banks are regularly traded.

For the global sample, the research hypothesis was accepted, at a 10% significance level, given that the interactive variable *IFRS X Der* in the complete model was significant with an expected coefficient and sign, i.e., it cannot be affirmed that the change in the fair value of derivatives, associated with the adoption of IFRS, negatively impacted the market value of the global financial institutions. This result may be related to the increased volatility of the companies' income after the adoption of IFRS, resulting from the change in the fair value of the derivatives, as explained by Allayannis and Weston (2001). Another point to consider for this result is that many countries are included in the global sample and the effect of adopting IFRS can be distinct in each legislation.

In addition, the results showed that, in general, Brazilian and global financial institutions have used derivatives to reduce risk (Venkatachalam, 1996), reducing profit volatility (Allayannis and Weston, 2001), as the change in the fair value of the derivatives (*Der*) was significantly and positively correlated with the market value of these institutions. Regarding IFRS, the results showed that the adoption of these standards by Brazilian financial institutions had a negative and relevant influence on the *Price*, indicating that the partial adoption of IFRS by financial institutions is translated as a synonym of risk, negatively affecting these institutions' market value, against expectations.

In short, we recognize both the empirical limitation of this work and its relevance. The research considering financial institutions is relevant and lacking treatment not only in Brazil and the results found show the importance of derivatives both for risk management and for the market value of these institutions. In addition, the investigation of the effects of financial instruments on the capital market is relevant given their importance and the associated risks. Another point to be highlighted is the inclusion of a new element to the *value relevance* literature, namely, the relationship of derivatives and the adoption of IFRS with company value. The topic can be deepened and treated with different approaches in future research. In addition, the limited treatment of the database may have compromised the analysis due to the high occurrence of *missing values*. This limitation suggests a continuation of the research with a data collection through the financial statements of banks around the world, instead of the use of databases for inference.

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