

UNIVERSIDADE DE SÃO PAULO  
FACULDADE DE ECONOMIA, ADMINISTRAÇÃO E CONTABILIDADE  
DEPARTAMENTO DE CONTABILIDADE E ATUÁRIA  
PROGRAMA DE PÓS-GRADUAÇÃO EM CONTROLADORIA E  
CONTABILIDADE

VERÔNICA DE FÁTIMA SANTANA

IFRS Adoption, Stock Price Synchronicity and Volatility

São Paulo  
2014

Prof. Dr. Marco Antonio Zago  
Reitor da Universidade de São Paulo

Prof. Dr. Adalberto Américo Fischmann  
Diretor da Faculdade de Economia, Administração e Contabilidade

Prof. Dr. Gerlando Augusto Sampaio Franco de Lima  
Chefe do Departamento de Contabilidade e Atuária

Prof. Dr. Andson Braga de Aguiar  
Coordenador do Programa de Pós-Graduação em Controladoria e Contabilidade

**VERÔNICA DE FÁTIMA SANTANA**

**IFRS Adoption, Stock Price Synchronicity and Volatility**

Dissertação apresentada ao Departamento de Contabilidade e Atuária da Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo como requisito parcial para a obtenção do título de Mestre em Ciências.

**Orientador: Prof. Dr. Francisco Henrique Figueiredo de Castro Junior**

Versão Corrigida  
(versão original disponível na Faculdade de Economia, Administração e Contabilidade)

**São Paulo  
2014**

Autorizo a reprodução e divulgação total ou parcial deste trabalho, por qualquer meio convencional ou eletrônico, para fins de estudo e pesquisa, desde que citada a fonte.

### **FICHA CATALOGRÁFICA**

Elaborada pela Seção de Processamento Técnico do SBD/FEA/USP

Santana, Verônica de Fátima

IFRS adoption, stock price synchronicity and volatility / Verônica de Fátima Santana. – São Paulo, 2014.

129 p.

Dissertação (Mestrado) – Universidade de São Paulo, 2015.

Orientador: Francisco Henrique Figueiredo de Castro Junior.

1. Contabilidade internacional 2. Divulgação de informações financeiras 3. Sincronicidade 4. Finanças 5. Volatilidade I. Universidade de São Paulo. Faculdade de Economia, Administração e Contabilidade. II. Título.

CDD – 657.6

*À minha família, por tudo.*



# Agradecimentos

Agradeço primeiramente ao apoio de meus pais, Clélia e Judas Tadeu, meus padrinhos-pais, Célia e José, e meu irmão, Félix, pelo contínuo incentivo para estudar e o conseqüente sacrifício da distância. Agradeço também ao apoio financeiro da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), sem o qual essa pesquisa não teria sido feita.

Agradeço ao Prof. Henrique Castro, por aceitar me orientar, por acreditar no meu trabalho e ouvir os meus problemas. E à Prof.<sup>a</sup> Flávia Dalmácio, pelos primeiros encaminhamentos e orientações na FEA.

Agradeço aos membros da banca de qualificação, Prof. Lucas Ayres e Prof.<sup>a</sup> Ana Gisbert Clemente, pela rica discussão promovida.

Aos professores do departamento, em especial ao Prof. Bruno Salotti, Prof. Fernando Murcia, e Prof.<sup>a</sup> Silvia Casa Nova. E ao Prof. Gerlando Lima, pela amizade, pelos incentivos e pelo Congresso. Falando em Congresso, agradeço ao Rodolfo, José Renato e agregados, que tornaram a temporada na FEA mais produtiva e, claro, divertida.

À Prof.<sup>a</sup> Isabel Lourenço, pelo choque de pesquisa e pela imersão ao IFRS. E, claro, ao “time IFRS”, Alex e Raquel, grandes colegas de estudos e pesquisas e, principalmente, grandes amigos, pelo tão divertido sofrimento acadêmico que passamos juntos. Falar de normas internacionais nunca mais será a mesma coisa depois de vocês.

Agradeço aos membros do 11A, Cláudio, Marília, Angélica, Simone (e a agregada Bianca, e também a Ademir), pela amizade e acolhimento nessa cidade tão grande. E nesse quesito também à minha tia, Rita, e às minhas primas, Natália e Ana Paula, pelos socorros do dia a dia.

Aos amigos e colegas da melhor turma de todas, em especial a Diane, Talles, Patrícia, Cíntia, Sara, Cristiane, André, Sandro e Flores, pela amizade, apoio e discussões, acadêmi-

cas ou não. E, claro, aos funcionários da Coordenação do Programa, da Secretaria da Pós-Graduação e da Biblioteca, pela infinita paciência e atenção.

Por fim agradeço também aos professores, e antigos colegas, da Universidade Federal de Viçosa (UFV) pelos primeiros incentivos ao ensino e à pesquisa, e por promover tanto crescimento.

Enfim, agradeço a todos que, direta ou indiretamente, contribuíram com as palavras escritas neste trabalho.

Obrigada!

*Anything that happens, happens.  
Anything that, in happening, causes something else to happen,  
causes something else to happen.  
Anything that, in happening, causes itself to happen again,  
happens again.*

*It doesn't necessarily do it in chronological order, though.*

---

DOUGLAS ADAMS



# Resumo

Santana, V. F. (2014). *IFRS adoption, stock price synchronicity and volatility* (Dissertação de Mestrado, Universidade de São Paulo, São Paulo).

Esta pesquisa buscou investigar se, e de que forma, a adoção dos *International Financial Reporting Standards* (IFRS) afetou a sincronicidade dos preços das ações no mercado de capitais brasileiro e como isso se refletiu no comportamento dos riscos idiosincrático e sistemático. Para tanto, foi feita uma análise de regressão associando o período de Transição (2008 e 2009) e o de Pós-Adoção (a partir de 2010) com uma medida de sincronicidade dos preços das ações, controlando por aspectos estruturais que afetam o funcionamento do mercado de capitais e por aspectos individuais das firmas que afetam a incorporação de informações em seus preços e seus incentivos para reportar demonstrações financeiras transparentes. Em seguida, foram construídas séries de volatilidade decompostas em dois componentes: o mercado em geral (capturando o risco sistemático) e específica da firma (capturando o risco idiosincrático), segundo a metodologia de Campbell et al. (2001), e foi feita uma análise baseada em testes para identificar tendências nessas séries. O estudo previa que se a adoção das IFRS foi capaz de aumentar a quantidade de informação específica das firmas incorporada nos preços das ações, então ela poderia (i) *diminuir* a sincronicidade (J. Kim & Shi, 2012), e a volatilidade idiosincrática teria se tornado *mais intensa* em relação à volatilidade sistemática; ou (ii) ela poderia *aumentar* a sincronicidade (Beuselinck et al., 2010; Dasgupta et al., 2010), e a volatilidade idiosincrática teria, então, se tornado *menos intensa*. Os resultados confirmaram que a sincronicidade *diminuiu* a partir do período de Pós-Adoção, em consonância com a visão de J. Kim & Shi (2012), de que o efeito redutor pode ser mais intenso para países menos desenvolvidos, que tendem a ter mercados mais sincronizados (Morck et al, 2000) e porque a melhora no ambiente informacional funciona como uma substituta para o ambiente institucional fraco. Esse resultado indica que os preços das ações se tornaram mais informativos (Durnev, Morck, & Yeung, 2004), tornando o mercado menos obscuro (K. Li et al., 2003) e melhor capaz de alocar recursos eficientemente (Wurgler, 2000; Habib, 2008). No entanto, apesar de uma análise visual das séries de volatilidade mostrar uma leve tendência crescente para a série do nível da firma, os testes estatísticos não puderam identificar qualquer tendência significativa, então, somente a primeira parte da hipótese pôde ser confirmada. Contudo, apesar dessa limitação e das possíveis ressalvas quanto aos modelos que foram usados, esta pesquisa fornece evidências de que a adoção das IFRS trouxe mudanças positivas para o funcionamento do mercado de capitais brasileiro.

Palavras-chave: Contabilidade Internacional. Divulgação de Informações financeiras. Sincronicidade. Finanças. Volatilidade.



# Abstract

Santana, V. F. (2014). *IFRS adoption, stock price synchronicity and volatility* (Master's thesis, University of São Paulo, São Paulo).

This research aimed to investigate whether and how the adoption of the International Financial Reporting Standards (IFRS) has affected the synchronicity of stock prices in the Brazilian capital market and how this was reflected in the behavior of idiosyncratic and systematic risk. In order to do so, it was first conducted a regression analysis associating the Transition (2008 and 2009) and the Post-Adoption (from 2010) period with a measure of stock price synchronicity, controlling for structural aspects that affect the functioning of stock markets as a whole and for aspects of individual firms that affect the process of incorporating information into their stock prices and their incentives to report transparent financial statements. Then, it was built series of volatility decomposed into two components, market-wide (capturing the systematic risk) and firm-specific (capturing the idiosyncratic risk), according to the methodology of Campbell et al. (2001), and performed an analysis based on tests for identifying trends on the series. The study predicted that if IFRS was able to increase the amount of firm-specific information incorporated into stock prices, it could (i) *reduce* synchronicity (J. Kim & Shi, 2012), and idiosyncratic volatility would have become *more intense* relatively to systematic volatility; or (ii) it could *increase* synchronicity (Beuselinck et al., 2010; Dasgupta et al., 2010), and idiosyncratic volatility would, then, have become *less intense*. The results confirmed that stock price synchronicity has *decreased* from the Post-Adoption period, in line with the view of J. Kim & Shi (2012), that the reducing effect can be more intense for less developed countries, which tend to be more synchronous (Morck et al, 2000) and because the improvement in the informational environment acts as a substitute to the weak institutional environment. This results indicate that stock prices became more informative (Durnev, Morck, & Yeung, 2004), making the market less obscure (K. Li et al., 2003) and better able to efficiently allocate resources (Wurgler, 2000; Habib, 2008). However, although a visual analysis of the volatility series suggests a slightly upward trend for the firm-level series, the statistical tests were not able to identify any significant trend, so, only the first part of the hypothesis could be confirmed. Nevertheless, despite of this limitation and the possible caveats with the models that were used, this research provides evidence that IFRS adoption brought positive changes to the functioning of the Brazilian capital market.

Keywords: International Accounting. Disclosure of financial Information. Synchronicity. Finance. Volatility.



# Contents

<b>List of Tables</b>	<b>3</b>
<b>List of Figures</b>	<b>5</b>
<b>Acronyms</b>	<b>7</b>
<b>1 Introduction</b>	<b>9</b>
1.1 Context and Research Question . . . . .	9
1.2 Objectives . . . . .	11
1.3 Hypotheses . . . . .	12
1.4 Contributions . . . . .	14
1.5 Content Outline . . . . .	15
<b>2 Background and Hypotheses Development</b>	<b>17</b>
2.1 Information Constraints and Stock Price Synchronicity . . . . .	17
2.1.1 Informational Asymmetry . . . . .	17
2.1.2 Information Theory . . . . .	19
2.2 Factors Associated with Stock Price Synchronicity . . . . .	20
2.2.1 The Influence of the Financial Reporting System . . . . .	22
2.3 The International Financial Reporting Standards (IFRS) . . . . .	24
2.3.1 IFRS Adoption throughout the World . . . . .	24
2.3.2 The Economic Effects of IFRS . . . . .	26
2.3.2.1 The Role of Enforcement . . . . .	27
2.3.2.2 The Effects of IFRS in Stock Price Synchronicity . . . . .	30
2.4 IFRS into the Brazilian Environment . . . . .	33
2.4.1 IFRS Adoption in Brazil . . . . .	33
2.4.2 Early Adoption . . . . .	35
2.4.3 Enforcement in Brazil . . . . .	36
2.4.4 The Economic Effects of IFRS in Brazil . . . . .	40
<b>3 Research Design</b>	<b>43</b>
3.1 Stock Price Synchronicity Analysis . . . . .	43

3.1.1	Sample and Data . . . . .	43
3.1.2	Measure of Stock Price Synchronicity . . . . .	44
3.1.3	Empirical Modelling . . . . .	48
3.1.3.1	Variables of Interest and Control Variables . . . . .	48
3.1.3.2	Controlling for Country-level Factors . . . . .	49
3.1.3.3	Controlling for Firm-level Factors . . . . .	50
3.1.3.4	Empirical Model for Stock Price Synchronicity . . . . .	54
3.1.3.5	Estimation . . . . .	55
3.2	Volatility Analysis . . . . .	59
3.2.1	Volatility Decomposition . . . . .	59
3.2.1.1	Estimation . . . . .	61
3.2.2	Trend Analysis of the Volatility Series . . . . .	62
3.2.2.1	Testing Deterministic and Stochastic Trends . . . . .	65
<b>4</b>	<b>Empirical Results</b>	<b>69</b>
4.1	Stock Price Synchronicity Analysis . . . . .	69
4.1.1	Descriptive Statistics . . . . .	69
4.1.2	Regression Results . . . . .	75
4.2	Volatility Analysis . . . . .	79
<b>5</b>	<b>Concluding Remarks</b>	<b>83</b>
	<b>References</b>	<b>87</b>
<b>A</b>	<b>Firms included in the Sample</b>	<b>99</b>
<b>B</b>	<b>Factor Analysis</b>	<b>105</b>
B.1	Country-Level Variables . . . . .	105
B.2	Firm-Level Variables . . . . .	107
<b>C</b>	<b>Results with Alternative Measures</b>	<b>111</b>
C.1	Synchronicity Analysis . . . . .	111
C.2	Volatility Analysis . . . . .	114

# List of Tables

3.1	Final Sample Size . . . . .	44
3.2	Annual Sample Size for the Market Model . . . . .	46
4.1	Descriptive Statistics by Period of Analysis . . . . .	70
4.2	Correlation Matrix – Synchronicity and Country-Level Variables . . . . .	72
4.3	Correlation Matrix – Synchronicity and Firm-Level Variables . . . . .	73
4.4	Correlation Matrix – Firm-Level and Country-Level Variables . . . . .	74
4.5	Regression Results . . . . .	77
4.6	Tests for Identifying Trends – Full Period . . . . .	80
4.7	Tests for Identifying Trends – Post Adoption Period . . . . .	81
A.1	Firms Included in the Sample . . . . .	99
B.1	Country-Level Variables: Factors Extracted . . . . .	106
B.2	Country-Level Variables: Communalities . . . . .	106
B.3	Country-Level Variables: Rotated Component Matrix . . . . .	107
B.4	Firm-Level Variables: Factors Extracted . . . . .	108
B.5	Firm-Level Variables: Communalities . . . . .	108
B.6	Firm-Level Variables: Rotated Component Matrix . . . . .	109
C.1	Regression Results: Four Alternative Models to Calculate Synchronicity . .	113
C.2	Tests for Identifying Trends – Full Period (Series with Market Capitaliza- tion Weighing Criterion) . . . . .	114
C.3	Tests for Identifying Trends – Post Adoption Period (Series with Market Capitalization Weighing Criterion) . . . . .	115



# List of Figures

2.1	Market Capitalization as Percentage of GDP: Brazil and other IFRS adopters	36
2.2	Worldwide Governance Indicators: Brazil and other IFRS adopters . . . .	38
3.1	R-Squared Comparison: Equally <i>versus</i> Value-Weighted Market Index . . .	47
3.2	R-Squared Comparison: One-Factor <i>versus</i> Two-Factors Model . . . . .	47
4.1	Firm and Market Volatility . . . . .	79
4.2	Firm and Market Volatility at the Post-Adoption Period . . . . .	81
B.1	Country-Level Variables: Scree Plot . . . . .	106
B.2	Firm-Level Variables: Scree Plot . . . . .	108
C.1	R-Squared Comparison: Four Alternative Models . . . . .	111
C.2	Synchronicity Comparison: Four Alternative Models . . . . .	112
C.3	Firm and Market Volatility (Market Capitalization Weighing Criterion) . .	114
C.4	Firm and Market Volatility at the Post-Adoption Period (Market Capital- ization Weighing Criterion) . . . . .	115



# Acronyms

**ACF** Autocorrelation Functions. 63

**ADF** Augmented Dickey-Fuller Test. 65, 66, 80, 114

**ADR** American Depositary Receipts. 54, 70, 72, 75

**CAPM** Capital Asset Pricing Model. 10, 60, 61, 80, 84, 85

**CDI** *Certificado de Depósito Interfinanceiro*. 60

**CPC** *Comitê de Pronunciamentos Contábeis*. 34, 35, 39

**CVM** *Comissão de Valores Mobiliários*. 33, 34, 39, 40, 78, 83

**EMH** Efficient Market Hypothesis. 18

**G20** Group of Twenty. 25

**GAAP** Generally Accepted Accounting Principles. 26

**GDP** Gross Domestic Product. 20, 21, 34, 36, 49, 66, 69, 70, 71, 72, 75, 105, 106

**GLS** Generalized Least Squares. 57

**IAS** International Accounting Standards. 26, 35

**IASB** International Accounting Standards Board. 14, 25, 26, 34, 35

**IASC** International Accounting Standards Committee. 24, 25

**IBGE** *Instituto Brasileiro de Geografia e Estatística*. 49

**IFRS** International Financial Reporting Standards. 9, 10, 11, 12, 13, 14, 15, 17, 18, 20, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 39, 40, 43, 48, 49, 51, 52, 53, 54, 62, 76, 77, 78, 79, 80, 83, 85

**IGP-M** *Índice Geral de Preços de Mercado*. 49

**KPSS** Kwiatkowski-Phillips-Schmidt-Shin Test. 66, 80, 114

**OLS** Ordinary Least Squares. 57, 58, 59

**PP** Phillips-Perron Test. 66, 80, 114

**RTT** *Regime Tributário de Transição*. 34

**S&P** Standards & Poor's. 43, 46, 47, 51, 111, 112

**SEC** Security Exchange Commission. 54

**SIC** Standard Industry Classification. 43, 51, 99

# 1 Introduction

## 1.1 Context and Research Question

This study aims to examine whether and how the adoption of the International Financial Reporting Standards (IFRS) in Brazil has affected the movement of stock prices and the consequent reflection in their volatility at the firm and at the market level. There are several studies analyzing the economic and financial effects of IFRS around the world (e.g., Daske, Hail, Leuz, & Verdi, 2008; S. Li, 2010; Brüggemann, Hitz, & Sellhorn, 2013), including in Brazil (e.g., J. Lima, 2010; V. Lima, 2011; R. Silva, 2013; Lourenço, Branco, & Dias Curto, 2013). However, the way by which IFRS affects risk calculations remains poorly explored, especially when considering the financial environment characteristics of an emerging economy like Brazil.

The means by which IFRS adoption may affect the financial markets are mainly related to the improvement in the informational environment (e.g., Beuselinck, Joos, Khurana, & Van der Meulen, 2010; Dasgupta, Gan, & Gao, 2010; J. Kim & Shi, 2012), but there is also some discussion about its relation to the institutional and legal systems (Christensen, Hail, & Leuz, 2013), which also affects some financial market features and agents' behavior (La Porta, López Silanes, Shleifer, & Vishny, 1998).

IFRS adoption is largely believed to affect the amount and the quality of firm-specific information available to the financial market's agents (e.g., Daske & Gebhardt, 2006; Barth, Landsman, & Lang, 2008; H. Chen, Tang, Jiang, & Lin, 2010; Ahmed, Neel, & Wang, 2013) and, regardless of the means, higher quality information about firm-specific events may have some implications for the behavior of individual stocks and their components of risk. This may happen because it affects the relation between two basic components of stock prices: (i) factors related to the economy as a whole (market-level shocks), that reflect the systematic risk, and (ii) factors related to specific features of each firm (firm-level shocks), that reflects the idiosyncratic risk. The more representative is the

systematic risk, the less firm-specific information is incorporated into stock prices and the more they tend to move together in the market, once they basically reflect market-wide events.

The extent to which individual stock prices move together in a market is known as stock price synchronicity. Synchronicity represents the relative amount of firm-specific information seized by stock prices. If it is difficult to price firm-specific fundamental information and market-wide risk factors are excessively taken into account by investors, the stock price synchronicity will be higher (Hsin & Tseng, 2012). Operationally, synchronicity is usually defined as the explanatory power of the market model,  $R^2$  (Roll, 1988; Morck, Yeung, & Yu, 2000; K. Chan & Hameed, 2006), which captures the average market-wide variation across stocks in a market, according to the concepts of the Capital Asset Pricing Model (CAPM).

If the most important factors explaining stock prices movements are market-level factors, the percentage of systematic risk should be high (Hsin & Tseng, 2012), so as the explanatory power of the market model; which means a higher stock price synchronicity (Morck et al., 2000). Assuming that the relation between idiosyncratic and systematic risk provided by the the CAPM is valid, if stock prices reflect more firm-specific information, the  $R^2$  will be lower, potentially because they are reflecting a greater idiosyncratic noise (Roll, 1988). Therefore, as the incorporation of firm-specific information into stock prices increases, the idiosyncratic volatility relative to the systematic volatility is expected to increase.

Stock price synchronicity is an economically important concept for a number of reasons. K. Li, Morck, Yang, and Yeung (2010) separate these reasons into two classes, the first one is related to portfolio risk calculation and option valuation while the second one has to do with its impacts on real economy. Regarding its impacts on real economy, stock price synchronicity may be a symptom of market inefficiencies (Wurgler, 2000; K. Li et al., 2010; Habib, 2008). A more developed financial market is believed to improve capital allocation by providing external finance to firms (Bena & Ondko, 2012), allowing higher investments in growing industries and pulling out funds of declining ones (Pang & Wu, 2009). Wurgler (2000) showed that lower stock price synchronicity is one of the factors by which financial markets improve capital allocation, pointing out that informativeness of stock prices facilitates efficient investment. For the author, the information efficiency of the stock market matters to the real economy.

The level of volatility at the firm and market level can be considered evidence of information efficiency (Durnev, Morck, & Yeung, 2004). Informativeness of stock prices concerns

the three components of their volatility – market, industry and firm-level, each one of them is related to a certain information category. If IFRS is able to change the amount and quality of firm-specific information available to the market, it changes the informativeness of stock prices at the firm-level relative to the other ones which is expected to affect synchronicity and the behavior of the components of volatility.

Campbell, Lettau, Malkiel, and Xu (2001) have studied the behavior of disaggregated volatilities in the United States through 1962 to 1997 and found that while the market and industry variances have been relatively stable, firm-level variance has presented a significant positive trend. That is, while the market as a whole has not become more volatile, the uncertainty on the level of individual firms has increased, increasing the difference between the systematic and the idiosyncratic risk. The authors found that, consistent with this increase in idiosyncratic risk, the correlations among individuals stocks and the explanatory power of the market model have declined. In other words, the extent to which stock prices move together has declined, that is, stock price synchronicity has decreased.

Therefore, assuming that IFRS, as a high quality financial reporting system, is capable to influence the informational environment by increasing the amount and quality of firm-specific information available to the market, increasing its relevance to stock price formation, the following question emerges: Has IFRS adoption affected synchronicity and, consequently, the behavior of stock prices volatility, changing the relation between the systematic and idiosyncratic risk in the Brazilian capital market?

## 1.2 Objectives

In order to answer the research question, the study aimed to analyze if and in which way IFRS adoption has affected the informational environment in the Brazilian capital market and how it has affected the behavior of idiosyncratic volatility and market volatility.

Specifically, the study went through the following steps:

1. Verify if IFRS adoption has reduced stock price synchronicity through the years of 2004 to 2013. The process of IFRS adoption in Brazil started in 2007 and the first financial statements according to the international standards were published for the year of 2008. Since 2010 all listed firms have mandatorily published IFRS financial statements. Details about the adoption can be seen in the Section 2.4 in Chapter

2. Therefore, the sample comprised accounting data from the four years that are available for the Post-Adoption period (2010, 2011, 2012 and 2013) and four years from the Pre-Adoption period (2004, 2005, 2006 and 2007), besides the Transition period (2008 and 2009).
2. Build volatility measures at the firm and market level through a decomposition analysis of stock volatility proposed by Campbell et al. (2001).
3. Analyze the behavior of the volatility series, searching for trends. The objective is to verify if the series has presented an upward or a downward trend, or if they have remained relatively constant. If IFRS adoption affected the amount of firm specific information incorporated into stock prices, one shall expect the firm volatility series to present a different trend compared to the market volatility.

### 1.3 Hypotheses

This section enumerates the hypotheses of the study, concisely explaining the main fundamentals of each one. Section 2.3.2.2 in Chapter 2 provides full background regarding the literature that relates corporate transparency to an improvement in the informational environment (e.g., Habib, 2008; Beuselinck et al., 2010; Dasgupta et al., 2010; J. Kim & Shi, 2012) and the Brazilian financial markets characteristics, namely low financial development, weak institutions and enforcement mechanisms (C. Anderson, 1999; La Porta et al., 1998; Kaufmann, Kraay, & Mastruzzi, 2007; Lopes & Walker, 2010), and highly concentrated ownership structures (Dami, Rogers, & Sousa Ribeiro, 2007; Hahn, Nossa, Teixeira, & Nossa, 2010) that may indicate poor investor protection (La Porta et al., 1998).

The hypotheses and their underlying basic rationale are as following:

**Hypothesis 1.** IFRS adoption has *reduced* stock price synchronicity and is related to a consequent *increase* in idiosyncratic volatility relative to systematic volatility.

The rationale underlying this hypothesis is that IFRS, as a high quality financial reporting system, has improved the informational environment in the Brazilian capital market, increasing the amount of firm-specific information incorporated into stock prices and, thus, reducing stock price synchronicity. With more firm-specific information incorporated

into stock prices, idiosyncratic volatility has become more intense relative to systematic volatility.

This effect can be explained according to the view of J. Kim and Shi (2012), who argues that once countries with poor investor protection, less developed financial system and a poorer corporate governance tend to present higher synchronicity, the IFRS reducing effect might be more intense for them. J. Kim and Shi (2012) also argue that even when the institutional environment is weak, the improvement in the firm-level informational environment may act as substitute to the weaker legal environment.

Another explanation for this effect could rely on the arguments of Christensen et al. (2013), who point out that the economic effects of IFRS adoption are most likely due to a bundle of changes in accounting standards and in enforcement. In this situation, IFRS adoption could have also brought changes in enforcement.

**Hypothesis 2.** IFRS adoption has *increased* stock price synchronicity and is related to a consequent *decrease* in idiosyncratic volatility relative to systematic volatility.

The rationale underlying this hypothesis is that increasing the amount and quality of firm-specific information has discouraged the collect and trade of private information, as pointed out by J. Kim and Shi (2012). Dasgupta et al. (2010) and Beuselinck et al. (2010) offer another possible explanation for this hypothesis. The authors explain that if the information environment around a firm improves, there will be an improvement in the market's agents predictions about future events of the firms and when they actually occur they will be no longer a surprise, hindering investors to react to firm-specific events, making stock prices more synchronous. In this situation, one may expect firm volatility to present a less accentuated increase compared to market volatility. This would be, therefore, a consequence of efficient markets. It is important to highlight that synchronicity, according to these rationale, cannot necessarily measure markets' efficiency, but it is merely a possible consequence of it.

**Null Hypothesis.** IFRS has not caused any effect on stock price synchronicity and in the behavior of idiosyncratic and systematic volatility.

This could have happened because the mere adoption of a new set of accounting standards was not enough to improve the informational environment in Brazil, because of the limitations related to enforcement mechanisms, in line with Daske et al. (2008), S. Li

(2010) and Ahmed et al. (2013). This result would show that stock price synchronicity for emerging market works as other economic consequences of IFRS, such as the cost of capital, that are only verifiable for economies with high developed capital markets and enforcement mechanisms (e.g., S. Li, 2010; Daske et al., 2008). Therefore, IFRS adoption did not affect stock price synchronicity and there were not significant differences in the behavior of the firm and market volatility series, due to IFRS, through the period of analysis.

## 1.4 Contributions

This research is important for three main reasons. First, stock price synchronicity is an important issue in macroeconomics because it may indicate poor resource allocation by the capital market. Associating IFRS adoption and synchronicity allows some inference about how accounting affects the financial economy and, according to the argument of K. Li et al. (2010), how it may possibly affect the real economy.

This idea appeals to the importance of financial accounting to other stakeholders. The current conceptual framework, that provides the fundamental concepts to IFRS setting, establishes that the standards should focus on the needs of investors and creditors (CPC, 2011; IASB, 2008). The International Accounting Standards Board (IASB), responsible for issuing the IFRS, argues that assisting investors and creditors, the interests of all other stakeholders (employees, consumers, government and the public) are ultimately assisted (IFRS Foundation, 2010). During the discussion of the conceptual framework, some discussants have argued that accounting should focus on providing financial stability at a macroeconomic level (IASB, 2006). The Board argued that providing reliable information about the economic reality of a firm leads to more sustainable economic decision, providing a more healthy financial environment (IFRS Foundation, 2010). The results of this research associating IFRS accounting information with stock price synchronicity and the components of risk may provide some evidence for this rationale.

Second, conducting this research in Brazil allows comprehensive understanding about the role of IFRS in the informational environment due to the country's specific economic and financial features and due to the peculiarities of the process of adopting IFRS. Brazil is one of the few countries to mandatorily adopt IFRS to consolidated financial statements as well as the individual ones, which may have influenced enforcement instruments. If the adoption is only for the consolidated statements, firms may produce individual financial statements according to their traditional accounting standards and only make some ad-

justments for the consolidated disclosures in order to comply with IFRS. Therefore, if the adoption occurs on both levels (individual and consolidated) firms are more likely to completely change their accounting systems, which may produce more accurate IFRS financial statements.

Finally, this research brings new insights into the implications of IFRS adoption expanding the effects on stock price synchronicity to the behavior of the idiosyncratic and systematic risks. While most studies about the consequences of IFRS relies on the accounting information quality (e.g., Daske & Gebhardt, 2006; Barth et al., 2008; H. Chen et al., 2010; Sun, Cahan, & Emanuel, 2011) and the cost of equity capital (e.g., Daske et al., 2008; S. Li, 2010); and the studies about synchronicity are mainly worried in identifying its causes and explanations (e.g., K. Chan & Hameed, 2006; An & Zhang, 2013; Beuselinck et al., 2010; Boubaker, Mansali, & Rjiba, 2014) this research seeks to show practical implications of the greater availability and quality of firm-specific information. Therefore, this study can provide some practical evidence of the efforts of the standard-setting body; besides allowing firms to better understand the effect of their disclosure practices to individual investors, who can better understand the wide information environment they are inserted and how it may affect their investment decisions.

## 1.5 Content Outline

The study is organized as follows. Chapter 2 provides background ideas to the research's hypotheses, starting with the theories that supports the argument that IFRS improves the informational environment and impacts stock price synchronicity. Next, it explores the factors found in the literature to be associated with synchronicity, ultimately analyzing the role of the financial reporting system. Then, it explores the origin and state of IFRS in the world and the economic consequences of its adoption. Finally, it explore the adoption process in Brazil and the preliminary evidence found about the consequences of this adoption.

Chapter 3 shows how the research was conducted, separated into the synchronicity and the volatility analysis. The first section explores how stock price synchronicity was measured and how its relationship with IFRS adoption was assessed, through an empirical regression model. The next section analyzes how the behavior of idiosyncratic and systematic risk were evaluated through a volatility decomposition analysis, which is then followed by the procedures to identify trends on the volatility series at the firm level and at the market level.

Chapter 4 presents and discusses the results, first for the effect of IFRS on stock price synchronicity and then the evaluation of the trends in the volatility components. Finally, Chapter 5 presents some concluding remarks regarding the study.

# 2 Background and Hypotheses

## Development

### 2.1 Information Constraints and Stock Price Synchronicity

Stock price synchronicity can be understood as a consequence of market imperfections, where information is not equally available to all market participants and/or where the agents have limited capacity to process the information available in the market.

Section 2.1.1 explores how Agency Theory and its consequent informational asymmetry works as a background explaining stock price synchronicity at the market level. Section 2.1.2 explores the concepts of Information Theory from Microeconomics and how they are related to the capacity of individuals to process information (market-wide and firm-specific) affecting how it is incorporated into stock prices and, therefore, how it affects stock price synchronicity. The role of IFRS to synchronicity inside these theories is also briefly discussed.

#### 2.1.1 Informational Asymmetry

In the 1960s and 1970s the studies concerning the risk-sharing problem among individuals or groups that have different attitudes towards risk started to be explored. This literature were expanded by Agency Theory when it included the agency problem (Eisenhardt, 1989). Jensen and Meckling (1976) describes the agency problem as the conflict between the manager and the outside shareholders which comes from the manager's tendency to expropriate the firm's resources for his/her own purposes. The mathematical formulation of agency problem can be seen in Ross (1973).

Agency theory is concerned with two problems that arise from agency relationships. The first one emerges when the desires or goals of the principal and the agent conflict and when it is difficult or expensive for the principal to supervise the agent's actions. The second one concerns the risk-sharing issue, when the principal and the agent may have different risk preferences and, thus, may prefer different actions (Eisenhardt, 1989).

The principal can try to mitigate the agency problem setting contracts in order to align his/her interests and the manager's. Setting contracts specifying how the agents should act in each situation could mitigate this problem, however, it is impossible to cover all possible situations. Jensen and Meckling (1976) propose that the principal should limit the opportunistic behavior of the agent, harmonizing both interests through incentives to the agent. Besides, the principal may resort to monitoring, such as auditing, which costs are called agency costs.

The informational asymmetry between the principal and the agent hinder the principal to fully supervise the agent's actions. In a context where information is not symmetric among the cooperating parties, some parties may take advantage through privileged information, which may cause some problems in the market, such as moral hazard and adverse selection. Specifically concerning the financial markets, informational asymmetries can cause problems such as insider trading and frauds to emerge.

Healy and Palepu (2001) argue that information asymmetry and the agency conflict between managers and outside investors give rise to the demand for financial reporting and disclosure. For the authors, corporate disclosure is critical for the functioning of an efficient capital market. Leuz and Verrecchia (2000) note that the major link between the economic theory and contemporary accounting thought is the notion of greater disclosure decreasing the cost of capital that arises from information asymmetry. The authors argue that the commitment to increase levels of disclosure reduces information asymmetries between the firm and its shareholders and among potential shareholders, that is, potential buyers and sellers of the firm's stocks. They note that "increased levels of disclosure" may be interpreted as an increase in the quantity of disclosure as well as an increase in the quality of disclosure (or both).

The level of disclosure is one of the main concerns of IFRS (IFRS Foundation, 2014b) and there is fruitful evidence about the higher quality of these disclosures, as discussed in Section 2.3.2. Therefore, IFRS as a high quality financial reporting system may work as a key instrument to mitigate informational asymmetry.

The absence of information asymmetry is one of the assumptions for the Efficient Market Hypothesis (EMH), where prices are a result of every available informational about an

asset (Malkiel & Fama, 1970). Therefore the availability of specific information about an asset is crucial for the efficiency of capital markets. If higher stock price synchronicity means less incorporation of firm-specific information into the market prices, it can, therefore, be understood as an indication of bad functioning of the financial market and/or the financial reporting system responsible for corporate disclosure.

Akerlof (1970) explains how informational asymmetry may hinder the agents to differentiate good and bad opportunities and end up excluding the good ones from the market. In this scenario the market is unable to allocate resources efficiently. Habib (2008) argues that when the markets have more informative prices, investors and managers can better distinguish between good and bad investments through more accurate measures of Tobin's  $q$ . Informative prices are those that carry specific information about what they represent. Stock prices are supposed to provide public signals of investment opportunities, but if they carry lower firm-specific information they become less useful for investment decision making (Habib, 2008). In this scenario stock prices reflect mainly market-wide information and tend to move in a more synchronous way.

Therefore, stock price synchronicity may be considered a symptom of an obscure and inefficient market (K. Li et al., 2010), signaling a poor capital allocation (Habib, 2008). Wurgler (2000) argues that countries where stock prices incorporate more firm-specific information, that is, where stock price synchronicity is lower, exhibit a better allocation of capital because more informative prices help investors and managers to distinguish between good and bad investment. Using Tobin's marginal  $q$  ratio as a measure for the efficiency of corporate investment and synchronicity as a measure of stock prices informativeness, Durnev, Morck, and Yeung (2004) found that Tobin's  $q$  approximates its optimal value when there are more firm-specific varying returns, pointing out that informativeness of stock prices facilitates efficient investment.

### **2.1.2 Information Theory**

Mondria (2010) argues that investors choose the range of information to be used subject to an information flow constraint, because the amount of information they can process is limited. The author explains that, intuitively, this means that there is a large amount of information freely available relevant for decision making, but incorporating this information to the decision process takes time and mental attention. Sims (2003) models imperfect information of market players considering this limited capacity through the Information Theory developed by engineering sciences, based on the idea that information initially flows through a channel before being available to the market players.

Peng, Xiong, and Bollerslev (2007) note that this limited attention, that is, the ability of processing only a limited amount of information during a given period, is demonstrated by a large body of psychological research. The authors argue that when investors face vast amount of information in the financial markets, if their attention is limited, they have to be selective while processing information. Depending on priority, urgency and on how much they trust that information, they allocate attention across on market-level or asset-specific information, which leads to an endogenous structure of information flow, which directly affects asset return comovement. The authors then argue that investors can strategically shift their attention in response to changing conditions. Their hypothesis concerns market uncertainty, that is, when macroeconomic shocks occur, investors may temporarily shift attention away from processing asset-specific information to processing more market-level information, shifting attention back to asset-specific information over the ensuing days, increasing market volatility and asset return comovement.

Analogously to the rationale of Peng et al. (2007), it is possible to build a rationale in order to explain changes in the comovement of stock prices when changes in asset-specific informations occur. If IFRS can substantially change the amount and quality of firm-specific information available in the market, investors would turn their attention to it, turning it more relevant than market-wide information and, therefore, decreasing stock prices comovements.

## **2.2 Factors Associated with Stock Price Synchronicity**

There is fruitful literature about the factors explaining stock price synchronicity. Morck et al. (2000) found that stock prices in economies with higher Gross Domestic Product (GDP) move in an unsynchronized manner, while in lower GDP economies, they tend to move up or down together. The authors point that this may be due to several reasons. First, low-income economies tend to be undiversified, implying that industry events are basically market-wide events, which causes firms' fundamentals to be highly correlated and, consequently, firm-level information is also highly correlated. A second reason could be related to poor and uncertain protection of private property rights, in such a way that political events and rumours could cause market-wide stock prices swings and could make informed risk arbitrage unattractive. Third, poorer protection for investors from corporate insiders could cause problems, such as intercorporate income shifting, which would make firm-specific information less useful to risk arbitrageurs, which could hinder it to be capitalized into stock prices. Studying several stock markets around the world,

Morck et al. (2000) have found evidence that the level of private property rights protection affects both the extent to which information is capitalized into stock prices and which kind of information is capitalized.

Seeking to explain this relation between property rights protection and stock price synchronicity, Jin and Myers (2006) have found that control rights affect the division of risk-bearing between managers and outside investors. Insiders capture part of the firm's operating cash flows, but limited to outsider investors' perception of the value of the firm, that is, they extract more cash than they would receive if the property rights of the investors were fully protected.

Boubaker et al. (2014) studied the effect of ultimate cash flow rights of controlling shareholders and the separation of voting and cash flow rights on stock price synchronicity. The authors found that there is a strong positive relationship between the ownership structure and synchronicity, supporting the hypothesis of control and cash flow rights precluding information disclosure to the market. An and Zhang (2013) studied the role of institutional investors in monitoring managers, limiting their capture of the firm's cash flow, reducing stock price synchronicity. X. Chen, Harford, and Li (2007) explain that investor monitoring improves both firm-specific gathering and the protection of investors' property rights, through its influence on management. Therefore, stock price synchronicity is strictly related to the environment of the financial markets.

The Brazilian financial market has its own particularities and weaknesses. Chong and López-de-Silanes (2007) comment that capital markets in Latin America have been presenting little dynamism, that is, the growth of markets has not matched that of the economy. There has been some upward movement in terms of market capitalization as a proportion of GDP, but it is due to some large firms that are cross-listed in foreign exchanges. For the authors, there are some concern that capital markets in the region does not work as a real source of finance and have not yet developed at the appropriate pace to sustain business growth. One could argue that this situation is due to the poor record of past economic and political stability and unfavourable exchange rate relations. However, if this was the case, once relatively more stable macroeconomic and political environment were reached, capital markets would consolidate as a serious source of finance. But that did not happen (Chong & López-de-Silanes, 2007).

C. Anderson (1999) explains some Brazilian financial features usually found in emerging economies, namely high inflation, volatile real-sector activity, weak institutions and strong state intervention. The author explains that the Brazilian financial system appears to be insufficiently developed to assist parties to financial contracts and that the Brazilian

civil-law legal tradition works as an impediment to external financing in general. As a consequence, as also pointed by Lopes and Walker (2010), Brazilian firms do not rely on equity markets as a main source of funds as the ones from developed economies.

An important aspect is how Brazilian companies tend to have highly concentrated ownership structures (Dami et al., 2007). Hahn et al. (2010) show that, in 2008, Brazilian companies had, on average, an ownership concentration of 45%, and the electrical and electronics industry had the highest level of concentration (64%) and the Oil and Gas industry had the lowest level (32%). Silveira, Barros, and Famá (2008) searched for firm-level explanations for this ownership structure characteristics in Brazil and could not find significant corporate features that could influence cash flow and control rights. They speculate that the reason may lie on the institutional environment, the firms' history and their particular idiosyncrasies.

La Porta et al. (1998) argue that a high ownership concentration is a response to the lack of legal protection. While some concentration is efficient in providing managers with incentives to work and large investors with incentives to monitor these managers, some dispersion is desirable to diversify risk. La Porta et al. (1998) give two reasons why countries with poor investor protection would have more concentrated ownership structures. First, large shareholders need more capital to exercise their control rights and avoid expropriation by the managers, especially when they own significant cash flow and vote rights. Second, if investors are poorly protected, small investors will be willing to buy stocks only at such low prices that make it unattractive for companies to issue new securities to the public. So, the demand for stocks by minority investors is low, stimulating ownership concentration. Therefore, ownership concentration in Brazil may be acting as a substitute for legal protection.

### **2.2.1 The Influence of the Financial Reporting System**

Besides the legal environment, the accounting and financial reporting systems play an important role in explaining stock price synchronicity. Jin and Myers (2006) point that lack of transparency affects how much risk are borne by inside and outside investors, by shifting firm-specific risk to insiders, reducing the amount of firm-specific risk absorbed by outside investors. K. Chan and Hameed (2006) explain that in emerging markets there is little enforcement of information disclosure and a low degree of voluntary disclosure and corporate transparency, which could lead to a higher stock price synchronicity.

For Jin and Myers (2006), imperfect protection of investors' property rights and financial

opaqueness may be mutually reinforcing. They explain that investors might induce opaqueness to protect their capture of cash flow from the firm. For the authors, this is strictly related to corporate transparency. If the firm is not completely transparent, outside investors can observe all market-wide information, but not all firm-specific information. So, insiders will capture a greater part of the firm's cash flows when the hidden firm-specific information is positive and a smaller part when it is negative. Therefore, opaqueness requires insiders to absorb some firm-specific variance, while the amount absorbed by investors is lower. But these investors absorb all market risk, then the ratio of market to total risk is increased by opaqueness. This effect may have implications on the behavior of systematic and idiosyncratic risk (Campbell et al., 2001). For Jin and Myers (2006), the more opaque the firm, the greater the amount of hidden firm-specific information, and the higher will be the  $R^2$  of market model.

Corporate transparency is a result from the firm's accounting and financial reporting system. For Habib (2008), financial reporting provides the primary source of independent information to shareholders about the performance of the company and facilitates efficient resource allocation decisions. The author has found evidence that financial transparency is positively related to capital allocation efficiency. In the same line, Bushman and Smith (2001) believe that financial accounting systems mitigate agency problems, facilitating the efficient flow of scarce human and financial capital to increase investment opportunities.

If the financial accounting system is efficient, there is a greater financial transparency, which, in turn, leads to a better allocation of capital. Higher levels of financial transparency result in a production of a greater amount of firm-specific information. When good quality firm-specific information is not readily available, stock prices tend to move more according to market-wide information, that is, tend to be more synchronous. Whether firm-specific information is available to all market participants or is only accessible to certain parts depends on the quality of the firm's information environment (Xing & R. Anderson, 2011). A lower degree of transparency, through a financial reporting system less developed, leads to lower firm-specific information available for investors and, consequently, to higher synchronicity (Jin & Myers, 2006). Thus, the higher level of disclosure leads to higher flow of firm-specific information that will be incorporated into stock prices and, therefore, *ceteris paribus* reduces synchronicity.

## **2.3 The International Financial Reporting Standards (IFRS)**

### **2.3.1 IFRS Adoption throughout the World**

Historically, the process for producing accounting statements has emerged from two basic models with different objectives. The first systematized accounting regulation comes from the Continental Europe in 1673, when an annual financial position statement at fair value was established in order to protect the economy against bankruptcies. This method spread through all Continental Europe and was enhanced by Germany in the nineteenth century, emphasizing historical cost instead of fair value. This model that intermediates the relation between the firms and the State is useful for tax audit and dividend payment, working as a mean to protect the economic development with penalties for firms that were not financially healthy or were poorly managed. Although this model was adopted by financial statements for the capital markets, this is not its focus (Mackenzie et al., 2013).

The other model came on the nineteenth century as a consequence for the industrial revolution, which created the need for great capital concentration to undertake big industrial projects and to share the risks among several investors. In this model, the accounting statement worked as a means to monitor and inform the activities of big companies to their shareholders. The accounting statements designed for capital markets were first developed in the United Kingdom, under the common law, where the State intervention is the least possible, and there is a wide margin for interpretation (Mackenzie et al., 2013).

This approach was swiftly adopted by the United States. Both in the United States as in the United Kingdom, this model was seen as appropriate for information purposes rather than for income tax issues (Mackenzie et al., 2013). This second model, usually known as Anglo-Saxon approach of accounting information, focuses on the relation between the firm and the investor and in the information flow to the capital market. The government may use the statements as a means for controlling the economic activities, but this is not their focus (Mackenzie et al., 2013). The International Financial Reporting Standards (IFRS) are an example of this second model of accounting.

IFRS was developed as a response to the need for analyzing investments in different countries that arose from financial globalization (Perez Junior, 2009). The first step towards their formulation dates from 1973, when professional accounting bodies from ten countries (Germany, Australia, Canada, the United States, France, Ireland, Japan,

Mexico, the Netherlands and the United Kingdom) founded the International Accounting Standards Committee (IASC) (Mackenzie et al., 2013).

The objective of this committee was establishing a completely independent structure to create and publish a new set of international accounting standards that could be globally accepted. IASC was created as a nonprofit institution with resources from several international organizations and audit firms (Perez Junior, 2009).

In 2001, IASC went through a comprehensive reorganization and came to be known as International Accounting Standards Board (IASB). The objective was to improve the technical structure for formulating and validating the new international standards to be issued under the nomination of International Financial Reporting Standards. The IASB first earned the respect and support of national accounting bodies, then of national standard setters and ultimately of regulators in the major capital markets and governments, as well as the respect of preparers and users of financial statements around the world (Zeff, 2012).

Then, the IFRS started to be developed by the IFRS Foundation (early known as the International Accounting Standards Committee Foundation), through IASB, intending to be understandable, enforceable and globally accepted, promoting the use and application of these standards, taking into account the financial reporting needs of emerging economies and small and medium-sized entities, facilitating the convergence of domestic accounting standards to IFRS. In order to do so, the IFRS formulation process is intended to be thorough, open, participatory and transparent, engaging investors, regulators, business leaders and the global accountancy profession at every stage, counting on collaborative efforts with the worldwide standard-setting community (IFRS Foundation, 2014a).

In order to assess the progress of this goal, the IFRS Foundation is developing and creating profiles about the use of IFRS in individual institutions. In 2014, there were 129 profiles completed that include all the Group of Twenty (G20) jurisdictions. In 123 jurisdictions, the relevant authority has made a public commitment to IFRS as a single set of global accounting standards and 105 jurisdictions require IFRS for all or most domestic publicly accountable entities in their capital markets. From the remaining 24 jurisdictions that have not adopted IFRS yet, thirteen of them allow the use of IFRS (Bermuda, Cayman Islands, Guatemala, Honduras, India, Japan, Madagascar, Nicaragua, Panama, Paraguay, Singapore, Suriname and Switzerland), two of them are in process of full adoption (Indonesia and Thailand) and seven remain with their domestic standards (Bolivia, China, Egypt, Guinea-Bissau, Macao, Niger and the United States) (IFRS Foundation, 2014c).

### **2.3.2 The Economic Effects of IFRS**

When IFRS were adopted by the European Union, the IASB Chairman, Sir David Tweedie, enumerated some benefits of IFRS adoption for financial markets. According to him, IFRS would enable investors to compare the financial results of companies operating in different jurisdictions more easily, providing more opportunity for investment and diversification. The removal of the risk associated with the nuances of different national accounting regimes should reduce the cost of capital and open new opportunities for investment (Tweedie, 2006).

For most countries, IFRS adoption is associated with a significant shifting of paradigm, from a set of rules to a set of principles aiming to offer useful information to economic decision making processes. Usually, it is associated with a more complex accounting system, which demands a higher judgment level and a greater involvement of managers, increasing the level of disclosure. There are plenty of studies assessing the effects of IFRS adoption.

These effects of IFRS adoption can be divided into seven categories, namely the ones regarding the analysts, the information comparability, costs, quality and use, the credit market and the capital markets (IFRS Institute, 2014). Several of these studies have documented that IFRS do produce higher-quality accounting information, that is, more transparent information.

Daske and Gebhardt (2006) studied the quality of the financial statements of Austrian, German, and Swiss firms which had already adopted internationally recognized standards, IFRS or U.S. Generally Accepted Accounting Principles (GAAP), before the mandatory adoption in the European Union that took place in 2005.<sup>1</sup> Firms in these three countries predominantly followed similar local reporting standards based on the German accounting origin tradition and then switched to IFRS or U.S. GAAP. The authors compared disclosure quality scores extracted from the annual reports, and found that they have significantly increased with the adoption of IFRS financial statements.

Sun et al. (2011) were slightly surprised in seeing that IFRS earnings of foreign firms listed in the United States presented higher quality than matched American firms under U.S. GAAP. The authors have studied firms cross-listed in the United States from countries

---

<sup>1</sup>German firms started publishing extra sets of financial statements according to international standards (that is, standards different from the domestic ones) in the 1990s. Austrian firms were allowed to use international standards in 1998, while the Swiss Stock Exchange has accepted International Accounting Standards (IAS) or U.S. GAAP as an alternative to the local GAAP since 1996 (Daske & Gebhardt, 2006).

that have compulsorily adopted IFRS, comparing them with an U.S. matched sample, and found that IFRS adoption led to an improvement in earnings quality.

Using data from the publicly listed companies of fifteen members of European Union for the years from 2000 to 2007, H. Chen et al. (2010) found evidence that IFRS adoption improves accounting quality. The authors argue that IFRS reduce available accounting alternatives, limiting management opportunistic discretion, enhancing accounting quality.

However, these results cannot be fully attributed to IFRS neither fully generalized to all countries. Analyzing firms from 21 countries, Barth et al. (2008) examined the relation between accounting and IFRS, and found that IFRS adopters generally evidence less earnings management, more timely loss recognition and more value relevance than do matched sample firms with non-U.S. domestic accounting standards. Though, the authors emphasized that the results cannot be directly attributable to the IFRS adoption, explaining that the effective application of IFRS standards reflects combined effects of the standards itself, their interpretation, enforcement and litigation features.

Isidro and Raonic (2012) studied firms from 26 countries all under IFRS in order to separate the influence of accounting standards from those of firms' incentives and jurisdiction institutional complexity on the quality of accounting information. The authors found that accounting quality is positively associated with ownership structure, audit fees, external financial needs, leverage and analyst scrutiny, while it is negatively associated with instability in business operation, existence of losses and lack of transparency. Regarding institutional features, the authors found that the general economic and institutional development, business sophistication and globalization positively affect accounting quality. The author also point that the firm-specific incentives seems to be more important in defining the quality of financial reporting than the jurisdiction factors.

Therefore, both the characteristics of firms' incentives and the economic environment play a relevant role on the impact of IFRS in the accounting quality and other outcomes.

### **2.3.2.1 The Role of Enforcement**

In line with this caveat, the effect of IFRS adoption in accounting quality is not always positive. Ahmed et al. (2013) studied a set of firms from 20 countries that have adopted IFRS. Controlling for the strength of legal enforcement, industry, size, book-to-market ratio, and accounting performance, the authors have found that the improvement only holds for firms in strong enforcement countries. Similarly, Jeanjean and Stolowy (2008), when

analyzing earnings management for mandatory IFRS adopters, concluded that sharing rules is not a sufficient condition to create a common business language. For the authors, management incentives and national institutional factors play an important role in framing financial reporting characteristics.

Similarly to the results regarding accounting quality and transparency, the effects of IFRS adoption in the capital markets is also not uniform, usually depending on the countries specific characteristics. Daske et al. (2008) analysed the capital markets effects of IFRS adoption in 26 countries around the world. Specifically, they analysed effects in stock market liquidity, cost of equity capital and firm value, which, according to them, should reflect the improvement around IFRS application through the change in the quality of the reported financial information. The authors employed four proxies for market liquidity (the proportion of zero returns, the price impact of trades, total trading costs and bid-ask spreads), four models to assess the cost of equity capital and used Tobin's  $q$  as a proxy for firms' value. They have found a general increase in market liquidity around the time of IFRS introduction, a decrease in firms' cost of capital and an increase in equity value. However, after the general analysis, they partitioned their sample and found that those capital markets benefits occur only in countries where firms have incentives to be transparent and are under strong enforcement instruments.

S. Li (2010) also observed a decrease in cost of equity capital related to IFRS adoption, and she also documented that it is only significant in countries with strong legal enforcement. The author then looked for the means by which IFRS reduces the cost of equity capital and found that the reduction is significantly greater among mandatory adopters in countries where IFRS induced a large increase in comparability and a large increase in disclosures, but, once again, only for countries with strong legal enforcement. It is interesting to note that, for countries with weak enforcement mechanisms and a small increase in disclosures, IFRS adoption was associated with an increase in the cost of equity capital, which is consistent with the idea that more discretion afforded under IFRS have a detrimental effect to shareholders when the standards are not properly enforced.

There are several capital markets effects related to IFRS adoption in the literature. However, as noted by Christensen et al. (2013), the mechanisms through which these effects take place remain unclear. Many countries have adopted IFRS around the same time, which makes it difficult to isolate the effects of IFRS reporting. Studies analysing the capital-market effects could be confounded by unrelated institutional changes or economic shocks that happened in the same period. Many of these effects are usually found in the European Union but not in other countries. Once by the time of IFRS adoption the European Union passed a series of directives to improve financial market regulation, these

concurrent institutional changes could be the reason for the effects found in the literature.

Nevertheless, Christensen et al. (2013) point out that it is also possible that institutional changes are explicitly tied to IFRS adoption. Taking the European Union as an example, the authors remember that the regulation which introduced IFRS reporting starting in 2005 required member states to take appropriate measures to ensure compliance. Thus, many countries bundled IFRS adoption with changes in financial reporting enforcement, which raises the possibility that the observed effects in the capital market reflect, at least in part, the changes with respect to financial reporting rather than the switch in the accounting standards.

However, it is possible that the switch in standards and the changes in enforcement mutually reinforce each other. Christensen et al. (2013) distinguish and analyse four possible explanations for the observed capital market effects after IFRS adoption: the switch from domestic standards to IFRS play the primary role; IFRS had market benefits, but only under strong enforcement mechanisms; countries make enforcement changes to support the introduction of IFRS and this bundle is responsible for the effects; and IFRS per se has little effect, but other institutional changes or economic shocks that are unrelated to the financial reporting system drive the observed effects.

Analyzing market liquidity effects across countries, the authors found evidence supporting the hypothesis that the bundle comprising IFRS adoption and changes in enforcement is the most likely responsible for the documented liquidity effects. The authors argue that IFRS reporting might be a pre-condition for the enforcement changes to take place, or that the effects would be smaller without IFRS.

In line with the rationale put by Christensen et al. (2013), IFRS might be related to changes in the financial environment as a whole, such as improvements in corporate governance and the enforcement of corporate laws. Hong (2013) argues that the conjunct change in accounting standards, governance and enforcement is expected to influence accounting practices and outputs, which may narrow the ability of controlling party' to extract the firm's value at the expense of minority shareholders, that is, the private benefits of control.

In order to assess if and how mandatory IFRS adoption influences the value of private control benefits, Hong (2013) examined whether firms that have a dual class share structure presented a decrease in voting premium after IFRS. The author found that voting premium do decrease after IFRS, and more significantly among firms from countries with strong law enforcement and have experienced a large increase in disclosure and comparability under IFRS reporting. These results, according to the author, support the idea

that IFRS adoption is related to a constraint in the controlling party's ability to divert corporate cash.

In general, the literature shows that IFRS adoption is related to a series of changes in the capital markets, affecting the financial markets environment and the financial information flow and, consequently, investor behavior. Khurana and Michas (2011) provide evidence that IFRS, as a common set of global accounting standards, matters for portfolio holdings and that the enforcement of these standards influences the investors' outcomes. The authors investigate the effect of IFRS adoption in U.S. investors' bias against investments in foreign countries (home bias) and found that this bias decreases for countries that have mandatorily adopted IFRS, controlling for country-level characteristics, such as equity market development and the legal and ownership environment. They documented that the reduction is greater for countries with large differences between IFRS and their domestic standards, common law legal origin and with greater incentives to report higher quality financial statements.

### **2.3.2.2 The Effects of IFRS in Stock Price Synchronicity**

When analyzing studies regarding the effects of corporate transparency on stock price synchronicity, the role of differences in legal enforcement mechanisms and equity market development are not conclusive. There is also some controversy about how the process of incorporating new firm-specific information into stock prices works and how it influences stock price synchronicity (e.g., Veldkamp, 2006; Beuselinck et al., 2010; Dasgupta et al., 2010; J. Kim & Shi, 2012).

One stream of research believes that the IFRS, as a higher quality accounting regime, helps to ensure a higher degree of transparency and comparability of financial statements, which, in consequence, improves the efficiency of capital market (Brüggemann et al., 2013). Veldkamp (2006) argues that when good quality firm-specific information is not readily available, investors rely more on common information, which is cheaper and has a higher demand. However, the enhanced disclosures via IFRS adoption contributes to facilitate the flow of higher-quality firm-specific information into the market at no additional cost (compared to common information) to investors that become more likely to rely more on this kind of information than on market-wide information (Veldkamp, 2006). If higher-quality firm-specific information flows into the market and the investors rely more on it, than stock prices incorporate a greater amount of it and, thus, the synchronicity is expected to be lower.

J. Kim and Shi (2012) provide evidence that stock price synchronicity is significantly lower for IFRS adopters than non-adopters and that it decreases from the pre-adoption period to the post-adoption period. However, like the process of IFRS adoption, the impact in synchronicity might not be the same in all countries. J. Kim and Shi (2012) mention the synchronicity-reducing effect of IFRS adoption is more pronounced in countries with a weaker institutional environment. This can be explained by the fact that countries with poor investor protection, less developed financial system and poorer corporate governance, informed trading is discouraged, which, in turn, leads to higher synchronicity when compared to countries with strong institutional environments (Morck et al., 2000; Jin & Myers, 2006; Gul, Kim, & Qiu, 2010). Once synchronicity is higher for these countries, IFRS adoption effect might be more intense for them.

K. Chan and Hameed (2006) say that a possible explanation for higher synchronicity in emerging countries is the difficulty to collect firm-specific information and, thus, the information that security analysts collect might have more macroeconomic content than firm-specific details. This lack of firm-specific information in emerging markets is due to a number of factors, namely: little enforcement, low degree of voluntary disclosure and a large number of companies which are group affiliated or family owned, and it is difficult to collect reliable information on such firms.

This idea is in line with the ones presented in J. Kim and Shi (2012), once emerging countries present less levels of enforcement (La Porta et al., 1998; Kaufmann et al., 2007). So, once the stock price synchronicity is higher in emerging countries, IFRS adoption might reduce it in a more accentuated way.

Nevertheless, some authors believe that the adoption of higher-quality accounting standards improves the information environment only if there is effective enforcement mechanisms strong enough to produce higher quality information. For Ball (2001), an economically efficient report system requires separation from corporate income taxation, well trained and independent auditors, and an independent legal system for detecting and penalizing fraud and manipulation. The accounting infrastructure cannot be separated from the overall economic, legal and political infrastructure.

Thus, stock price synchronicity might not significantly decrease in Brazil, because of its lower financial development (C. Anderson, 1999), its firm's ownership structures characteristics (Dami et al., 2007; Hahn et al., 2010; Silveira et al., 2008) its consequences to investor protection (La Porta et al., 1998), and its relatively low enforcement environment (La Porta et al., 1998; Kaufmann et al., 2007).

However, even if the institutional environment is relatively weak, IFRS adoption can

reduce stock price synchronicity if one considers that country and firm-level governance mechanisms act as substitutes for each other (J. Kim & Shi, 2012). Thus, if the firm-level environment improves, through the adoption of higher quality accounting standards, for example, it will substitute the weaker country-level environment. So, the synchronicity reduction will be actually more pronounced in countries with poor institutions than in countries with stronger institutions.

These two later possibilities diverge regarding the effect on countries with poorer institutional environment, but both agree that higher corporate transparency reduce stock price synchronicity. However, this is also not a consensus in the literature. Some studies demonstrate that stock price synchronicity can actually increase when transparency improves.

J. Kim and Shi (2012) segregate the impact of IFRS adoption on synchronicity into two approaches. The first approach is called “information encouragement role of IFRS adoption”, which believes that it reduces synchronicity considering that IFRS reporting improves the quality of a firm’s financial reporting, facilitating the flow of firm-specific information into market. The second approach, called “crowding-out role of IFRS adoption” by the authors, considers that an increase in the quantity and quality of public information associated with IFRS adoption may lower the profitability of acquiring firm-specific information and thus discourage informed traders from collecting and trading on private information, making stock prices more synchronous with common information (J. Kim & Shi, 2012).

Despite this crowding-out effect described by J. Kim and Shi (2012), Dasgupta et al. (2010) argue that the increase in stock price synchronicity when corporate transparency improves is a consequence of efficient markets. In efficient markets, stock prices only react to information that were not anticipated by the market. Therefore, if the information environment around a firm improves and there are more firm-specific information available, market agents will be able to improve their predictions about the firm’s events.

Thus, when these events actually happen in the future, stock prices will not react to them once they will no longer be a surprise, in such a way that future stock prices will present less firm-specific variation, that is, synchronicity will be higher (Dasgupta et al., 2010). Thus, when IFRS adoption provides more transparency, through a higher quality accounting standards set, it might actually increase synchronicity. While greater disclosure generates more information, it also allows better forecasting of fundamentals and, thus, less innovation.

Complementary to this approach, Beuselinck et al. (2010) also examined whether the

adoption of IFRS influences the flow of firm-specific information and contributes to stock prices informativeness in 14 countries in Europe. The results shows a reduction of synchronicity at the transition period, but an increase in the post-adoption period.

In line with Dasgupta et al. (2010), the results of Beuselinck et al. (2010) suggest that the new information allows investors not only to improve their predictions about the occurrence of future firm-specific events, but also to incorporate the likelihood of occurrence of these future events into stock prices. Consequently, when these events happen in the future, investors react less to such news, making stock prices more synchronous (Beuselinck et al., 2010).

## 2.4 IFRS into the Brazilian Environment

### 2.4.1 IFRS Adoption in Brazil

Accounting in Brazil has always been strongly influenced by regulation, especially the income tax ones, which has limited the accounting principles evolution or at least has detracted their application (Martins, Gelbcke, Santos, & Iudícibus, 2013). For example, tax legislation dictated a ceiling for registering expected losses from receivables, which harmed the disclosed information regarding the assets' firm quality (Lopes, 2002). Using tax settings while reporting the financial and economic condition of the firm in the capital market harms the discretionary process of accounting choice, causing damages to the communication between the firm and its investors, increasing information asymmetry (Lopes, 2002).

The first comprehensive legislation addressing financial accounting in Brazil dates from 1940 which set out specific procedures and practices for corporations, comprising rules for asset measurement, profit retention and dividend distribution. In the 1970s, a crash of the stock exchanges took place in Rio de Janeiro and São Paulo revealing the considerable weakness in company law, notably regarding investor protection and corporate disclosure. This crash led to a new legislation enacted in 1976, reforming company law and creating the Brazilian Securities Commission, *Comissão de Valores Mobiliários* (CVM) (Carvalho & Salotti, 2012). This new company law provided the main accounting concepts that should be followed by publicly held companies in Brazil.

This model contrast with the ones from countries like the United States, the United Kingdom, Canada and Australia, where accounting is regulated by private initiative without

direct intervention from the government. Under the Brazilian model of corporate reporting, the main user of accounting is the government (Lopes, 2002), and all the accounting income tend to be viewed as a pie to be divided into dividends, bonuses and taxes. Therefore, the demand for accounting income is influenced more by the payout preferences of agents for labor, capital and government, and less by the demand for public disclosure (Ball, Kothari, & Robin, 2000).

For Lopes (2002), such a direct and strong influence from the government limits accounting evolution by cutting off the participation of diverse market sectors. In other words, accounting used to be a mere legal obligation which companies should comply with, in such a way that accounting information could not be relevant for decision making in the capital market; as seen in Section 2.2.

However, an attempt to change this scenario was made with the public commitment to move Brazilian accounting standards towards IFRS. According to Carvalho and Salotti (2012), this was possible due to three reasons: the control of inflation, the balance of the federal budget and the increase of market capitalization of the Stock Exchange, that amounted to about 25% of GDP, as a result of the improvement of the country's economic condition. These factors convinced Brazilian business people that a new accounting regime would be beneficial for this new expanding and increasingly internationalized economy. In December 2007, a new piece of legislation was enacted, requiring a country-wide convergence to the international accounting standards, both for listed and non-listed firms and large (as legally defined) private firms (Carvalho & Salotti, 2012).

One of the most important steps taken towards IFRS adoption in Brazil concerns the implications for income taxes calculations. When debating the new legislation, it was decided that any accounting adjustment due to IFRS would not have any tax impact. So, in 2008, a legislation established the Transition Tax Regime, *Regime Tributário de Transição* (RTT), settling that IFRS would be "tax neutral", that is, revenues and expenses to be registered according to IFRS would not count for tax calculations purposes (Cardoso, Saravia, Tenório, & Silva, 2009).

As a result of this process, since 31 December 2007 the Brazilian accounting standards were partially converged with IFRS, due to alterations in the Corporate Law. Since 2010, IFRS has been mandatory for the financial statements of firms whose debt or equity securities are publicly traded (IFRS Foundation, 2014d).

The institution responsible for translating and introducing each new standard issued by the IASB is the *Comitê de Pronunciamentos Contábeis* (CPC), created in 2005, organized

by professionals of accounting, the capital market, auditors and academics. The committee has formal and strong support of the government through CVM and the Central Bank (Martins et al., 2013).

## 2.4.2 Early Adoption

Brazil had two important moments configuring IFRS adoption. Starting 2008, the first IAS and IFRS translated and inserted by the CPC were adopted by some Brazilian firms. From 2010, all the standards issued by IASB were converged and all firms were obligated to publish their financial statements according to them.

Some considerations must be made regarding the early adoption period (2008 and 2009). The first international standards converged did not follow the original order they were issued by IASB. Among the first standards valid for the period were the Technical Pronouncements (*Pronunciamentos Técnicos*) CPC 01, equivalent to IAS 36 (Impairment of Assets), CPC 04, equivalent to IAS 38 (Intangible Assets), CPC 06, equivalent to IAS 17 (Leases) and CPC 14, equivalent to IAS 39 and 32 (Financial Instruments).

These first standards were expected to cause major changes in the Brazilian accounting. The CPC 01, for example, brought the concept of “economic substance”, stating that it is not conceptually possible to keep an asset registered for a value over its economic capacity. Regarding the intangible assets, a new group inside the balance sheet was created and the Anglo-Saxon principle of “arm’s length”<sup>2</sup> were introduced to define what should be recognized as an asset. CPC 06 also brought important changes to accounting for leases. The main change was the idea that an asset should be registered according to the “transference of benefits, risks and control”, not simply the legal ownership. Before this standard, all the leases contracts only affected their current exercise through accounting expenses. After CPC 06, every contract should be examined in order to evaluate if it implied on transference of risk, benefits and control; if so, it should be recognized as an asset in the balance sheet (Martins et al., 2013).

finally, the standardization process of financial instruments should be cited because it happened in different phases. The CPC 14 was initially issued being valid for only the years of 2008 and 2009. In 2009 the CPC issued other three standards for financial instruments (CPC 38, CPC 39 and CPC 40) to be adopted from 2010, when the initial CPC 14 was transformed into a technical orientation (OCPC 03) (Martins et al., 2013).

---

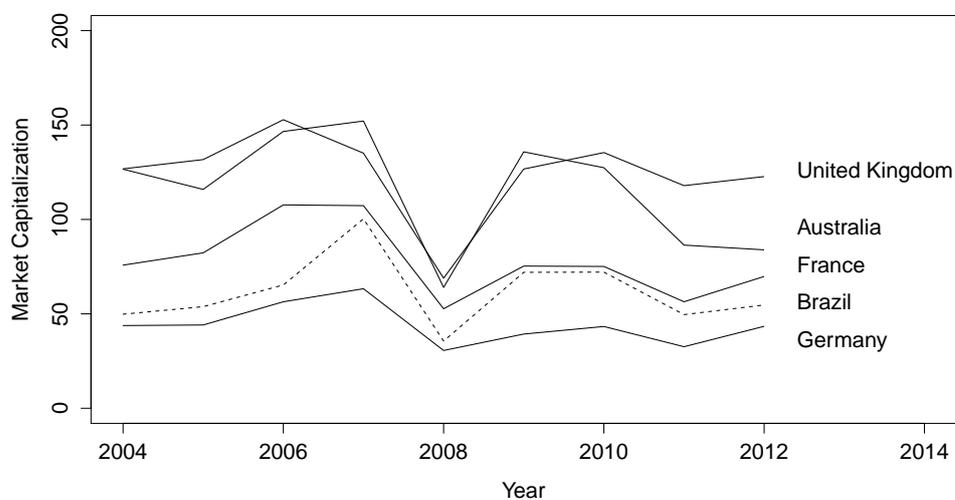
<sup>2</sup>Economically, “arm’s length” refers to contracts with independent third parties.

Therefore, several changes were brought to the Brazilian accounting in different moments. It is important to highlight that, besides the differences brought by the standards per se and their new concepts, in addition to the general unfamiliarity with the new accounting procedures, other factors related to the early adoption affected the business environment at the time, mainly the uncertainties about the tax effects and also the general other effects the new standards should cause to the firms' contracts. Therefore, the years of 2008 and 2009 had some particularities that demand them to be considered as a different period from the years after 2010, when the full adoption took place.

### 2.4.3 Enforcement in Brazil

There are a wide variation of countries adopting IFRS. The level of development of capital markets and institutions varies considerably among these countries, which have different historical accounting systems.

The ability of the capital market to respond to IFRS shall depend on its stage of development and its overall importance as a source of finance for firms. Consider, for example, the importance of Brazilian capital market in the economy in comparison with other IFRS adopters. Figure 2.1 compares the percentage of market capitalization, from 2004 to 2012, of Brazil with United Kingdom and Australia (Anglo-Saxon countries) and with France and Germany (Continental European countries). The data were obtained in The World Bank Group (2014a).



**Figure 2.1**  
Market Capitalization as Percentage of GDP: Brazil and other IFRS adopters

In Figure 2.1, the importance of capital markets to Anglo-Saxon countries is highlighted, ranging above the level of 100% (except for 2008 due to the financial crisis). In this feature, Brazil is closer to the Continental European Countries, ranging from 40% do 80%. When compared to other Latin American IFRS adopters, Brazil has a less prominent capital market than Chile, that presents a market capitalization over 100% of GDP for the last years and is closer to Peru, whose proportion ranges around 50% (The World Bank Group, 2014a).

Another important factor that shall affect the response of the capital market to IFRS is the level of confidence of investors in that market and on its institutions, to ensure that public accounting numbers are useful to their particular investment decisions.

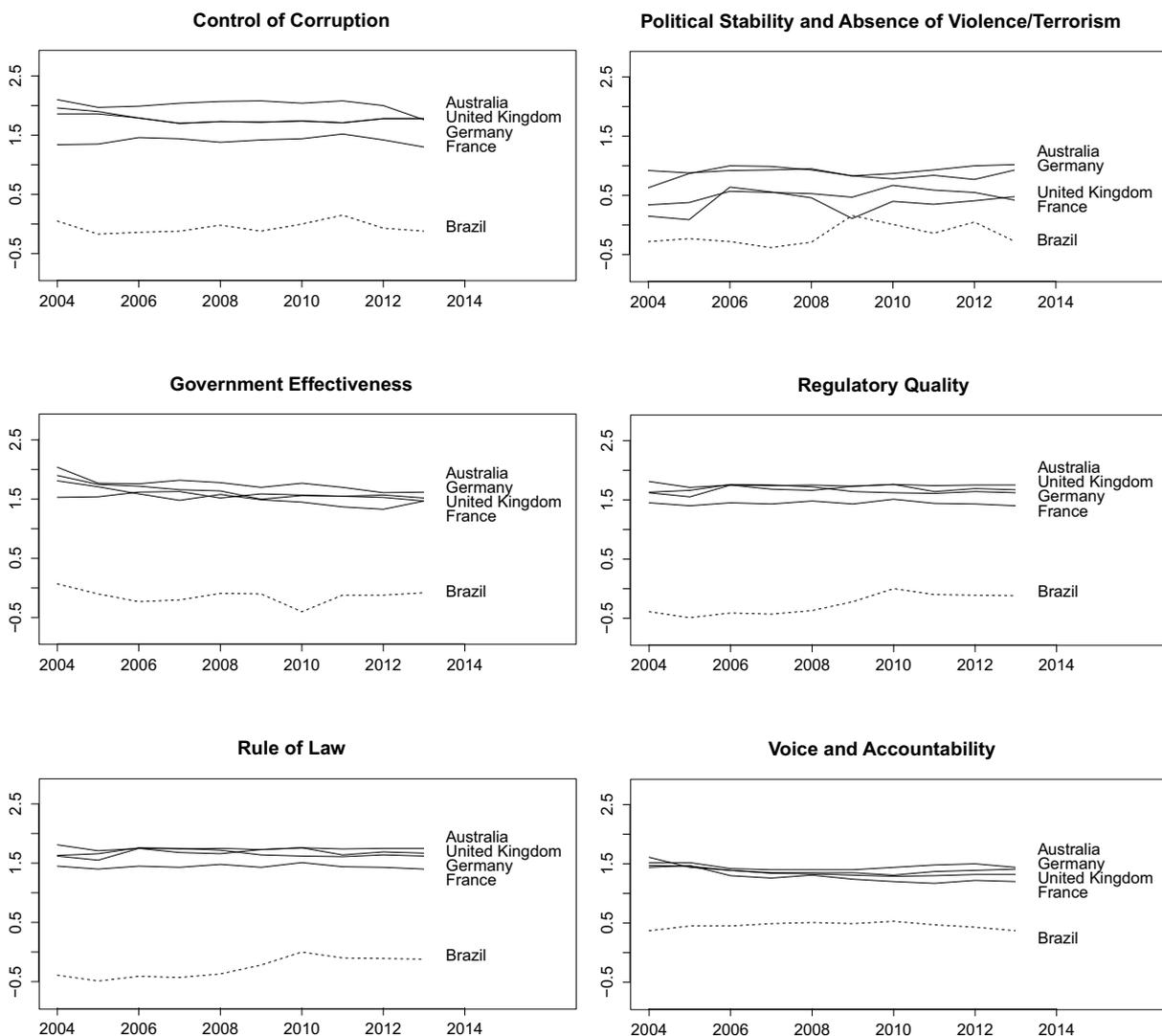
The concept of enforcement in the accounting literature is often understood as general procedures and mechanisms that ensure the obedience of corporate law or investor protection laws (Ernstberger, Stich, & Vogler, 2012). The World Bank calculates some aggregate indicators for several countries in order to assess their level of governance. According to the institution, governance captures the mechanisms by which authority is exercised in a country, including the process of selecting, monitoring and replacing the government, its capacity to effectively formulate and implement policies and the respect for institutions that govern economic and social questions (The World Bank Group, 2014b). Six indicators are available of a country's governance, which intends to capture the following aspects (Kaufmann, Kraay, & Mastruzzi, 2010):

- Control of Corruption, which captures perceptions of the extent to which public power is exercised for private gain, and how state is “captured” by elites and private interests;
- Government Effectiveness, which captures perceptions of public and civil services quality and its independence from political pressures, the quality of policy formulation and application and the credibility of the government to commit to such policies;
- Political Stability and Absence of Violence/Terrorism, which captures perceptions of the likelihood of a government being destabilized or overthrown by violent means, including violence and terrorism politically-motivated;
- Regulatory Quality, which captures perceptions of the ability of the government to coordinate policies and regulations promoting private sector development;
- Rule of Law, which captures perceptions of the extent to which agents trust and abide the rules of society, in particular the quality of contract enforcement, property

rights, the police, and the courts, and also the likelihood of crime and violence;

- Voice and Accountability, which captures perceptions of the extent to which citizens are able to participate in selecting their government, freedom of expression and association, and a free media.

Figure 2.2 compares the Worldwide Governance Indicators, from The World Bank Group (2014b), of Brazil with United Kingdom and Australia and with France and Germany. All these five countries present accounting numbers according to the same standards and principles. However, given their institutional features differences, these numbers are likely not to have the same consequences.



**Figure 2.2**  
Worldwide Governance Indicators: Brazil and other IFRS adopters

Holthausen (2009) analyses the literature about how law influences the effects of accounting standards on financial reporting outcomes. The author documents that there is still

not final conclusion about the determinants of financial reporting outcomes, but that there are some evidence showing that legal and cultural environments play an important role. The studies described in Section 2.3.2.1 provide some of these evidences.

However, when analyzing the role of enforcement on economic consequences of IFRS, it is interesting to separate general legal enforcement from accounting enforcement, that is, analyze the specific institutional processes related to financial reporting. During the process of IFRS adoption, a country can enact specific pieces of law in order to promote the consistency and faithful application of the new standards. For example, in 2005, the European Union required that all member states to introduce enforcement bodies to support IFRS adoption (Brown & Tarca, 2005). An assessment of these specific acts to enforce IFRS can be seen in the study of Ernstberger et al. (2012), who analyzed the effect of three reforms in Germany that aimed to enhance the degree of financial reporting. The authors found positive effects on earnings management, stock liquidity and market valuation associated with these specific reforms.

The relation between accounting and law enforcement can be better understood analyzing the process from issuing new standards until their application. In Brazil, the process of adopting a new standard starts with the CPC, that first issues its pronouncement. Then, in order to be applied, CVM officially endorses and enforces its application, once it has legal powers (Martins et al., 2013). Therefore, firms in Brazil can be legally punished if not complying with IFRS, which can be considered as a specific accounting enforcement mechanism.

There is another point specific to Brazil that can also be considered as an accounting enforcement mechanism. Consider the difference of purposes and regulation of individual and consolidated financial statements. Consolidated statements are believed to convey information about the real economic entity, that is, the entire economic group, not only about the entity whose borders are legally defined, that is, the individual financial statements. These individual statements are used for dividend and tax purposes and are, consequently, more subject to legal scrutiny.

While most countries that adopted IFRS require its application only for consolidated statements, Brazil also requires it for individual financial statements. Therefore, one can argue that IFRS in Brazil is under more regulation than in a country that requires it only for consolidated financial statements, where local accounting practices are still present in the financial reporting systems for dividends and tax payment purposes. Firms from these countries may use their local practices to produce individual financial statements and made only adjustments to build the consolidated ones in IFRS. When IFRS were

institutionalized by the Corporate Law 11638/07, the old Brazilian accounting practices were substituted by the international standards on both levels which implied in a greater change in the accounting systems of Brazilians firms and in a change supported and subject to law.

Therefore, due to this process of issuing new standards through CVM and adopting IFRS in consolidate and individual financial statements, both supported by major changes in corporate law and regulatory agencies, Brazil can be considered as a country with low general enforcement mechanisms (as evidenced in Figure 2.2), but with possible strong instruments to enforce financial accounting.

#### **2.4.4 The Economic Effects of IFRS in Brazil**

There are some analyses concerning economic consequences of IFRS adoption in Brazil. V. Lima (2011) has investigated the role of firm-level incentives for Brazilian firms to adopt IFRS and how the adoption has affected the cost of capital and market liquidity. The author has found that firms with a higher level of compliance to the IFRS present lower cost of capital and that these results hold when controlling for size, debt structure, growth opportunities, profitability and vote rights. Similar results were found when analyzing bid-ask spreads, price impact and share turnover.

R. Silva (2013) has analyzed the impact of IFRS on accounting quality and in the cost of equity capital. The author has found that the level of earnings management has decreased in the period of full adoption and that conditional conservatism has increased. When analyzing value relevance and timeliness, the author also provided improvement evidences. Regarding the cost of equity capital, the author have showed a reduction around seven basis points.

However, there are some studies that could not find significant effects in Brazil. Analyzing discretionary accruals of non-financial firms, Grecco (2013) did not find a significant reduction of earnings management associated with IFRS. Similarly, Paulo, Girão, Carter, and Souza (2013), could not also find significant effects of IFRS regarding earnings management, conservatism and accruals errors, for both Brazil and Europe.

Therefore, there is still no consensus about the economic effects of IFRS adoption in Brazil. The reason behind these inconsistencies may lie on the treatment of incentives and enforcement mechanisms. An investigation about stock price synchronicity and its

reflection on volatility behavior may shed light on this issue, considering its particular relations with financial development and weak enforcement, discussed in Section 2.3.2.1.



## 3 Research Design

### 3.1 Stock Price Synchronicity Analysis

#### 3.1.1 Sample and Data

The first financial statements under the International Financial Reporting Standards in Brazil were issued for the year of 2008. By 2010 all listed firms adopted IFRS for the individual and the consolidated financial statements. Therefore, the sample comprise the years of 2008 and 2009 (early adoption, discussed in Section 2.4.2) as the Transition period and the years of 2010 to 2013 (last year for which there were accounting data available) as the Post-Adoption period. The Pre-Adoption period also comprises 4 years, that is, from 2004 to 2007.

The initial sample consisted in all listed firms on the Brazilian Stock Exchange available on Standards & Poor's (S&P) Capital IQ, that is, 312 firms. However, I only included in my sample firms that were traded every day at each year. This criterion is necessary because only firms actively negotiated may have prices able to capture public information in the market. In this sense, for firms that have more than one class of stocks (ordinary and preferred shares, for example), I chose the one with higher trading volumes. This filter reduced my sample ranging from 39 firms in 2004 to 159 firms in 2013, summing 1,028 firm-year observations. However, the final model, excluding every observation not available for each variable (explained in Section 3.1.3), only comprised 523 observations.

Table 3.1 reports the number of firms by each industry, according to the one-digit Standard Industry Classification (SIC) codes, at each year comprising the sample, summing 523 observations.

The analysis demands accounting annual data that were obtained on S&P Capital IQ. The data concerning stocks, such as price and trading volume, were obtained on Economatica.

**Table 3.1**  
**Final Sample Size**

	SIC 0	SIC 1	SIC 2 and 3	SIC 4	SIC 5	SIC 6	SIC 7 and 8	Total
2004	0	0	2	1	0	0	0	3
2005	0	0	2	2	0	0	0	4
2006	0	0	3	6	0	0	1	10
2007	0	1	7	6	0	2	2	18
2008	0	0	10	10	1	8	3	32
2009	0	1	18	16	2	17	3	57
2010	0	2	27	19	4	21	5	78
2011	0	2	25	20	3	23	10	83
2012	0	4	34	23	6	30	10	107
2013	0	6	42	25	13	32	13	131
Total	0	16	170	128	29	133	47	523

One digit SIC Codes – 0: Agriculture, Forestry and Fishing; 1: Mining and Construction; 2 and 3: Manufacturing; 4: Transportation and Public Utilities; 5: Wholesale and Retail Trade; 6: Finance, Insurance, Real State; 7 and 8: Services.

As specified in Section 3.1.3, the macroeconomic data were made available by the Brazilian Central Bank and the World Bank.

### 3.1.2 Measure of Stock Price Synchronicity

In order to capture the extent to which stock prices in Brazil have moved together I use the approach of the market model, which is followed by a wide range of authors working with stock prices comovements, such as Morck et al. (2000), K. Li et al. (2010), Barberis, Shleifer, and Wurgler (2005), Jin and Myers (2006), R. Greenwood (2008), Hutton, Marcus, and Tehranian (2009), Beuselinck et al. (2010) and J. Kim and Shi (2012). This approach consists in estimating the market model for each firm in each year, using daily returns, as seen on Equation (3.1), where  $r_{it}$  is the return of firm  $i$  on day  $t$  and  $r_{mt}$  is the market return in day  $t$ :

$$r_{it} = \alpha + \beta r_{mt} + \epsilon_{it}. \quad (3.1)$$

Equation (3.1) sets the firm return as a function of the market return. The error term captures all other factors that affect the firm return besides the market movements, including firm-specific information. The coefficient of determination,  $R^2$  on Equation (3.1), thus, reflects the amount of the firm returns variation that is explained by the market.

Considering that the market returns reflects macroeconomic information, the greater the  $R^2$ , the greater is the weight of market-wide information in stock returns. If the market model for all individual stocks have large coefficients of determination, this indicate that stock prices frequently move together (Morck et al., 2000), that is, they tend to be more synchronized. However, it is important to highlight that this may not be necessarily true, once it is possible that the error term still conveys systematic components, specially when using one-factor models such as Equation (3.1).

Before entertaining the models, it is first necessary to establish a measure for the market return. In Brazil, the return of Ibovespa, the index of the BM&FBovespa is usually considered as a proxy for market return. Ibovespa is a theoretical portfolio that indicates the average performance of the most traded and representative assets of the Brazilian market. The index can be viewed as an theoretical application in a certain number of stocks, which varies depending on the free float market capitalization of the stock. The criteria for a stock to be included on Ibovespa have recently changed (BM&FBovespa, 2013). Currently, to be included in the index, the stock must have been present in 95% of the trading sessions and have a trading volume higher than 0.1% (BM&FBovespa, 2014c), and its weight cannot exceed 20%.

Considering these weighing criteria, the higher is the trading volume of a stock, higher is its weight on the index. Therefore, using Ibovespa as a proxy for the market may lead to some problems because there are a few stocks with a too high weight in the index. By June 2014, there were more than 500 firms listed on BM&FBovespa (BM&FBovespa, 2014b), but there were only 71 stocks in the index. From this composition, 5 firms (Bradesco, Itaú Unibanco, Ambev and Petrobras) summed more than 30% of weight in the index (BM&FBovespa, 2014a). Therefore, the behavior of Ibovespa may be too affected by those few firms.

Considering the potential weighting problems of Ibovespa, I built an index comprising the firms of my sample. The firms I have included are those with daily negotiation, as mentioned before. I used daily returns of the firms available at each year in order to build the market return. The number of firms included in the index at each year is shown in Table 3.2.

Some authors measure the market return by an equally-weighted index, such as Hsin and Tseng (2012) and R. M. Greenwood and Sosner (2007), while others use a value-weighted index, namely Hutton et al. (2009), Beuselinck et al. (2010), Xing and R. Anderson (2011) and K. Chan, Hameed, and Kang (2013). One can argue that, theoretically, a value-weighted index can better represent the market movements, once bigger firms are indeed

**Table 3.2**  
**Annual Sample Size for the Market Model**

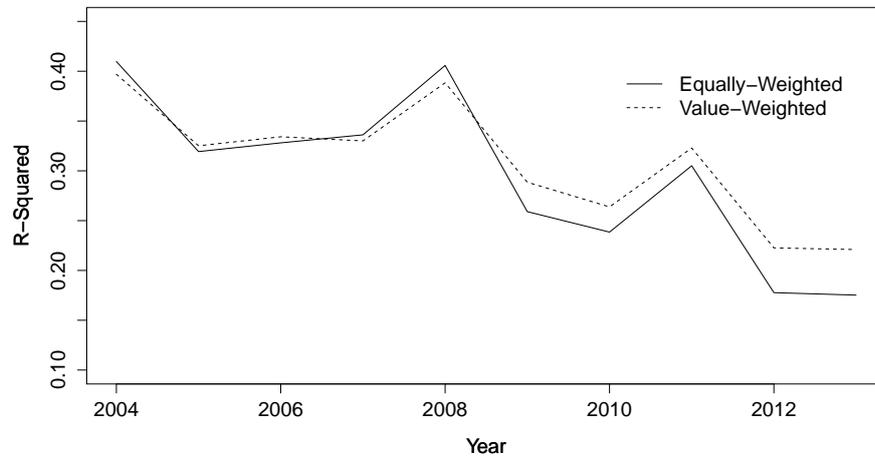
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number of firms	39	44	54	79	111	118	137	135	152	159
Number of Daily Returns Observations	238	237	231	231	238	233	234	238	231	237

more important into the market and, therefore, should have higher weights. However, some can also argue that if the market index conveys important information for a certain firm it might not make sense that other firms (the bigger with higher influence in the value-weighted index) with completely different activities, convey important information for that particular firm. Besides that, a value-weighted index could bring the risk of reverse causality, that is, the firm returns causing the market returns instead of the market returns influencing the firm returns.

Taking these observations into account, I consider the better model to measure synchronicity the one that generates, on average, higher explanatory power, that is, the higher R-squared. figure 3.1 compares the annually average R-squared obtained by Equation (3.1) for an equally-weighted and a value-weighted market index. The figure shows that, on average, the model with an equally-weighted market index produces higher values for the coefficient of determination. Therefore, I consider a model with an equally-weighted index the more appropriate to my analysis.

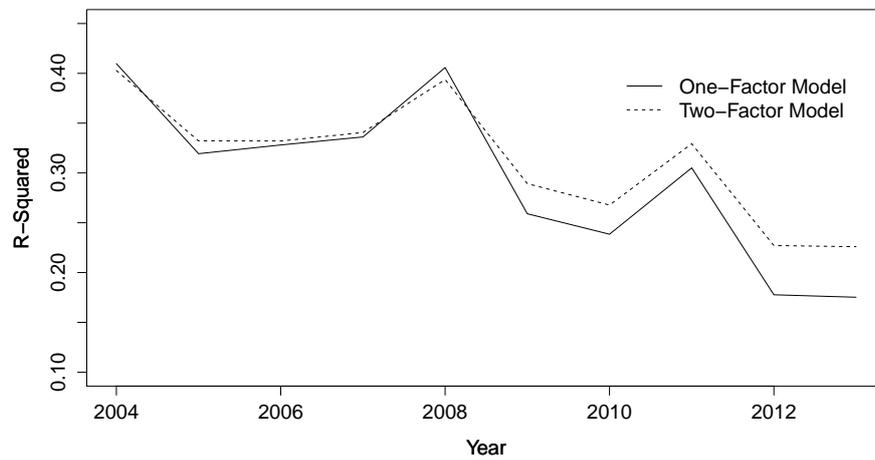
Some authors add other factors in the model in order to isolate the idiosyncratic movements. J. Kim and Shi (2012) and Beuselinck et al. (2010) add a industry return index. However, K. Chan and Hameed (2006) argue that, in emerging markets, including industry returns as an additional factor to isolate firm-specific returns is problematic because these economies tend to be dominated by few industries and, therefore, is difficult to disentangle the industry effect from the market effect. Besides that, if an industry is composed by only a few firms, its returns will reflect basically those firm-specific news rather than industry news. In fact, Table 3.1 shows that my sample is indeed concentrated in few industries and there are some industries with to few firms.

Morck et al. (2000) add the the United States stock market return as a factor in their market model, arguing that most economies are at least partially open to foreign capital. Considering that part of the risk of each Brazilian stock may be due to international



**Figure 3.1**  
R-Squared Comparison: Equally *versus* Value-Weighted Market Index

shocks, I include the return of the equally-weighted version of the S&P 500 index. figure 3.2 shows that adding this factor in Equation (3.1) slightly increases its average R-Squared. Therefore, the movements of the U.S. stock market apparently have significant, although small, explanatory power to Brazilian firms return.



**Figure 3.2**  
R-Squared Comparison: One-Factor *versus* Two-Factors Model

Considering the later evaluations, the model used to measure stock price synchronicity is the one including two factors:

$$r_{it} = \alpha + \beta_1 r_{mt} + \beta_2 SP500_t + \epsilon_{it}, \quad (3.2)$$

where  $r_{it}$  is the firm  $i$  return on day  $t$ ,  $r_{mt}$  is the return of an equally-weighted index composed by the firms of the sample and  $SP500_t$  is the S&P 500 equal-weighted return on day  $t$ , obtained in S&P Capital IQ.

I estimate Equation (3.2) for each firm on each year, gauging its  $R^2$ . Therefore, I have one measure for the extent to which the return of each firm of the sample moves according to market-wide information for each year. Henceforth, I denote this measure as  $R_{it}^2$ , where  $i$  identifies each firm and  $t$  identifies each year.

While the  $R_{it}^2$  of Equation (3.2) works as a measure of how much of the stock returns variation is due to the market return variation, its values are limited to the interval of 0 to 1. Therefore, following Durnev, Morck, and Yeung (2004), I circumvent this bounded nature of the coefficient of determination applying a logistic transformation on  $R^2/(1 - R^2)$ , obtaining the measure for the stock price synchronicity. Equation (3.3) shows this measure for each firm  $i$  in each year  $t$ , where  $R_{it}^2$  is the coefficient of determination of Equation (3.2):

$$Syn_{it} = \ln \left( \frac{R_{it}^2}{1 - R_{it}^2} \right). \quad (3.3)$$

### 3.1.3 Empirical Modelling

#### 3.1.3.1 Variables of Interest and Control Variables

My variables of interest are the ones that capture the general effects of IFRS adoption for Brazilian firms. Considering the early adoption period (2008 and 2009) and the full adoption period (from 2010), I build two dummy variables to capture possible different effects for these two periods. The first one,  $Trans_t$ , is intended to capture the transition effects and equals one if the observation is for the years 2008 and 2009 and zero otherwise, while the second one,  $Post_t$ , is intended to capture the full adoption effects and equals one for observations from the year 2010 and zero otherwise.

However, associating the evolution of stock price synchronicity over time and across firms only with these dummy variables would probably lead to misinterpretation, because that are several factors affecting synchronicity that could have evolved concomitantly to IFRS adoption. According to the previous literature, I have identified two major classes of these factors: Country-level, or macroeconomic, factors; and firm-level, or microeconomic, factors. The first class is related to institutional and structural aspects that affects the

functioning of the stock market as a whole. The second class refers to aspects of individual firms that affect the process of incorporating information into their stock prices and other related to corporate transparency that affects specific information about them available to the market, related to managers' and auditors' incentives to report transparent financial statements.

### 3.1.3.2 Controlling for Country-level Factors

Morck et al. (2000) have found that stock prices in economies with higher GDP per capita tend to move in a unsynchronized way, while countries with lower GDP per capita tend to move up and down together. The authors then explore which structural variables may explain these differences. Morck et al. (2000) analyse these factors because they assess stock price synchronicity in 37 countries. Although I focus on Brazil, I must account for these factors because I work with a period of 10 years and these structural features are most likely to have changed through this period and, then, caused synchronicity to change. Therefore, it is necessary to control for these factors in order to isolate the effects of IFRS adoption.

**Market Size.** By construction, the  $R^2$  of Equation (3.1) is sensible to the number of securities traded in the stock market. The higher is the number of stocks composing  $r_{mt}$ , the lower is the market model explanatory power. In a market with only a few securities, each individual is a more important part of the market index, then, higher synchronicity may be simply reflecting fewer traded stocks (Morck et al., 2000). Therefore, following Morck et al. (2000) I use the natural logarithm of the number of stocks traded ( $MktSize_t$ ) each year as a control variable.

**Macroeconomic Instability.** It is possible that volatile market fundamentals overcome variations due to firm-specific factors and cause stock prices to move together (Morck et al., 2000; Peng et al., 2007). So, stock price synchronicity evolution is likely to be affected by changes in macroeconomic instability. As a proxy for macroeconomic instability I use the variance of inflation rates ( $VarInfl_t$ ) throughout each year. Specifically, I use the mean of monthly variation of the market prices general index, *Índice Geral de Preços de Mercado* (IGP-M) calculated by the Central Bank, following Morck et al. (2000) and Durnev, K. Li, Morck, and Yeung (2004). The data is available in the Time Series Management System of the Central Bank. As other proxies for macroeconomic stability I also use the variance of GDP ( $VarGDP_t$ ), available at the *Instituto Brasileiro*

*de Geografia e Estatística* (IBGE) website and the variance of the exchange rate (Real to Dollar) ( $VarEx_t$ ), also available at the Central Bank website.

**Property Rights Protection.** As discussed in Section 2.2, the level of property rights protection is likely to be related to stock price synchronicity in such a way that a higher comovement of stocks might be reflecting a higher political cost (Morck et al., 2000). La Porta et al. (1998) have constructed a number of measures for protection of corporate shareholders and creditors for 49 countries, including Brazil. Kaufmann et al. (2007) build some indicators for quality of governance, regulation and political stability and effectiveness for 2012 countries between 1996 and 2007. Morck et al. (2000) uses the indicators in La Porta et al. (1998) as a proxy for property rights protection.

Once my analysis comprises the years between 2004 and 2013, I use the Worldwide Governance Indicators published by the World Bank, that is, Control of Corruption ( $Corrupt_t$ ), Government Effectiveness ( $GovEff_t$ ), Political Stability and Absence of Violence/Terrorism ( $PolStab_t$ ), Regulatory Quality, ( $RegQual_t$ ), Rule of Law ( $Law_t$ ) and Voice and Accountability ( $Voice_t$ ) as control variables. The definitions of these variables can be seen in the Section 2.4.3.

A more efficient way to control for all these country-level factors besides any other not identified could be through the use of time-factor variables, that is, a dummy variable for each year. However, my two interest variables are basically a combination of time dummy variables. *Trans* would be a perfect linear combination between the time dummies for 2008 and 2009, while *Post* would be the sum of the time dummies from 2010 to 2013. Therefore, some of the time-factors would have to be necessarily out of the model because of perfect collinearity, and the model could lose important information from those years left out.

### 3.1.3.3 Controlling for Firm-level Factors

**Trading Volume.** K. Chan and Hameed (2006) points out that the level of a stock's trading volume affects stock return synchronicity because it influences the speed of price adjustments. Stocks that are more frequently traded tend to react to information on a more timely basis while infrequently traded stocks will take a longer time to incorporate new market or firm-specific information. Therefore, I use the natural logarithm of the average weekly trading volume ( $TradVol_{it}$ ) of the firm  $i$  in the year  $t$ .

**Ownership Structure.** As seen in Section 2.2, the ownership structure of a firm is important to explain its stocks synchronicity due to the structure of control and cash flow rights. So, the behavior of the stock prices of a firm may change through the period due to changes on its ownership concentration. Therefore, I use a variable that accounts the percentage of stocks held by the largest shareholder ( $OwnStruct_{it}$ ).

Ownership structure can also be considered an incentive to report transparent information. In the words of Durnev and E. Kim (2005, p. 1642), “ownership concentration matters because one does not steal from oneself”.

**Economic and Managerial Diversification.** L. Chan, Lakonishok, and Swaminathan (2007) argue that industry classifications captures a large portion of extra market correlations in stock returns and that analysts are usually concerned about industry effects on stock prices. Roll (1992) finds evidence that industry classification affects the behavior of stock prices. For the author, some economies vary in their industrial compositions and have some industries inherently more or less volatile. The author points out that the stock market reflects the idiosyncrasies of the country’s industrial structure.

Roll (1992) compares a country’s market to a managed portfolio with particular industry sector choices. Therefore, a large market (portfolio) can be influenced by disproportionate investments in certain industries. The author finds that a country’s market index is more volatile when it is less diversified. Morck et al. (2000) also compare a country’s stock market to a portfolio. For them, if firms are concentrated in few industries, their fundamentals could be highly correlated causing stock prices to move together. Additionally, some firms may be too large and have too much influence in such a way that the market becomes dominated by only a few very large firms.

Hence, I consider in my analysis an industry concentration measure, a Herfindahl-Hirschman index (Rhoades, 1993) for industries and for individual firms for each year. I define  $H_{jt}$  as the industry index, defined by the ratio between the combined sales of industry  $j$  and the combined sales of all the sample; and  $H_{it}$  as the firm index, defined as the ratio between the sales of firm  $i$  and the sales of all firms in the sample. I define the industries according to its one-digit SIC codes for each year of the analysis, available in S&P Capital IQ.

Beuselinck et al. (2010) and J. Kim and Shi (2012) control IFRS adoption for industry fixed effects, adding dummy variables on their models. However, Morck et al. (2000) point out that controlling for the Herfindahl indexes is roughly equivalent to using SIC codes to define industry category.

**Synchronized Fundamentals.** Pindyck and Rotemberg (1993) argue that the prices of different stocks can move together in response to common movements in earnings. In this situation, stock price synchronicity would not be a market deficiency, but it would only be reflecting the underlying economic situation. Morck et al. (2000) assess if the correlation of firms profitability can explain stock price synchronicity. They argue that synchronous fundamentals can be due to industry concentration or to widespread intercorporate ownership, that causes the performance of some firms to depend on the performance of other firms. The authors measure the fundamentals' synchronicity in a similar way to Equation (3.1), where, instead of the stock and market returns, they use the return on assets (*ROA*) of each firm. However, once earnings data are annual, I can only obtain one *ROA* for each firm and for the market per year. It is, therefore, not possible to control for synchronous fundamentals.

However, this impossibility of controlling for fundamentals may not cause great damage to my model, once I control for industries. It is expected that firms from same industries to present correlated fundamentals (Pindyck & Rotemberg, 1993). Therefore, controlling for industry concentration may minimize the confounding effects of synchronized fundamentals.

I argument that IFRS adoption may affect stock price synchronicity through producing more transparent accounting information to the market. However, the financial reporting system per se is not the only factor capable to affect corporate transparency. It is necessary to account for managers' and auditors' incentives to report transparent information.

Ball, Robin, and Wu (2003) argue that these incentives depend on the combination of market and political forces. The market forces are related to the demand for high-quality financial reporting according to the amount of publicly traded equity, to the firm's size, its amount of public debt; while the political forces are the ones related to the involvement of the government and political incentives to reduce volatility of reported income.

Daske, Hail, Leuz, and Verdi (2013) assess some of these firms incentives analysing firms' size, profitability, foreign sales, financial needs, growth opportunities and ownership concentration. Barth et al. (2008) include in their analysis variables identifying firms audited by one of the Big Four audit firms (Ernst & Young, Deloitte Touche Tohmatsu, PricewaterhouseCoopers and KPMG), the number of exchanges in which the firm's stocks is listed and specifically if they are listed in the United States.

Studying the role of these incentives to IFRS adoption in Brazil, V. Lima (2011) found that larger firms, less leveraged, more profitable, with a less concentrated ownership structure

and the ones audited by a Big Four firm are more likely to adopt IFRS practices that account material changes on its financial reporting practices.

Therefore, I also control the effect of IFRS adoption on stock price synchronicity for the following factors.

**Size.** Larger firms are more susceptible to political forces and monitoring by the stock market, they attract more attention and may be under greater scrutiny by the public (Durnev & E. Kim, 2005) which may affect the quality of their financial reports. Several studies has associated the firm's size to more voluntary disclosed information (e.g., Ho & Shun Wong, 2001), probably because large firms need more financing capital than smaller firms. Besides these two reasons, some argue that larger firms can produce better accounting information simply because there are more resources available to them (V. Lima, 2011). Therefore, I control the impact of IFRS adoption on stock price synchronicity for the firms' size ( $Size_{it}$ ), measured as the natural logarithm of the total assets.

**Leverage.** The structure of debt is also an important factor to consider when dealing with financial transparency. Firms more leveraged (that is, with a higher proportion of debt in their capital structure) may manipulate the accounting numbers to prevent the violation of debt covenants or to achieve a good credit rating in order to access more favorable conditions from creditors (A. Silva, Weffort, Flores, & Silva, 2014; V. Lima, 2011). So, I use in my analysis a control variable for the debt structure ( $Lev_{it}$ ) defined as the ratio between the total liabilities and the total assets.

**Profitability.** Dechow, Sloan, and Sweeney (1995) argues that the firm's profitability influences managers to manipulating earnings according to, for example, the top executives bonus plan. Larcker and Richardson (2004) point that current performance can create incentives to engage in earnings management and, therefore, affect financial transparency. Then, I use the current profitability ( $ROA_{it}$ ), defined as the ratio between Net Income and Total Assets, as a control variable in my analysis.

**Investments Opportunities.** The annual percentage in growing sales ( $Grow_{it}$ ) is often related to higher accounting quality (e.g., Barth et al., 2008; H. Chen et al., 2010). Lee and Hutchison (2005) argues that firms with growing sales are more likely to react to public pressure and negative publicity than firms without a continuing need for new production facilities. Therefore, firms with growing sales are expected to produce more transparent

financial statements to facilitate access to resources to support this growing. I, therefore, include the annual percentage variation in Total Revenues as a control variable in my analysis.

**Growth Opportunities.** Firms which are facing greater growth opportunities will need more external finance to exploit these opportunities. These firms will benefit from higher quality and more transparent financial accounting allowing them to obtain external funds at a lower cost (Durnev & E. Kim, 2005). The extent to which a firm market value exceeds its book value, measure by the market-to-book ratio ( $MTB_{it}$ ) is, therefore, used as a measure to control for growing opportunities.

**Cross-listing in the United States.** Cross-listing in the United States is usually associated with a better informational environment and a higher firm-specific information flow (Fernandes & Ferreira, 2008), besides a higher analyst coverage and forecast accuracy (Lang, Lins, & Miller, 2003). A non-US firm that issues American Depositary Receipts (ADR) is seeking for other markets access and enhancing its visibility (Licht, 2003), having more incentives to disclose financial statements with higher transparency than other firms do. Once firms cross-listed in the U.S. face extra enforcement by the Security Exchange Commission (SEC), they tend to present more disclosure (Coffee Jr, 2002) and to improve investor protection (Benos & Weisbach, 2004; Reese Jr & Weisbach, 2002). In order to control for this effect I employ a dummy variable ( $ADR_{it}$ ) as a control for firms issuing ADR.

**Big Four Auditor.** DeAngelo (1981) argues that the audit firm size alone alters auditors' incentives in such a way that larger audit firms supply a higher level of audit quality. This effect, according to Francis and Wang (2008), is due to these firms' need to protect their brand name reputation from legal exposure if the financial statements signed by them are found to be misleading. Considering this, I include in my analysis a dummy variable ( $Aud_{it}$ ) that indicates if the firm is audited by one of the Big Four at each year.

### 3.1.3.4 Empirical Model for Stock Price Synchronicity

In this section I present the empirical model for measuring the effect of IFRS adoption on stock price synchronicity. I hypothesize that IFRS adoption affects the extent to which stock prices have been moving together in the Brazilian stock market. However, I

must account for structural factors and firm-level incentives that may affect synchronicity besides the financial reporting system. Equations (3.4) and (3.5) present this rationale:

$$Syn_{it} = f(IFRS\ Adoption, Country\text{-}Level\ Factors, Firm\text{-}Level\ Factors); \quad (3.4)$$

$$\begin{aligned} Syn_{it} = & \beta_0 + \beta_1 Trans_t + \beta_2 Post_t + \\ & + \beta_3 MktSize_t + \beta_4 VarInfl_t + \beta_5 Corrupt_t + \beta_6 GovEff_t + \beta_7 PolStab_t + \\ & + \beta_8 RegQual_t + \beta_9 Law_t + \beta_{10} Voice_t + \beta_{11} TradVol_{it} + \beta_{12} OwnStruct_{it} + \\ & + \beta_{13} H_{jt} + \beta_{14} H_{it} + \beta_{15} Size_{it} + \beta_{16} Lev_{it} + \beta_{17} ROA_{it} + \beta_{18} Grow_{it} + \\ & + \beta_{19} MTB_{it} + \beta_{20} ADR_{it} + \beta_{21} Aud_{it} + \epsilon_{it}. \end{aligned} \quad (3.5)$$

The variables definitions are the ones seen in sections 3.1.2 and 3.1.3.1. If  $\beta_1$  is *negative* and statistically significant, this is the first indication that Hypothesis 1 is the holding one. The hypothesis, though, only holds if  $\beta_2$  is *negative* and statistically significant. If Hypothesis 2 holds,  $\beta_1$  and  $\beta_2$  are expected to be *positive* and statistically significant. If both parameters cannot be considered significant at any reasonable level, this is an evidence that the Null Hypothesis is the holding one. However, it is important to notice that, if both parameters are not statistically significant, a possible reason is that the effects predicted by both Hypotheses 1 and 2 are present, cancelling each other. Therefore, in this situation, inferences about improvements in the informational environment could not be made.

### 3.1.3.5 Estimation

The analysis of several firms over time demands an estimation approach that exploits this double dimensionality and copes with some of the typical problems associated with this kind of economic data, especially the problem of unobserved heterogeneity (Croissant & Millo, 2008). This approach is known as panel data econometrics.

Controlling for individual heterogeneity is the first reason Baltagi (2008, p. 7) gives for using panel data models. Besides that, the author says that these models give “more informative data, more variability, less colinearity among the variables, more degrees of freedom and more efficiency” and are better able to study the dynamics of adjustments.

The following specifications for estimating panel data models are based on Wooldridge (2010). The author argues that the main point of using panel data estimation methods is to deal with the unobserved heterogeneity, which is considered a problem of omitted

variable in econometrics. Consider the model on Equations (3.6) and (3.7), that show the dependent variable,  $y_t$ , as a function of a vector of observable variables,  $\mathbf{x}_t$ , and an unobserved time-constant variable,  $c$ :

$$E[y_t|\mathbf{x}_t, c] = \beta_0 + \mathbf{x}_t\beta + c \quad (3.6)$$

$$y_t = \mathbf{x}_t\beta + c + u_t. \quad (3.7)$$

The variable  $c$  is called the unobserved effect in panel data analysis, which captures features of the firms that are constant over the period of analysis. Therefore, panel data models are able to control for some part of the error term that is constant over time, that is, the unobserved variables that are constant (Wooldridge, 2010).

A model with those unobserved effects can be written as:

$$y_{it} = \mathbf{x}_{it}\beta + c_i + u_{it}, \quad t = 1, 2, \dots, T, \quad (3.8)$$

where  $\mathbf{x}_{it}$  is a  $1 \times K$  vector ( $K$  explanatory variables) that can contain variables that change across firms and across time or just across one of these dimensions. In order to consistently estimate the vector  $\beta$  it is necessary that all variables in  $\mathbf{x}$  are exogenous, that is, are uncorrelated with the error term. However, when dealing with panel data, the explanatory variables and the error term occur at several moments of time. Panel data methods requires each explanatory variable to be uncorrelated with the error term at any period of time (Wooldridge, 2010). This is the *strict exogeneity condition*, stated in Equation (3.9):

$$E[u_{it}|x_{i1}, x_{i2}, \dots, x_{iT}, c_i] = 0, \quad t = 1, 2, \dots, T, \quad (3.9)$$

which implies that  $E[\mathbf{x}_{is}^\top u_{it}] = \mathbf{0}$ ,  $s, t = 1, 2, \dots, T$ .

The equations shown in this section are in terms of  $y$  and  $x$  in order to provide a cleaner explanation. My analysis considers as  $y$  the variable  $Syn_{it}$  defined on Section 3.1.2 and as the components of  $\mathbf{x}$  the variables of interest  $Trans_t$  and  $Post_t$  besides the control variables defined on Section 3.1.3.1. Inside  $\mathbf{x}$  there are variables that change across time and across firms (the firm-level variables) and only across time (the country-level variables). There are no observable variables constant over time, once I control for industry-effects through the Herfindahl-Hirschman Index by Industry, that varies according to firms' revenues.

It is likely that there are omitted variables in the model influencing  $Syn_{it}$  that are correlated with some of the control variables. These omitted factors are crucial for defining the adequate method for estimating panel data models. If these omitted variables can

be considered constant over time, some estimation methods for panel data are able to control for them. Next, I explore the traditional methods of panel data and how they can be appropriate or not depending on the assumptions regarding the relation between the unobserved effects and the explanatory variables, and the behavior of the error term, as written by Wooldridge (2010).

### Pooled OLS

The Ordinary Least Squares (OLS) estimator can be used to consistently obtain  $\beta$  under the following situations. One can write the model as Equation (3.10):

$$y_{it} = \mathbf{x}_{it}\beta + v_{it}, \quad (3.10)$$

where  $v_{it} = c_i + u_{it}$  are the composite errors, that is, the sum of the unobserved effect  $c_i$  and the idiosyncratic errors,  $u_{it}$ . If  $E[\mathbf{x}_{is}^\top v_{it}] = \mathbf{0}$  holds, the parameters will be consistent. However, one must note that this assumption holds if  $E[\mathbf{x}_{is}^\top u_{it}] = \mathbf{0}$  and  $E[\mathbf{x}_{is}^\top c_i] = \mathbf{0}$  are true. Therefore, the unobserved effect is not allowed to be correlated with any of the explanatory variables (Wooldridge, 2010).

Additionally, once  $c_i$  is constant over time,  $v_{it}$  will be necessarily serially correlated. Therefore, one must compute the robust variance matrix estimator and robust test statistics when estimating the parameters through pooled Generalized Least Squares (GLS) (Wooldridge, 2010).

### Random Effects

Random effects estimation treats the unobservable effect just as the pooled OLS, that is, it is considered part of the error term. Therefore, it also requires that the explanatory variables and the unobservable effect to be uncorrelated. Besides this assumption, random effects still requires that the strict exogeneity condition holds (Wooldridge, 2010).

The alleged advantage to use Random Effects instead of Pooled OLS is that the random effects approach relies on a GLS framework to exploit the serial correlation in the composite errors (Wooldridge, 2010).

## Fixed Effects

Pooled OLS and Random Effects treat the unobservable effects as part of the error term. However, if one cannot guarantee that the omitted variables are uncorrelated with the explanatory variables in  $\mathbf{x}$ , a method that controls for them is necessary. Fixed effects methods achieve this purpose, under the assumption that the unobservable variables are constant over time.

The fixed effects approach also requires strict exogeneity, such as random effects, but it can produce consistent parameters in the presence of time-constant variables that can be correlated with the observable variables in  $\mathbf{x}_{it}$ . Therefore, fixed effects methods are more robust than random effects (Wooldridge, 2010). However, once  $c_i$  is constant over time, the effect of any observable variable that is also constant over time cannot be distinguished from the unobservable effects. Therefore, variables describing structural characteristics of the firms that do not change over the period of analysis cannot be estimated by fixed effects. However, once I control for industries (time-constant characteristic of firms) using the Herfindahl-Hirschman Index by Industry, which varies over time, the empirical model (3.5) can be estimated by fixed effect without limiting its analysis.

The intuition for estimating the vector  $\beta$  is to eliminate the unobserved effects  $c_i$  through a transformation on the original variables, called *within transformation*, and then apply OLS on the transformed variables. First, one must average Equation (3.8) over  $t = 1, 2, \dots, T$  to get the cross section Equation (3.11), where each variable is the mean of the variable on Equation (3.8):

$$\bar{y}_i = \bar{\mathbf{x}}_i \beta + c_i + \bar{u}_i. \quad (3.11)$$

Subtracting Equation (3.8) from (3.11), yields Equation (3.12), which no longer presents any time-constant unobserved effect. Therefore, if the strict exogeneity condition holds, one can consistently estimate  $\beta$  applying OLS on Equation (3.12) (Wooldridge, 2010):

$$\begin{aligned} (y_{it} - \bar{y}_i) &= (\mathbf{x}_{it} - \bar{\mathbf{x}}_i) \beta + (c_i - c_i) + (u_{it} - \bar{u}_i), & t = 1, 2, \dots, T \\ \dot{y}_{it} &= \dot{\mathbf{x}}_{it} \beta + \dot{u}_{it}, & t = 1, 2, \dots, T. \end{aligned} \quad (3.12)$$

In the presence of heteroskedasticity and serial correlation in the idiosyncratic errors, one can apply the robust variance matrix estimator according to Arellano (1987).

### First-Difference

The unobserved effect  $c_i$  can be eliminated by another type of transformation, the *first-difference transformation*. Taking the first difference of each observation in model (3.8) yields the model in Equation (3.13), where  $\Delta y_{it} = y_{it} - y_{it-1}$ ,  $\Delta \mathbf{x}_{it} = \mathbf{x}_{it} - \mathbf{x}_{it-1}$  and  $\Delta u_{it} = u_{it} - u_{it-1}$ :

$$\Delta y_{it} = \Delta \mathbf{x}_{it} \beta + \Delta u_{it}. \quad (3.13)$$

Once  $c_i$  is constant over time,  $\Delta c_i = 0$ , so, just like the *within transformation*, the *first-differencing transformation* eliminates the unobserved effects that are constant over time. Therefore, the first-difference estimator is the pooled OLS estimator on Equation (3.13) (Wooldridge, 2010).

Under strict exogeneity, the absence of perfect collinearity, homoskedasticity and absence of serial correlation, the fixed effects estimator is more efficient than the first-difference estimator. However, if the idiosyncratic errors  $u_{it}$  are serially dependent, the first-difference estimator is more efficient (Wooldridge, 2010).

## 3.2 Volatility Analysis

The next step of the analysis concerns the volatility measures and the behavior of the systematic and idiosyncratic risk through the years of 2004 to 2013.

### 3.2.1 Volatility Decomposition

This section provides the methodology to decompose the stock returns' into two components: market-wide and firm-specific. The proceeds and deduction are based on Campbell et al. (2001) and Campbell and Lettau (1999). The objective is to construct time series of volatility measures of these two components, in order to assess the behavior of idiosyncratic and systematic risks throughout the period of analysis.

Campbell et al. (2001) and Campbell and Lettau (1999) build some volatility measures that sum to the total return volatility of a typical firm, without the need of estimating

betas for firms neither covariances. The authors decompose the volatility series into three components: market-wide, industry-wide and firm-specific. However, once the purpose of the present study relies on the behavior of market and firm individual risks, and considering the observations of K. Chan and Hameed (2006) about industry-returns basically reflecting firm-specific news in a market such as the Brazilian one, I decompose volatility only into the market-wide and firm-specific components.

The excess return over a risk-free rate is denoted as  $r_{it}$ , that is, the stock return of firm  $i$  in day  $t$ . The excess market return is denoted as  $r_{mt} = \sum_i w_{it} r_{it}$ , where  $w_{it}$  represent the weight of firm  $i$  for aggregating the market return. As a risk-free rate I consider the daily returns of *Certificado de Depósito Interfinanceiro* (CDI), discussed by Barros, Famá, and Silveira (2002) as an appropriate approximation for the Brazilian market. For aggregating the firm returns into market returns I use equal weights, consistently with the analysis in Section 3.1.

First, Campbell et al. (2001) draw a decomposition based on the CAPM, which implies in setting intercepts to zero on Equation (3.14):

$$r_{it} = \beta_{im} r_{mt} + \tilde{\epsilon}_{it}, \quad (3.14)$$

where  $\beta_{im}$  represents the beta for firm  $i$  in respect to the market return and  $\tilde{\epsilon}_{it}$  is the firm-specific residual.  $r_{mt}$  and  $\tilde{\epsilon}_{it}$  are orthogonal by construction. The weighted sum of betas equals to one ( $\sum_i w_{it} \beta_{im} = 1$ ). Once the CAPM decomposition in (3.14) guarantee that the two components of the stock return are orthogonal to each other, it is possible to build a simple variance decomposition where the covariance terms are zero, as seen in Equation (3.15):

$$\begin{aligned} \text{Var}[r_{it}] &= \text{Var}[\beta_{im} r_{mt} + \tilde{\epsilon}_{it}] \\ &= \text{Var}[\beta_{im} r_{mt}] + \text{Var}[\tilde{\epsilon}_{it}] + 2\text{Cov}[\beta_{im} r_{mt}, \tilde{\epsilon}_{it}] \\ &= \beta_{im}^2 \text{Var}[r_{mt}] + \text{Var}[\tilde{\epsilon}_{it}] + 2\beta_{im} \text{Cov}[r_{mt}, \tilde{\epsilon}_{it}] \\ &= \beta_{im}^2 \text{Var}[r_{mt}] + \text{Var}[\tilde{\epsilon}_{it}]. \end{aligned} \quad (3.15)$$

According to Campbell et al. (2001), the problem with the decomposition in Equation (3.15) is that it requires information about the firm-specific betas, which are difficult to estimate and may be unstable over time. Therefore, the authors work with a simplified model that does not require knowledge about the betas.

Dropping the beta from (3.14) yields a “market-adjusted return model” (Campbell, Lo, & MacKinlay, 1997), as seen in Equation (3.16), which defines  $\epsilon_{it}$  as the difference between

the firm return  $r_{it}$  and the market return  $r_{mt}$ :

$$r_{it} = r_{mt} + \epsilon_{it}. \quad (3.16)$$

If the firm beta  $\beta_{im} = 1$  or the market return  $r_{mt} = 0$ , the market-adjusted return residuals  $\epsilon_{is}$  equal the CAPM residual on Equation (3.14). Rearranging Equation (3.16) and placing (3.14) into it, one can relate the two residuals:

$$\begin{aligned} r_{it} &= r_{mt} + \epsilon_{it} \\ \epsilon_{it} &= r_{it} - r_{mt} \\ \epsilon_{it} &= \beta_{im}r_{mt} + \tilde{\epsilon}_{it} - r_{mt} \\ \epsilon_{it} &= \tilde{\epsilon}_{it} + (\beta_{im} - 1)r_{mt}. \end{aligned} \quad (3.17)$$

Now, according to Equation (3.17),  $r_{mt}$  and  $\epsilon_{it}$  are not orthogonal, so it is necessary to compute the covariance between them. So, the variance of the firm returns is as Equation (3.18):

$$\begin{aligned} \text{Var}[r_{it}] &= \text{Var}[r_{mt}] + \text{Var}[\epsilon_{it}] + 2\text{Cov}[r_{mt}, \epsilon_{it}] \\ &= \text{Var}[r_{mt}] + \text{Var}[\epsilon_{it}] + 2\text{Cov}[r_{mt}, \tilde{\epsilon}_{it} + (\beta_{im} - 1)r_{mt}] \\ &= \text{Var}[r_{mt}] + \text{Var}[\epsilon_{it}] + 2\{\text{Cov}[r_{mt}, \tilde{\epsilon}_{it}] + \text{Cov}[r_{mt}, (\beta_{im} - 1)r_{mt}]\} \\ &= \text{Var}[r_{mt}] + \text{Var}[\epsilon_{it}] + 2(\beta_{im} - 1)\text{Var}[r_{mt}]. \end{aligned} \quad (3.18)$$

Although Equation (3.18) contains a covariance term, once the weighted sum of betas equals one ( $\sum_i w_{it}\beta_{im} = 1$ ), when all firms are included in the sample it implies that the knowledge of covariance between  $r_{mt}$  and  $\epsilon_{it}$  is not required (C. Chen, Guo, & Tay, 2010), yielding a beta-free variance decomposition, as seen in Equation (3.19):

$$\sum_i w_{it} \text{Var}[r_{it}] = \text{Var}[r_{mt}] + \sum_i w_{it} \text{Var}[\epsilon_{it}] = \sigma_{mt}^2 + \sigma_{\epsilon_{it}}^2. \quad (3.19)$$

### 3.2.1.1 Estimation

The data used in this analysis are the same I used to calculate stock price synchronicity, consisting, as seen in Section 3.1.1, in the firms with daily negotiation from the years 2004 to 2013, resulting in a range of 39 firms in 2004 and 159 in 2013, as specified in Table 3.2.

Using daily returns of these firms, I estimated their volatility components defined in Equation (3.19) based on the decomposition (3.16). Still following Campbell et al. (2001) and Campbell and Lettau (1999), I estimated the variance components in Equation (3.19).

Let  $s$  denote the interval at which the returns were measured, that is,  $s$  denotes days. Using daily returns I constructed volatility measures at a weekly interval, denoted by  $t$ . That is, the returns were measured per day and aggregated per week, summing 527 observations for the period of analysis. Therefore, the market volatility in the week  $t$ , denoted by  $Mkt_t$  is computed as seen in Equation (3.20):

$$Mkt_t = \hat{\sigma}_{mt}^2 = \sum_{s \in t} (r_{ms} - \mu_m)^2, \quad (3.20)$$

where  $\mu_m$  represents the mean of the market return  $r_{ms}$  at each year. The market returns were the ones constructed to calculate stock price synchronicity, that is, by equally weighting the returns of the firms in my sample. Campbell et al. (2001) use weights based on market capitalization, but emphasizes that their decomposition is valid for any weighing criteria.

For firm volatility, I summed the squares of firm-specific residuals from Equation (3.16) for each firm in the sample:

$$\hat{\sigma}_{\epsilon_{it}}^2 = \sum_{s \in t} \epsilon_{is}^2. \quad (3.21)$$

Next, I computed the weighted average to ensure that the covariances of individual firms were canceled out, yielding the measure of the average firm volatility in Equation (3.22) for each week  $t$ :

$$Firm_t = \hat{\sigma}_{it}^2 = \sum_i w_{it} \hat{\sigma}_{\epsilon_{it}}^2. \quad (3.22)$$

### 3.2.2 Trend Analysis of the Volatility Series

If the synchronicity analysis provides evidence that the extent to which stock prices move according to the market has substantially changed over the period of analysis, one shall expect changes in the behavior of the volatility series defined on Section 3.2.1 and that these changes are different when considering the firm-level volatility and the market-wide one.

If IFRS adoption is associated with an increase (decrease) in the the proportion of firm-specific information incorporated into stock prices, one shall expect the volatility at the firm-level (market-level) to have increased in a more accentuated way than at the market-level (firm-level). Therefore, it would be possible to infer that IFRS is associated with this behavior, through its effect in synchronicity.

In order to analyze the evolution of volatility at the firm and at the market-level it was necessary to compute a trend analysis of the series generated by Equations (3.20) and (3.22).

The first step were the graphic analysis of the series, which could provide the first insights into the trend issue. A visual examination may be capable to identify some trends in the series through the period of interest. However, a formal analysis is necessary and it must first pass through the concept of stationarity in time series.

Stationarity, strictly speaking, is a feature of time series that present joint probability functions that are constant over time. That is, a time series  $\{y_t\}$  is strictly stationary if the joint distribution of  $(y_{t_1}, y_{t_2}, \dots, y_{t_k})$  is identical to that of  $(y_{t_1+t}, y_{t_2+t}, \dots, y_{t_k+t})$  for all  $t$ . Since this is a very strong condition, it is hard to be empirically verified. Therefore, it is possible to rely on a weaker concept of stationarity.  $\{y_t\}$  is said to be *weakly stationary* if both the mean of  $y_t$  and the covariance between  $y_t$  and  $y_{t-\ell}$  are time constant, where  $\ell$  is an arbitrary integer representing time lags. In other terms,  $y_t$  is stationary if  $E[y_t] = \mu$ , where  $\mu$  is a constant, and  $\text{Cov}[y_t, y_{t-\ell}] = \gamma_\ell$  (lag- $\ell$  autocovariance) are true. This conditions imply that the time plot of the series shows that the values of  $y_t$  fluctuate with constant variation around a fixed level (Tsay, 2010).

It is possible to test the stationarity of the volatility series generated through the methodology in Sections 3.2.1 and 3.2.1.1 by analysing their Autocorrelation Functions (ACF). The ACF is formed by the pairs  $(\rho_\ell, \ell)$ , where  $\ell$  is the number of lags and  $\rho_\ell$  is the correlation coefficient between  $y$  and its  $\ell$ -lagged value, as seen in Equation (3.23).

$$\tilde{\rho}_\ell = \frac{\sum_{t=\ell+1}^T (y_t - \bar{y})(y_{t-\ell} - \bar{y})}{\sum_{t=\ell+1}^T (y_t - \bar{y})^2}, \quad 0 \leq \ell < T - 1 \quad (3.23)$$

In order to test whether the autocorrelations calculated by Equation (3.23) are statistically different from zero, one may employ the Portmanteau test proposed by Box and Pierce (1970) and modified by Ljung and Box (1978). The test statistics is shown in Equation (3.24):

$$Q(m) = T(T+2) \sum_{\ell=1}^m \frac{\tilde{\rho}_\ell^2}{T-\ell}, \quad (3.24)$$

where  $T$  is the sample size and an appropriated value for  $m$  was empirically shown to be  $\ln(T)$  and  $Q(m)$  is asymptotically a chi-squared random variable with  $m$  degrees of freedom. The null hypothesis is that all autocorrelations for  $\ell$  lags are equal to zero, while the alternative hypothesis is that at least one of the autocorrelations is different

from zero (Tsay, 2010). If the autocorrelations are different from zero and slowly decrease as  $\ell$  increases, the mean and the variance of  $\{y_t\}$  are not constant over the time and the series is not stationary.

This concept of stationarity is strictly related to the trend analysis in time series. Time series may present two different types of trends: (1) deterministic trend, when the series is known as a trend-stationary one, and (2) stochastic trend, when the series is known as unit-root nonstationary series.

A series  $\{y_t\}$  is said to present a deterministic trend if it can be described by Equation (3.25). In this situation  $y$  evolves simply as the times goes by:

$$y_t = \beta_0 + \beta_1 t + \beta_2 t^2 + \dots + u_t. \quad (3.25)$$

However, the parameters on Equation (3.25) can vary through time. In this situation there would be a stochastic (random) trend in the time series. Suppose a dynamic model such as (3.26):

$$y_t = \alpha + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \dots + \epsilon_t. \quad (3.26)$$

If the sum of the parameters equals one, the shocks over the series are persistent and the trend becomes time variant, characterizing a series with a stochastic trend. It is important to notice that time series may present trends with a deterministic and a stochastic component at the same time.

Suppose the following process:

$$y_t = \alpha_0 + \alpha_1 t + u_t, \text{ where: } u_t = \theta u_{t-1} + v_t, \quad (3.27)$$

where the error term  $u_t$  assumes the form of a first-order autorregressive process, AR(1), while  $v_t$ , the innovation sequence, is iid  $N(0, \sigma^2)$  (independent and identically distributed). Therefore, the model defined on Equation (3.27) can be interpreted as a random walk about a linear trend when  $\theta = 1$  and as asymptotically stationary AR(1) process about a linear trend when  $\theta < 1$ .

Rearranging Equation (3.27) yields Equation (3.28):

$$y_t = \gamma + \delta t + \theta y_{t-1} + v_t, \quad (3.28)$$

where  $\gamma = \alpha_0(1 - \theta) + \alpha_1\theta$  and  $\delta = \alpha_0(1 - \theta)$  (DeJong, Nankervis, Savin, & Whiteman, 1992), which presents an deterministic ( $\delta t$ ) and a stochastic component ( $\theta y_{t-1} + v_t$ ).

### 3.2.2.1 Testing Deterministic and Stochastic Trends

In order to test for the existence of a stochastic trend one must look for the existence of unit-roots on the series. Consider a first-order autoregressive process,  $y_t = \phi y_{t-1} + \epsilon_t$ , when applying the *lag*-operator  $L$ , it yields the characteristic equation (3.29), which root is  $L = \frac{1}{\phi}$ :

$$\begin{aligned} y_t &= \phi y_{t-1} + \epsilon_t & (3.29) \\ y_t &= \phi L y_t + \epsilon_t \\ y_t - \phi L y_t &= \epsilon_t \\ (1 - \phi L) y_t &= \epsilon_t. \end{aligned}$$

If the root of the characteristic equation  $L$  equals one, the process is a random walk (once  $\phi = 1$ ) nonstationary, because each observation depends entirely on the past observations, and the shocks  $\epsilon_t$  will be cumulative in such a way that the series will not keep the mean and the variance constant over time. If  $L < 1$  and  $\phi > 1$ , the shocks will be explosive and the series also will not be stationary. But if the root is outside the unit circle ( $L > 1$  and  $\phi < 1$ ), the shocks will disperse over time making the series a stationary one (Dickey & Fuller, 1979).

Based on these concepts, the test proposed by Dickey and Fuller (1979) tests the existence of an unit-root in the following autoregressive process, AR(1):  $y_t = \rho y_{t-1} + \epsilon_t$ .

Subtracting  $y_{t-1}$  on both sides:

$$\begin{aligned} y_t - y_{t-1} &= \rho y_{t-1} - y_{t-1} + \epsilon_t & (3.30) \\ \Delta y_t &= \delta y_{t-1} + \epsilon_t, \text{ where: } \delta = \rho - 1. \end{aligned}$$

The null hypothesis is  $\delta = 0$  against the alternative that  $1 < \delta < 1$ . The test can be expanded to  $\ell$  lags, hereafter known as Augmented Dickey-Fuller Test (ADF). Consider data generated by the following model (Dickey & Fuller, 1981):

$$\begin{aligned} y_t &= \rho y_{t-1} + u_t, \text{ where: } u_t = \theta_1 u_{t-1} + \theta_2 u_{t-2} + \dots + \theta_\ell u_{t-\ell} + e_t \\ y_t &= \rho y_{t-1} + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \dots + \theta_\ell u_{t-\ell} + e_t. & (3.31) \end{aligned}$$

Subtracting  $y_{t-1}$  on both sides:

$$\begin{aligned}
y_t - y_{t-1} &= \rho y_{t-1} - y_{t-1} + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \dots + \theta_\ell u_{t-\ell} + e_t \\
\Delta y_t &= \delta y_t + \sum_{i=1}^{\ell} \theta_i u_{t-i} + e_t \\
\Delta y_t &= \delta y_t + \sum_{i=1}^{\ell} \theta_i (y_{t-i} - y_{t-1-i}) + e_t \\
\Delta y_t &= \delta y_t + \sum_{i=1}^{\ell} \theta_i \Delta y_{t-i} + e_t, \text{ where } \delta = \rho - 1.
\end{aligned} \tag{3.32}$$

One can, therefore, test  $H_0 : \delta = 0$  against the alternative  $H_a = \delta < 0$ .

The tests proposed by Dickey and Fuller (1979, 1981) are not the only ones to detect unit-roots on time series. A popular alternative is the test proposed by Phillips and Perron (1988), which tests the hypothesis that  $\delta = 1$  in Equation (3.32) against the alternative  $\delta = 0.85$ , hereafter Phillips-Perron Test (PP).

Yin-Wong and Chinn (1996) discuss the use of the tests of Dickey and Fuller (1981) and of Phillips and Perron (1988). The authors explain that these tests may be affected by structural instabilities on the series. Perron (1989) argues that if there is a structural break in the series, these conventional tests tend to misinterpret a trend-stationary time series (deterministic trend) with a difference-stationary series (stochastic trend).

Therefore, it is necessary to differentiate a deterministic trend from a stochastic trend. The Kwiatkowski-Phillips-Schmidt-Shin Test (KPSS), hereafter KPSS test, has the trend stationarity as the null and the unit-root process as the alternative (Kwiatkowski, Phillips, Schmidt, & Shin, 1992).

Yin-Wong and Chinn (1996) analyse GDP series and see that an econometrician using the ADF test, and another one the KPSS test would yield quite different conclusions regarding the time series characteristics. The econometrician using the ADF test would conclude that most GDP series were difference-stationary (that is, present a stochastic trend) while the econometrician using the KPSS test would conclude that most series were trend-stationary (deterministic trend). The authors then suggest to use the ADF and the KPSS tests as complementary to each other. If, for example, the ADF test fails to reject the unit-root null hypothesis because of low power, the KPSS test (which has trend-stationarity as the null hypothesis) should indicate the absence of unit-roots. On the other hand, if the KPSS test rejects the trend stationarity hypothesis, this would be

a stronger evidence for unit-root persistence.

DeJong et al. (1992) comment the problem with the power of the traditional tests associated with the nature of the trend process. For the authors, the trend need not literally to come from the data generation process but may be viewed as a substitute for a complicated and unknown function. The authors argue that the essential difference between the stochastic and the deterministic trend is the nature of the process driving the stochastic component  $u_t$ . In their paper, they conclude that unit-root tests have low power against plausible deterministic trend alternatives, and that when there is an empirically plausible trend-stationarity hypothesis, they have moderate power against the unit-root alternative. Besides that, there are many cases in which neither test will reject the unit-root hypothesis, suggesting that inferences based exclusively on tests for integration may be fragile.



## 4 Empirical Results

### 4.1 Stock Price Synchronicity Analysis

#### 4.1.1 Descriptive Statistics

Table 4.1 shows the evolution of each variable separately for each period of analysis (Pre-Adoption, Transition and Post-Adoption), computing their means and standard deviations, besides a t-test to verify if the changes in means are statistically significant.

When analyzing the dependent variable *Syn*, it is possible to see that, on average, it has reduced only from the Post-Adoption Period. From the Pre-Adoption to the Transition Period every Country-Level variable has significantly increased, except for Variation of Inflation (*VarInfl*), which has decreased. From the Post-Adoption Period, mostly of these variables significantly increased, following the previous trend. However, Voice and Accountability (*Voice*), Political Stability and Absence of Violence/Terrorism (*PolStab*) and the Variance of GDP (*VarGDP*) have significantly decreased.

The same significant moves cannot, however, be perceived among the firm-level variables. From the Pre-Adoption to the Transition Period, only the mean Leverage of firms (*Lev*) has significantly increased. From the Transition to the Post-Adoption Period, only the mean Trading Volume (*TradVol*) and the mean Market-to-Book ratio (*MTB*) have significantly changes. The average Trading Volume has increased from 7.40 to 8.55, while the average *MTB* increased from 0.73 to 0.94.

Table 4.1  
Descriptive Statistics by Period of Analysis

	Pre-Adoption		Transition		t-Statistic	Post-Adoption		t-Statistic
	Mean	Std. Dev.	Mean	Std. Dev.	(Pre versus Transition)	Mean	Std. Dev.	(Transition versus Post)
<b>Dependent Variable</b>								
<i>Syn</i>	-0.80	0.84	-0.99	0.94	1.09	-1.71	1.14	4.55***
<b>Country-Level Variables</b>								
<i>MktSize</i>	5.39	0.14	5.58	0.03	-8.13***	5.92	0.16	-40.56***
<i>RegQual</i>	-0.01	0.03	0.09	0.02	-18.81***	0.12	0.05	-7.07***
<i>Voice</i>	0.46	0.03	0.50	0.01	-5.35***	0.44	0.06	17.80***
<i>Corrupt</i>	-0.11	0.05	-0.08	0.05	-3.06***	-0.03	0.10	-7.73***
<i>PolStab</i>	-0.32	0.06	0.00	0.22	-12.77***	-0.10	0.14	4.11***
<i>GovEff</i>	-0.17	0.08	-0.09	0.00	-5.59***	-0.09	0.03	-1.86*
<i>Law</i>	-0.43	0.03	-0.27	0.07	-17.87***	-0.07	0.05	-24.46***
<i>VarInfl</i>	0.51	0.24	0.19	0.45	5.08***	0.58	0.18	-8.04***
<i>VarGDP</i>	0.05	0.00	0.07	0.01	-8.12***	0.06	0.00	3.96***
<i>VarEx</i>	0.01	0.00	0.01	0.00	-11.30***	0.01	0.00	13.69***
<b>Firm-Level Variables</b>								
<i>TradVol</i>	6.99	1.02	7.40	1.61	-1.70	8.55	1.70	-6.03***
<i>OwnStruct</i>	0.38	0.26	0.42	0.26	-0.73	0.42	0.27	0.03
<i>H<sub>j</sub></i>	0.26	0.13	0.25	0.10	0.52	0.24	0.11	0.91
<i>H<sub>i</sub></i>	0.01	0.01	0.01	0.03	0.13	0.01	0.02	0.99
<i>Size</i>	8.45	1.73	8.52	1.75	-0.19	8.69	1.68	-0.84
<i>Lev</i>	0.52	0.14	0.59	0.18	-2.21**	0.61	0.39	-0.56
<i>ROA</i>	0.10	0.08	0.07	0.09	1.55	0.07	0.14	-0.08
<i>Grow</i>	0.29	0.51	0.30	0.81	-0.03	0.32	1.89	-0.21
<i>MTB</i>	0.99	0.83	0.73	0.55	1.69	0.94	1.02	-2.70***

*MktSize*: Size of the Capital Market; *VarInfl*: Variance of Inflation; *VarGDP*: Variance of GDP; *VarEx*: Variance of the Exchange rate; *Corrupt*: Control of Corruption; *GovEff*: Government Effectiveness; *PolStab*: Political Stability and Absence of Violence/Terrorism; *RegQual*: Regulatory Quality; *Law*: Rule of Law; *Voice*: Voice and Accountability; *TradVol*: Trading Volume; *OwnStruct*: Ownership Structure; *H<sub>j</sub>*: Herfindahl-Hirschman Index by industry; *H<sub>i</sub>*: Herfindahl-Hirschman Index by firm; *Size*: Size of a firm; *Lev*: Leverage; *ROA*: Return on Assets; *Grow*: Revenue Growth; *MTB*: Market-to-Book ratio; *ADR*: firms that issues ADR; *Aud*: firms audited by a Big 4.

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 4.2 shows the simple Pearson correlations among the country-level variables and synchronicity. *Syn* is positively and significantly correlated with Control of Corruption (*Corrupt*) (0.23), Voice and Accountability (*Voice*) (0.29) and with the Variation of the Exchange Rate (*VarEx*) (0.32), which is one of the proxies for macroeconomic instability. *Syn* is negatively and significantly correlated with Market Size (*MktSize*) ( $-0.34$ ), the Variation of GDP (*VarGDP*) ( $-0.14$ ) and with Rule of Law (*Law*) ( $-0.15$ ).

From Table 4.2, one can see that the effects of these country-level variables might be difficult to isolate once they are highly correlated. For example, the correlation between Regulatory Quality and Rule of Law is 0.81, and between Control of Corruption and Political Stability is 0.77. In general the significant correlations varies from 0.11 to 0.81, averaging 0.39.

Table 4.3 shows the correlations among synchronicity and the firm-level variables. *Syn* is positively and significantly correlated with Trading Volume (0.41), both the Herfindahl-Hirschman indexes ( $H_i$  and  $H_j$ ) (0.10 and 0.32, respectively), Size (0.46) and with the variable *ADR* (0.14). *Syn* is negatively and significantly correlated with the Ownership Structure (*OwnStruct*) ( $-0.09$ ) and with *MTB*.

Likewise the country-level variables, there are some high correlations among the firm-level variables. The correlation between Size and Trading Volume, for example, is 0.68, and between the Return on Assets (*ROA*) and *MTB* is 0.47. In general, the significant correlations varies from 0.09 to 0.68, averaging 0.30.

Regarding the correlations among country and firm-level variables, Table 4.4 shows that few variables from these two groups are correlated. Market Size is positively correlated with Trading Volume (0.36) and *ADR* (0.17) and negatively correlated with *ROA* ( $-0.09$ ). The variance of the Exchange Rate (*VarEx*) is negatively correlated with Trading Volume ( $-0.24$ ), *MTB* ( $-0.12$ ) and *ADR* ( $-0.15$ ). Government Effectiveness is positively correlated with Leverage (0.09), just like Regulatory Quality (0.10). While Rule of Law is positively correlated with Trading Volume (0.23) and with *ADR* (0.17), Voice and Accountability is negatively correlated with these variables ( $-0.26$  and  $-0.09$ , respectively).

This analysis provides the first insights about the relationship among these variables. However, once the variables are highly correlated among each other, other than with *Syn*, their relation with synchronicity must be carefully analyzed.

**Table 4.2**  
**Correlation Matrix – Synchronicity and Country-Level Variables**

	<i>Syn</i>	<i>MktSize</i>	<i>VarInfl</i>	<i>VarGDP</i>	<i>VarEx</i>	<i>Corrupt</i>	<i>GovEff</i>	<i>PolStab</i>	<i>RegQual</i>	<i>Law</i>
<i>Syn</i>										
<i>MktSize</i>	-0.34***									
<i>VarInfl</i>	0.01	0.04								
<i>VarGDP</i>	-0.14**	0.08	-0.76***							
<i>VarEx</i>	0.32***	-0.51***	-0.09*	-0.24***						
<i>Corrupt</i>	0.23***	-0.17***	0.24***	-0.14**	0.19***					
<i>GovEff</i>	-0.07	0.05	0.28***	-0.05	-0.06	0.04				
<i>PolStab</i>	-0.08	-0.15***	-0.19***	0.72***	-0.20***	0.06	0.08			
<i>RegQual</i>	0.07	-0.03	0.11*	0.23***	-0.05	0.77***	0.44***	0.46***		
<i>Law</i>	-0.15***	0.48***	0.23***	0.16***	-0.51***	0.52***	0.42***	0.30***	0.81***	
<i>Voice</i>	0.29***	-0.78***	0.21***	-0.07	0.44***	0.47***	0.08	0.43***	0.48***	0.01

*Syn*: Stock Price Synchronicity; *MktSize*: Size of the Capital Market; *VarInfl*: Variation of Inflation; *VarGDP*: Variation in GDP; *VarEx*: Variation in the Exchange rate; *Corrupt*: Control of Corruption; *GovEff*: Government Effectiveness; *PolStab*: Political Stability and Absence of Violence/Terrorism; *RegQual*: Regulatory Quality; *Law*: Rule of Law; *Voice*: Voice and Accountability.

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 4.3**  
Correlation Matrix – Synchronicity and Firm-Level Variables

	<i>Syn</i>	<i>TradVol</i>	<i>OwnStruct</i>	$H_j$	$H_i$	<i>Size</i>	<i>Lev</i>	<i>ROA</i>	<i>Grow</i>	<i>MTB</i>	<i>ADR</i>
<i>Syn</i>											
<i>TradVol</i>	0.41***										
<i>OwnStruct</i>	-0.09*	-0.03									
$H_j$	0.10*	-0.05	0.06								
$H_i$	0.32***	0.37***	-0.08	0.10*							
<i>Size</i>	0.46***	0.68***	-0.01	0.09	0.57***						
<i>Lev</i>	-0.02	-0.01	0.03	-0.01	-0.01	-0.03					
<i>ROA</i>	0.01	-0.03	0.06	0.08	0.02	-0.08	-0.20***				
<i>Grow</i>	-0.06	-0.03	-0.03	-0.03	-0.03	-0.02	0.02	-0.10*			
<i>MTB</i>	-0.16***	0.08	0.03	-0.13**	-0.10*	-0.26***	-0.19***	0.47***	-0.03		
<i>ADR</i>	0.14**	0.52***	0.05	-0.05	0.30***	0.51***	0.01	-0.09*	0.02	-0.08	
<i>Aud</i>	-0.03	0.12**	-0.12**	-0.07	-0.01	0.04	-0.10*	0.04	0.01	0.12**	0.13**

*Syn*: Stock Price Synchronicity; *TradVol*: Trading Volume; *OwnStruct*: Ownership Structure;  $H_j$ : Herfindahl-Hirschman Index by industry;  $H_i$ : Herfindahl-Hirschman Index by firm; *Size*: Size of a firm; *Lev*: Leverage; *ROA*: Return on Assets; *Grow*: Revenues Grow; *MTB*: Market-to-Book ratio; *ADR*: firms that issues ADRs; *Aud*: firms audited by a Big 4.

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**Table 4.4**  
**Correlation Matrix – Firm-Level and Country-Level Variables**

	<i>MktSize</i>	<i>VarInfl</i>	<i>VarGDP</i>	<i>VarEx</i>	<i>Corrupt</i>	<i>GovEff</i>	<i>PolStab</i>	<i>RegQual</i>	<i>Law</i>	<i>Voice</i>
<i>TradVol</i>	0.36***	0.01	0.05	-0.24***	-0.03	0.03	-0.02	0.04	0.23***	-0.26***
<i>OwnStruct</i>	0.01	0.00	-0.01	0.02	0.02	0.01	0.00	0.03	0.03	0.02
<i>H<sub>j</sub></i>	-0.08	0.00	0.02	0.01	0.01	0.01	0.05	0.01	-0.04	0.05
<i>H<sub>i</sub></i>	-0.08	0.00	-0.01	0.06	0.01	0.00	0.00	-0.01	-0.06	0.05
<i>Size</i>	0.06	-0.03	0.04	-0.04	-0.01	-0.01	0.00	0.00	0.04	-0.06
<i>Lev</i>	-0.02	0.06	-0.04	0.01	0.06	0.09**	0.02	0.10**	0.08	0.07
<i>ROA</i>	-0.09**	0.06	-0.03	0.01	0.05	0.04	0.03	0.04	0.00	0.08
<i>Grow</i>	0.02	-0.02	-0.01	0.00	-0.01	0.01	-0.05	-0.01	0.00	-0.04
<i>MTB</i>	0.06	0.02	0.04	-0.12**	-0.04	-0.04	0.05	-0.03	0.03	-0.05
<i>ADR</i>	0.17***	0.04	0.04	-0.13**	0.02	0.05	0.04	0.08	0.17***	-0.09**
<i>Aud</i>	0.08	0.01	0.02	-0.08	-0.02	0.02	0.01	0.01	0.06	-0.06

*MktSize*: Size of the Capital Market; *VarInfl*: Variation of Inflation; *VarGDP*: Variation in GDP; *VarEx*: Variation in the Exchange rate; *Corrupt*: Control of Corruption; *GovEff*: Government Effectiveness; *PolStab*: Political Stability and Absence of Violence/Terrorism; *RegQual*: Regulatory Quality; *Law*: Rule of Law; *Voice*: Voice and Accountability; *TradVol*: Trading Volume; *OwnStruct*: Ownership Structure; *H<sub>j</sub>*: Herfindahl-Hirschman Index by industry; *H<sub>i</sub>*: Herfindahl-Hirschman Index by firm; *Size*: Size of a firm; *Lev*: Leverage; *ROA*: Return on Assets; *Grow*: Revenues Grow; *MTB*: Market-to-Book ratio; *ADR*: firms that issues ADR; *Aud*: firms audited by a Big 4.

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

## 4.1.2 Regression Results

In order to control for time-constant factors not captured by the model I entertained Equation (3.5) by Fixed-Effects, as explained in Section 3.1.3.5. I use  $Syn$  calculated accordingly to Equation (3.2), with equally-weighted versions of both market indexes.

However, considering the high correlation among the explanatory variables of Equation (3.5) seen in the previous section, estimating that model (3.5) is likely to produce unreliable results due to severe multicollinearity, that inflates the estimated parameters' variance (increasing the chance of incurring in Type II error), causes changes in the parameters' expected signs besides estimation instabilities.

The econometric literature offers two possibilities to deal with severe multicollinearity: exclude some variables with high correlations or using Factor Analysis to extract factors from the original variables that convey their information but are orthogonal to each other. Once there are high correlations between several pairs of variables, specially the country-level ones (as seen in Section 4.1.1), in order to not losing any important information from the set of control variables I use Factor Analysis to handling multicollinearity. The details of the analysis can be seen in the Appendix B.

The analysis resulted in the extraction of four factors from all the country-level variables (Market Size; Variance of Inflation, GDP, and of the Exchange Rate; and the six Worldwide Governance Indicators) and in other four factors from some of the firm-level variables (Trading Volume, the Herfindahl-Hirschman Index by firm, Size, the Return on Assets, the Market-to-Book ratio and the dummy variable for firms issuing ADR).

These variables were then fully substituted by the following factors:  $Macro1_t$ ,  $Macro2_t$ ,  $Macro3_t$  and  $Macro4_t$  and  $Micro1_t$ ,  $Micro2_t$ ,  $Micro3_t$  and  $Micro4_t$ , respectively for the country-level and the firm-level variables. The four factors formed by the country-level variables explain 87.28% of the total variance of these variable while the factors from the firm-level variables explain 88.70%. This means that these factors convey 87.28% of the information carried by the country-level variables and 88.70% of the information from the firm-level ones. Again, details can be seen in the Appendix B.

Therefore, the model entertained is Equation (4.1):

$$\begin{aligned}
 Syn_{it} = & \beta_0 + \beta_1 Trans_t + \beta_2 Post_t + \\
 & + \beta_3 Macro1_t + \beta_4 Macro2_t + \beta_5 Macro3_t + \beta_6 Macro4_t + \\
 & + \beta_7 Micro1_{it} + \beta_8 Micro2_{it} + \beta_9 Micro3_{it} + \beta_{10} Micro4_{it} + \\
 & + \beta_{11} OwnStruct_{it} + \beta_{12} H_{it} + \beta_{13} Lev_{it} + \beta_{14} Grow_{it} + \beta_{15} Aud_{it} + \epsilon_{it}. \quad (4.1)
 \end{aligned}$$

The results of Equation (4.1) are reported in Table 4.5.  $\beta_1$  is negative but cannot be considered statistically significant at any reasonable confidence level. Therefore, the reducing-effect could not be perceived at this period when the first firms started adopting the first international standards. A possible confounding effect that might be overwhelming the IFRS effect in this period is the financial crisis erupted in 2008 that may be acting at the opposite way, increasing synchronicity and conflicting with the reducing effect of IFRS. This possibility is according to the view of Peng et al. (2007), who argue that under macroeconomic shocks investors shift attention away from processing firm-specific information to processing more market-level information, increasing market volatility and the comovement of asset returns. Besides, this lack of effect can also be due to a learning-effect, that is, the market may take time to adapt to the new information environment to perceive and incorporate its changes.

When analyzing the Post-Adoption period, however, the effect gets stronger and statistically significant at a 1% level, when the coefficient of *Post*,  $\beta_2$ , is  $-1.186$ , indicating that from 2010 the incorporation of firm-specific information into stock prices significantly increased, reducing their comovement.

In general, these results indicate that the international standards were capable to reduce the informational asymmetry between Brazilian firms and their outsider investors; and that those investors had turned more of their attention to firm-specific information, making it more important to explain stock returns.

These results confirm the first part of *Hypothesis 1*, that is, IFRS was capable to improve the informational environment in the Brazilian capital market, increasing the amount and the quality of firm specific information available to the market agents. These results complement other studies about the economic consequences of IFRS in Brazil, who also found positive effects, such as V. Lima (2011), who found a significant decrease in the cost of equity capital and market liquidity; and R. Silva (2013) who found less cost of capital and earnings management and higher value relevance and timeliness associated with IFRS adoption. However it conflicts with the works of Paulo et al. (2013) and Grecco (2013), who could not find any significant effect regarding accounting information

quality. A possible reason for that is the way synchronicity interacts with the institutional factors. While accounting quality depends on a strong institutional environment, the reduction effect of IFRS in synchronicity could have been actually strengthened by this weak environment, in line with the view of J. Kim and Shi (2012).

**Table 4.5**  
**Regression Results**

<i>Dependent variable:</i>	
	<i>Syn</i>
<i>Trans</i>	−0.168 (0.222)
<i>Post</i>	−1.186*** (0.434)
<i>Macro1</i>	0.316*** (0.077)
<i>Macro2</i>	0.089 (0.118)
<i>Macro3</i>	−0.243*** (0.041)
<i>Macro4</i>	0.020 (0.056)
<i>Micro1</i>	0.219* (0.123)
<i>Micro2</i>	0.523*** (0.188)
<i>Micro3</i>	0.151** (0.067)
<i>Micro4</i>	0.001 (0.085)
<i>OwnStruc</i>	−0.651*** (0.228)
<i>H<sub>j</sub></i>	3.121*** (1.204)
<i>Lev</i>	−0.213 (0.145)
<i>Grow</i>	−0.032*** (0.009)
<i>Aud</i>	−0.077 (0.097)
Observations	523
R <sup>2</sup>	0.398
Adjusted R <sup>2</sup>	0.272
F Statistic	15.751*** (df = 15; 358)

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01, considering robust standard errors according to Arellano (1987).

The results show that, despite the lower level of property rights protection and governance compared to some other IFRS adopters, as seen in Section 2.4.3, the reducing effect was verified. A reason for that could either lie on a relative higher synchronicity or on the substitutive effect, where the improvement in the firm-level informational environment acted as a substitute to the legal environment, as explained by J. Kim and Shi (2012).

The argument of Christensen et al. (2013) may also explain this effect, once the efforts of the regulatory boards, specially the CVM, to properly enforce IFRS might have increased corporate monitoring. This may be an indication of the effects of accounting and legal enforcement to IFRS adoption, specially in emerging countries, as discussed in Section 2.4.3. Although works such as Daske et al. (2008) and S. Li (2010) argue that the economics effects of IFRS are only seen in countries with stronger enforcement mechanisms, future researches comparing emerging and developed countries and properly separating and measuring accounting and legal enforcement could provide better understanding about this issue, which is not yet clear.

From the control variables, the one measuring the level of ownership concentration demands special attention. As seen in Section 2.2, Boubaker et al. (2014) have found a strong and *positive* relationship between ownership concentration and synchronicity, explaining that large investors controlling cash flow rights tend to preclude information disclosure to the market. However, in the present study the coefficient associating stock price synchronicity and ownership concentration is *positive*. The arguments of La Porta et al. (1998) to explain why countries with poor investor protection tend to have ownership structures more concentrated may offer a possible explanation for this signal. First, investors need to hold more capital in order to exercise their control rights and avoid expropriation. Second, the demand for stocks by minority investors is low, since they have little rights guarantee, stimulating ownership concentration. In this situation, higher ownership structure acts as a substitute for legal protection. Therefore, firms with higher concentration could have been seen as “safer” investments, which would be associated with less stock price synchronicity. Further researches, though, could better explore this issue.

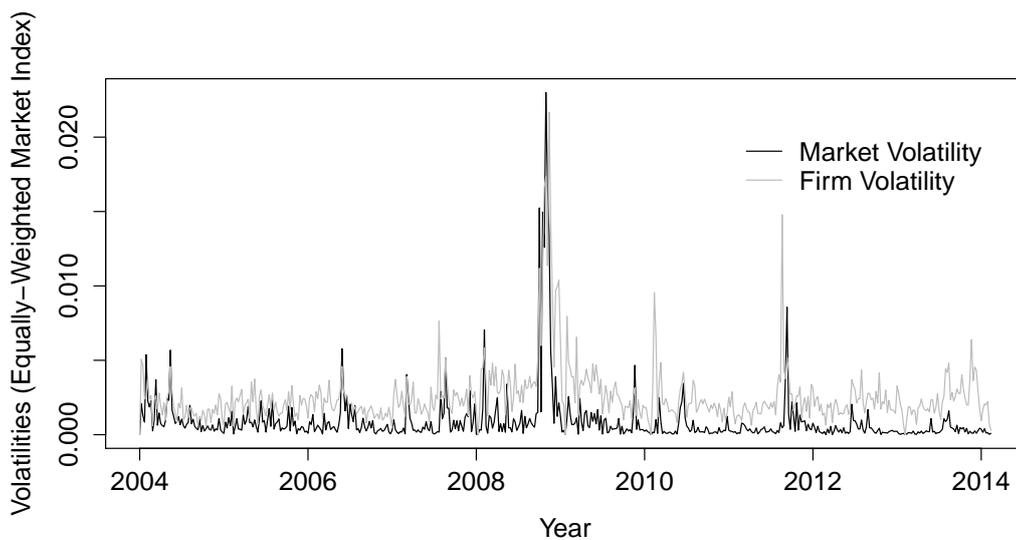
Besides Ownership Structure, the Herfindahl-Hirschman Index by industry,  $H_j$ , and the Revenues Growth (*Grow*) were significant to explain synchronicity. These results show that the higher is industry concentration, higher synchronicity tend to be, in line with the view of Morck et al. (2000), who argue that if firms are concentrated in few industries, their fundamentals tend to be highly correlated; and that the higher is the annual percentage growth of revenues of a firm, less synchronized it tend to be, consistent with the idea that firms with growing sales are expected to produce more transparent financial statements

(Lee & Hutchison, 2005).

Finally, although in Section 3.1.2 I have defined Equation (3.2) as the most appropriate one to estimate stock price synchronicity, Appendix C.1 compares the 4 alternative measures and presents the regression results according to them. No relevant different result was found.

## 4.2 Volatility Analysis

Figure 4.1 shows the firm-level and the market-wide volatilities series through the years 2004 to 2013 plotted together. The first visible behavior is that both series have been relatively stable throughout the period, except for the peaks around financial crises. Besides that, firm volatility reached higher levels during all the period of analysis.



**Figure 4.1**  
**Firm and Market Volatility**

Some may argue that after 2010 the difference between firm and market volatility became slightly higher according to what was predicted by this study. This difference could be a result of more incorporation of firm-specific information into stock prices, increasing their idiosyncratic noise (Roll, 1988) and the amount of idiosyncratic risk born by outside investors, relatively to the amount of systematic risk (Jin & Myers, 2006); which is, in turn, a result of the increase in corporate transparency brought by IFRS adoption. This can be, therefore an evidence that adopting a high developed financial reporting system affects the investors' risk exposure, supposing a constant level of diversification.

Although this slight accentuation in firm volatility relatively to market volatility can be visually perceived, the difference seems too small to be significant and, indeed, the statistical tests to identify stochastic or deterministic trends were not able to find any upward movement of any of the series.

First, I conducted the KPSS test in both series in order to identify deterministic trends. If the accentuation in firm volatility is significant, the tests should indicate significant trends for the series. However, the test reject the trend stationarity hypothesis for both the market and the volatility series, as seen in Table 4.6.

According to Yin-Wong and Chinn (1996), as seen in Chapter 3, if the KPSS test rejects its null hypothesis, this can be an evidence of the existence of unit-root persistence. So, after the KPSS test I conducted both the ADF and PP tests searching for evidences of stochastic trends. However, both tests rejected the null hypothesis of unit-roots for both series, as also seen in Table 4.6.

**Table 4.6**  
**Tests for Identifying Trends – Full Period**

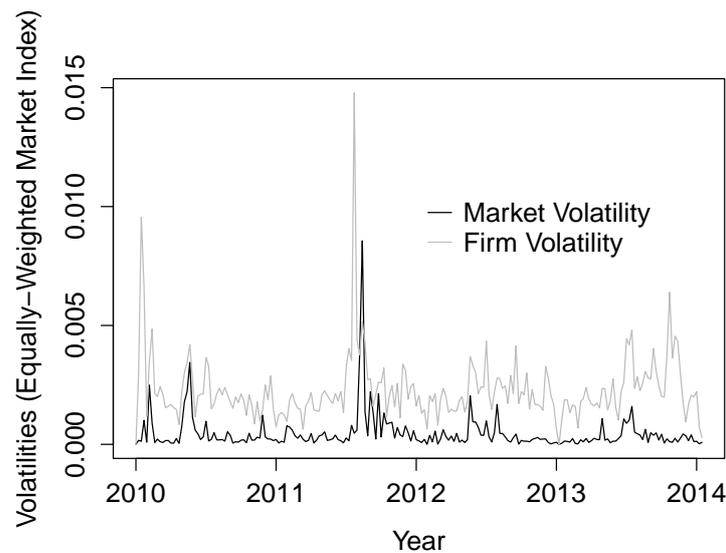
	KPSS	ADF	PP
Market-level Volatility	0.1722**	-6.0651***	-11.4047***
Firm-level Volatility	0.3808***	-5.0642***	-10.4529***

*Note:* KPSS null hypothesis: deterministic trend; ADF null hypothesis: stochastic trend; PP null hypothesis: stochastic trend.

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Analyzing only the Post-Adoption Period leads to the same results. Graphically, the upward trend of firm volatility is too weak and none of the tests were able to identify any statistically significant trend, as seen in Figure 4.2 and Table 4.7. Therefore, the statistical analysis of the volatility series could not confirm the second part of *Hypothesis 1*. That is, although IFRS is associated with a reduction in stock price synchronicity, the consequent increase in the level of idiosyncratic risk relatively to systematic risk could not be confirmed.

There are three possible reasons for that. First, the reducing effect of IFRS in stock price synchronicity is isolated from other factors through control variables in the empirical model, while the volatility analysis is carried in an univariate way, that is, the volatility behavior is not controlled by any factor. Therefore, while IFRS acted reducing synchronicity, other factors acting in opposite direction could have minimized its effects in



**Figure 4.2**  
Firm and Market Volatility at the Post-Adoption Period

**Table 4.7**  
Tests for Identifying Trends – Post Adoption Period

	KPSS	ADF	PP
Market-level Volatility	0.0947*	-4.5266***	-9.1937***
Firm-level Volatility	0.0846*	-4.5382***	-9.6463***

*Note:* KPSS null hypothesis: deterministic trend; ADF null hypothesis: stochastic trend; PP null hypothesis: stochastic trend.

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

such a way that the analysis was not strong enough to capture it. Second, while Campbell et al. (2001) found a relatively prominent increase in firm volatility compared to market volatility, which the authors associated with a reduction in the explanatory power of the market model, they worked with a period of almost forty years. Therefore, 10 years may be a too small period of time to perceive the effect on the volatilities components. Third, the decomposition was based on CAPM, which establishes that stock returns are formed by a risk-free rate return plus a risk premium, and was built for developed capital markets such as the one of the United States. If there is any other important component to explain stock returns in Brazil, such as macroeconomic and political stability, CAPM and, therefore, the volatility decomposition based on it, could not capture it.

Finally, likewise for the stock price synchronicity analysis, I also computed the results of the volatility analysis according to a weighing criterion based on market capitalization,

which results are also presented in Appendix C.1. Again, no different relevant result was found.

## 5 Concluding Remarks

The purpose of this research was to investigate whether IFRS adoption was able to affect the Brazilian capital market's informational environment by increasing the amount of firm-specific information available to the agents. In order to do so, the study went through an analysis of how IFRS affected stock price synchronicity and, then, if this effect was reflected in the behavior of idiosyncratic and systematic risk.

The analysis concerning stock price synchronicity was conducted through a regression model with data from 2004 to 2013. Controlling for institutional factors and firms' individual aspects, this analysis showed that there was a significant decrease in the level of stock price synchronicity following the Post-Adoption Period (from 2010). For the Transition Period (2008 and 2009) no significant result was found.

The regression results allow inferring that IFRS full adoption in Brazil was associated to a greater incorporation of firm-specific information into stock prices, once each firm's stock, on average, started to move less according to market-wide shocks. This is an important result because it indicates that the market has become less obscure (K. Li et al., 2010) and that stock prices became more informative (Durnev, Morck, & Yeung, 2004). Consequently, the Brazilian capital market became better able to efficiently allocate resources in the economy (Habib, 2008), making agents capable to better distinguish between good and bad investments (Wurgler, 2000).

This result is in line with previous researches that also found significant effects of IFRS in Brazil, such as V. Lima (2011) and R. Silva (2013). However, the result seems to conflict with some international research (see, for example, Daske et al., 2008; S. Li, 2010) that argues that the economic consequences of IFRS can only be perceived for countries with developed financial markets and strong enforcement mechanisms.

However, this may depend on which kind of economic consequences and which kind of enforcement are taken into account. The effect on stock price synchronicity is argued by

J. Kim and Shi (2012) to be actually more intense for emerging countries with these characteristics, because developed markets are already less synchronous (Morck et al., 2000) and because the improvement in the informational environment acts like a substitute for the weak institutional environment. Besides that, the discussion about the separately role of legal and accounting enforcement (see, e.g., Ernstberger et al., 2012) is also important. Firms from countries like Brazil, who have adopted IFRS for both individual and consolidated financial statements, may put a greater effort in changing their financial reporting system, not simply adjusting their consolidated statements to IFRS. Besides that, the actions taken by CVM towards a properly application of the international standards may be considered as effective mechanisms of accounting enforcement, despite of the lower general legal mechanisms. However, it is important to make a few observations. First, it is still not possible to say whether these informational gains are permanent or are only reflecting an adaptation period to the new standards. Future evaluations must assess the evolution of these gains over the time to better understand the learning effect of IFRS adoption. Second, although the best efforts were made to isolate the role of macroeconomic effects, there may still be remaining effects not captured by the control variables.

The second part of this research was dedicated to search for reflections of the decrease in stock price synchronicity in the behavior of idiosyncratic and systematic risks. If stock prices started to move more accordingly to idiosyncratic shocks and less accordingly to systematic shocks, it was expected that the volatility at the firm-level has become more intense than the volatility at the market-level. In order to evaluate that, I built series of volatility decomposed into these two components, according to the methodology of Campbell et al. (2001), and performed an analysis based on tests to identify trends on the series. Consistently to lower synchronicity, it was expected that the firm-level volatility presented a more intense upward trend than the market-level volatility.

Although a visual analysis of the series suggests a slightly upward trend for the firm-level volatility while the market-level one remained quite stable (despite the peaks around financial crises), the statistical tests were not able to identify any significant trend in the series, for both the whole period (2004 to 2010) and the Post-Adoption period (from 2010).

Therefore, only the first part of the hypothesis of the study could be confirmed. While the reason for that could be because the volatility analysis was carried out without controls or because of a too small period of time, it could also be an evidence of a caveat of the study. Both the synchronicity and the volatility analysis were carried out under the concepts of the Capital Asset Pricing Model (CAPM). The CAPM establishes that stock returns are composed by a risk-free return plus a risk premium measured by the association of the

stock return to the market return (*beta*). Any important factor not captured by the model is outside my measures of synchronicity and volatility. Therefore, one possible reason for not finding significant impacts for the idiosyncratic and systematic risk in the Brazilian market during the period of the study is that the measures of these risks lack important explanation factors.

Hence, this research is carrying CAPM limitations. As pointed by Barros et al. (2002), who has discussed the use of CAPM in Brazil, while the model was built for theoretical efficient markets, it was adopted around the world despite the differences among financial markets from different countries. According to the authors' view, differences between, for example, the U.S. market and the Brazilian market, can arise questions about its effectiveness in separating the idiosyncratic risk from the systematic. In addition, the existence of non observable variables in the model that demand proxies can also lead to deficiencies.

Finally, despite its caveats this research provided evidence that IFRS adoption in Brazil has contributed to building a more healthy financial environment, which may have increased its ability to efficiently allocate resources in the economy. Besides that, it brought important insights into the enforcement issue, due to the features of the Brazilian institutional environment. Finally, it brought new insights to more practical consequences of IFRS, discussing its reflection on the behavior of idiosyncratic and systematic risks.



# References

- Ahmed, A. S., Neel, M., & Wang, D. (2013). Does mandatory adoption of IFRS improve accounting quality? Preliminary evidence. *Contemporary Accounting Research*, 30(4), 1344–1372.
- Akerlof, G. A. (1970). The market for ‘lemons’: quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, 84(3), 488–500.
- An, H. & Zhang, T. (2013). Stock price synchronicity, crash risk, and institutional investors. *Journal of Corporate Finance*, 21, 1–15.
- Anderson, C. (1999). Financial contracting under extreme uncertainty: an analysis of Brazilian corporate debentures. *Journal of Financial Economics*, 51(1), 45–84.
- Arellano, M. (1987). Computing robust standard errors for within-groups estimators. *Oxford Bulletin of Economics and Statistics*, 49(4), 431–434.
- Ball, R. (2001). Infrastructure requirements for an economically efficient system of public financial reporting and disclosure. *Brookings-Wharton Papers on Financial Services*, 2001(1), 127–169.
- Ball, R., Kothari, S., & Robin, A. (2000). The effect of international institutional factors on properties of accounting earnings. *Journal of Accounting and Economics*, 29(1), 1–51.
- Ball, R., Robin, A., & Wu, J. S. (2003). Incentives versus standards: properties of accounting income in four East Asian countries. *Journal of Accounting and Economics*, 36(1), 235–270.
- Baltagi, B. (2008). *Econometric analysis of panel data* (4th). John Wiley & Sons.
- Barberis, N., Shleifer, A., & Wurgler, J. (2005). Comovement. *Journal of Financial Economics*, 75(2), 283–317.

- Barros, L. A., Famá, R., & Silveira, B. P. (2002). Conceito de taxa livre de risco e sua aplicação no Capital Asset Pricing Model. Um estudo explorativo para o mercado brasileiro. In *Encontro Brasileiro de Finanças*. Sociedade Brasileira de Finanças.
- Barth, M. E., Landsman, W. R., & Lang, M. H. (2008). International accounting standards and accounting quality. *Journal of Accounting Research*, 46(3), 467–498.
- Bena, J. & Ondko, P. (2012). Financial development and the allocation of external finance. *Journal of Empirical Finance*, 19(1), 1–25.
- Benos, E. & Weisbach, M. S. (2004). Private benefits and cross-listings in the United States. *Emerging Markets Review*, 5(2), 217–240.
- Beuselinck, C., Joos, P., Khurana, I. K., & Van der Meulen, S. (2010). Mandatory IFRS reporting and stock price informativeness. *Tilburg University Working Paper*.
- BM&FBovespa. (2013). Ofício Circular. Ibovespa – Nova Metodologia. Retrieved from [http://www.bmfbovespa.com.br/pt-br/noticias/2013/download/063-2013\\_DP.pdf](http://www.bmfbovespa.com.br/pt-br/noticias/2013/download/063-2013_DP.pdf)
- BM&FBovespa. (2014a, April). Carteira teórica do Ibovespa válida para o quadrimestre Mai. a Ago. 2014. Retrieved from <http://www.bmfbovespa.com.br/indices/ResumoCarteiraQuadrimestre.aspx?Indice=Ibovespa&idioma=pt-br>
- BM&FBovespa. (2014b, June). Empresas listadas. Retrieved from <http://www.bmfbovespa.com.br/cias-listadas/empresas-listadas/BuscaEmpresaListada.aspx?idioma=pt-br>
- BM&FBovespa. (2014c, April). Metodologia do índice Bovespa. Retrieved from <http://www.bmfbovespa.com.br/Indices/download/IBOV-Metodologia-pt-br.pdf>
- Boubaker, S., Mansali, H., & Rjiba, H. (2014). Large controlling shareholders and stock price synchronicity. *Journal of Banking & Finance*, 40, 80–96.
- Box, G. E. & Pierce, D. A. (1970). Distribution of residual autocorrelations in autoregressive-integrated moving average time series models. *Journal of the American Statistical Association*, 65(332), 1509–1526.
- Brown, P. & Tarca, A. (2005). A commentary on issues relating to the enforcement of international financial reporting standards in the E.U. *European Accounting Review*, 14(1), 181–212.
- Brüggenmann, U., Hitz, J., & Sellhorn, T. (2013). Intended and unintended consequences of mandatory IFRS adoption: A review of extant evidence and suggestions for future research. *European Accounting Review*, 22(1), 1–37.

- Bushman, R. M. & Smith, A. J. (2001). Financial accounting information and corporate governance. *Journal of Accounting and Economics*, 32(1), 237–333.
- Campbell, J. Y. & Lettau, M. (1999). Dispersion and volatility in stock returns: an empirical investigation. *National Bureau of Economic Research Working Paper*.
- Campbell, J. Y., Lettau, M., Malkiel, B. G., & Xu, Y. (2001). Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk. *The Journal of Finance*, 56(1), 1–43.
- Campbell, J. Y., Lo, A. W., & MacKinlay, A. C. (1997). *The econometrics of financial markets*. Princeton University Press.
- Cardoso, R. L., Saravia, E., Tenório, F. G., & Silva, M. A. (2009). Accounting regulation: theories and analysis of the Brazilian accounting standards convergence to IFRS. *Revista de Administração Pública*, 43(4), 773–799.
- Carvalho, L. N. & Salotti, B. M. (2012). Adoption of IFRS in Brazil and the consequences to accounting education. *Issues in Accounting Education*, 28(2), 235–242.
- Chan, K. & Hameed, A. (2006). Stock price synchronicity and analyst coverage in emerging markets. *Journal of Financial Economics*, 80(1), 115–147.
- Chan, K., Hameed, A., & Kang, W. (2013). Stock price synchronicity and liquidity. *Journal of Financial Markets*, 16, 414–438.
- Chan, L., Lakonishok, J., & Swaminathan, B. (2007). Industry classifications and the comovement of stock returns. *Financial Analysts Journal*, 63, 56–70.
- Chen, C., Guo, W., & Tay, N. S. P. (2010). Are member firms of corporate groups less risky? *Financial Management*, 39(1), 59–82.
- Chen, H., Tang, Q., Jiang, Y., & Lin, Z. (2010). The role of international financial reporting standards in accounting quality: evidence from the European Union. *Journal of International Financial Management & Accounting*, 21(3), 220–278.
- Chen, X., Harford, J., & Li, K. (2007). Monitoring: which institutions matter? *Journal of Financial Economics*, 86(2), 279–305.
- Chong, A. & López-de-Silanes, F. (2007). *Investor protection and corporate governance: firm-level evidence across Latin America*. Stanford University Press.

- Christensen, H. B., Hail, L., & Leuz, C. (2013). Mandatory IFRS reporting and changes in enforcement. *Journal of Accounting and Economics*, *56*(2), 147–177.
- Coffee Jr, J. C. (2002). Racing towards the top: the impact of cross-listing and stock market competition on international corporate governance. *Columbia Law Review*, *102*, 1757.
- CPC. (2011, December). Pronunciamento conceitual básico CPC 00 (R1). Retrieved from [http://static.cpc.mediatgroup.com.br/Documentos/147\\_CPC00\\_R1.pdf](http://static.cpc.mediatgroup.com.br/Documentos/147_CPC00_R1.pdf)
- Croissant, Y. & Millo, G. (2008). Panel data econometrics in R: the plm package. *Journal of Statistical Software*, *27*(2), 1–43.
- Dami, A. B. T., Rogers, P., & Sousa Ribeiro, K. C. (2007). Estrutura de propriedade no Brasil: evidências empíricas no grau de concentração acionária. *Contextus – Revista Contemporânea de Economia e Gestão*, *5*(2), 21–30.
- Dasgupta, S., Gan, J., & Gao, N. (2010). Transparency, price informativeness, and stock return synchronicity: theory and evidence. *Journal of Financial and Quantitative Analysis*, *45*(5), 1189–1220.
- Daske, H. & Gebhardt, G. (2006). International financial reporting standards and experts' perceptions of disclosure quality. *Abacus*, *42*(3-4), 461–498.
- Daske, H., Hail, L., Leuz, C., & Verdi, R. (2008). Mandatory IFRS reporting around the world: early evidence on the economic consequences. *Journal of Accounting Research*, *46*(5), 1085–1142.
- Daske, H., Hail, L., Leuz, C., & Verdi, R. (2013). Adopting a label: heterogeneity in the economic consequences around IAS/IFRS adoptions. *Journal of Accounting Research*, *51*(3), 495–547.
- DeAngelo, L. E. (1981). Auditor size and audit quality. *Journal of Accounting and Economics*, *3*(3), 183–199.
- Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. *The Accounting Review*, 193–225.
- DeJong, D. N., Nankervis, J. C., Savin, N. E., & Whiteman, C. H. (1992). Integration versus trend stationary in time series. *Econometrica: Journal of the Econometric Society*, 423–433.

- Dickey, D. A. & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit-root. *Journal of the American Statistical Association*, 74(366a), 427–431.
- Dickey, D. A. & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit-root. *Econometrica: Journal of the Econometric Society*, 1057–1072.
- Durnev, A. & Kim, E. (2005). To steal or not to steal: firm attributes, legal environment, and valuation. *The Journal of Finance*, 60(3), 1461–1493.
- Durnev, A., Li, K., Morck, R., & Yeung, B. (2004). Capital markets and capital allocation: implications for economies in transition. *Economics of Transition*, 12(4), 593–634.
- Durnev, A., Morck, R., & Yeung, B. (2004). Value-enhancing capital budgeting and firm-specific stock return variation. *The Journal of Finance*, 59(1), 65–105.
- Eisenhardt, K. M. (1989). Agency theory: an assessment and review. *Academy of Management Review*, 14(1), 57–74.
- Ernstberger, J., Stich, M., & Vogler, O. (2012). Economic consequences of accounting enforcement reforms: the case of Germany. *European Accounting Review*, 21(2), 217–251.
- Fernandes, N. & Ferreira, M. A. (2008). Does international cross-listing improve the information environment. *Journal of Financial Economics*, 88(2), 216–244.
- Francis, J. R. & Wang, D. (2008). The joint effect of investor protection and Big 4 audits on earnings quality around the world. *Contemporary Accounting Research*, 25(1), 157–191.
- Grecco, M. C. P. (2013). O efeito da convergência brasileira às IFRS no gerenciamento de resultados das empresas abertas brasileiras não financeiras. *Brazilian Business Review*, 10(4), 117–140.
- Greenwood, R. (2008). Excess comovement of stock returns: evidence from cross-sectional variation in Nikkei 225 weights. *Review of Financial Studies*, 21(3), 1153–1186.
- Greenwood, R. M. & Sosner, N. (2007). Trading patterns and excess comovement of stock returns. *Financial Analysts Journal*, 63(5), 69–81.

- Gul, F., Kim, J., & Qiu, A. (2010). Ownership concentration, foreign shareholding, audit quality, and stock price synchronicity: evidence from China. *Journal of Financial Economics*, *95*(3), 425–442.
- Habib, A. (2008). Corporate transparency, financial development and the allocation of capital: empirical evidence. *Abacus*, *44*(1), 1–21.
- Hahn, A. V., Nossa, S. N., Teixeira, A. J., & Nossa, V. (2010). Um estudo sobre a relação entre a concentração acionária e o nível de payout das empresas brasileiras negociadas na Bovespa. *Contabilidade Vista & Revista*, *21*(3), 15–48.
- Healy, P. M. & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: a review of the empirical disclosure literature. *Journal of Accounting and Economics*, *31*(1), 405–440.
- Ho, S. S. & Shun Wong, K. (2001). A study of the relationship between corporate governance structures and the extent of voluntary disclosure. *Journal of International Accounting, Auditing and Taxation*, *10*(2), 139–156.
- Holthausen, R. W. (2009). Accounting standards, financial reporting outcomes, and enforcement. *Journal of Accounting Research*, *47*(2), 447–458.
- Hong, H. A. (2013). Does mandatory adoption of international financial reporting standards decrease the voting premium for dual-class shares? *The Accounting Review*, *88*(4), 1289–1325.
- Hsin, C. W. & Tseng, P. W. (2012). Stock price synchronicities and speculative trading in emerging markets. *Journal of Multinational Financial Management*, *22*(3), 82–109.
- Hutton, A. P., Marcus, A. J., & Tehranian, H. (2009). Opaque financial reports, R-squared, and crash risk. *Journal of Financial Economics*, *94*(1), 67–86.
- IASB. (2006, July). Preliminary views on an improved conceptual framework for financial reporting: the objective of financial reporting and qualitative characteristics of decision-useful financial reporting information. Retrieved from [http://www.ifrs.org/Current-Projects/IASB-Projects/Conceptual-Framework/DPJul06/Documents/DP\\_ConceptualFramework.pdf](http://www.ifrs.org/Current-Projects/IASB-Projects/Conceptual-Framework/DPJul06/Documents/DP_ConceptualFramework.pdf)
- IASB. (2008, May). An improved conceptual framework for financial reporting. Retrieved from [http://www.ifrs.org/Current-Projects/IASB-Projects/Conceptual-Framework/EDMay08/Documents/conceptual\\_framework\\_exposure\\_draft.pdf](http://www.ifrs.org/Current-Projects/IASB-Projects/Conceptual-Framework/EDMay08/Documents/conceptual_framework_exposure_draft.pdf)

- IFRS Foundation. (2010). Basis for conclusions on chapter 1: the objective of general purpose financial reporting. In *Red Book Part A*.
- IFRS Foundation. (2014a, March). About the IFRS Foundation and the IASB. Retrieved from <http://www.ifrs.org/The-organisation/Pages/IFRS-Foundation-and-the-IASB.aspx>
- IFRS Foundation. (2014b, May). Disclosure initiative. Retrieved from <http://www.ifrs.org/Current-Projects/IASB-Projects/Disclosure-Initiative/Pages/Disclosure-Initiative.aspx>
- IFRS Foundation. (2014c, March). IFRS application around the world. Retrieved from <http://www.ifrs.org/Use-around-the-world/Pages/Jurisdiction-profiles.aspx>
- IFRS Foundation. (2014d, March). IFRS application around the world – jurisdictional profile: Brazil. Retrieved from <http://www.ifrs.org/Use-around-the-world/Documents/Jurisdiction-profiles/Brazil-IFRS-Profile.pdf>
- IFRS Institute. (2014, March). Research: o conhecimento científico sobre IFRS. Retrieved from <http://www.ifrs-institute.com/research.php>
- Isidro, H. & Raonic, I. (2012). Firm incentives, institutional complexity and the quality of “harmonized” accounting numbers. *The International Journal of Accounting*, 47(4), 407–436.
- Jeanjean, T. & Stolowy, H. (2008). Do accounting standards matter? An exploratory analysis of earnings management before and after IFRS adoption. *Journal of Accounting and Public Policy*, 27(6), 480–494.
- Jensen, M. C. & Meckling, W. H. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360.
- Jin, L. & Myers, S. C. (2006). R-squared around the world: new theory and new tests. *Journal of Financial Economics*, 79(2), 257–292.
- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2007). *Governance matters VII: aggregate and individual governance indicators, 1996-2007*. World Bank, World Bank Institute, Global Programs Division, Development Research Group, Macroeconomics, and Growth Team.
- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The worldwide governance indicators: a summary of methodology, data and analytical issues. *World Bank Policy Research Working Paper*, 5430.

- Khurana, I. K. & Michas, P. N. (2011). Mandatory IFRS adoption and the U.S. home bias. *Accounting Horizons*, 25(4), 729–753.
- Kim, J. & Shi, H. (2012). IFRS reporting, firm-specific information flows, and institutional environments: international evidence. *Review of Accounting Studies*, 17(3), 474–517.
- Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit-root: how sure are we that economic time series have a unit-root? *Journal of econometrics*, 54(1), 159–178.
- La Porta, R., López Silanes, F., Shleifer, A., & Vishny, R. (1998). Law and finance. *Journal of Political Economy*, 106, 1113–1155.
- Lang, M. H., Lins, K. V., & Miller, D. P. (2003). ADR, analysts, and accuracy: does cross-listing in the United States improve a firm's information environment and increase market value? *Journal of Accounting Research*, 41(2), 317–345.
- Larcker, D. F. & Richardson, S. A. (2004). Fees paid to audit firms, accrual choices, and corporate governance. *Journal of Accounting Research*, 42(3), 625–658.
- Lee, T. M. & Hutchison, P. D. (2005). The decision to disclose environmental information: a research review and agenda. *Advances in Accounting*, 21, 83–111.
- Leuz, C. & Verrecchia, R. E. (2000). The economic consequences of increased disclosure. *Journal of Accounting Research*, 38, 91–136.
- Li, K., Morck, R., Yang, F., & Yeung, B. (2010). Time varying synchronicity in individual stock returns: a cross-country comparison. *University of Alberta Business School Working Paper*.
- Li, S. (2010). Does mandatory adoption of International Financial Reporting Standards in the European Union reduce the cost of equity capital? *The Accounting Review*, 85(2), 607–636.
- Licht, A. N. (2003). Cross-listing and corporate governance: bonding or avoiding. *Chicago Journal of International Law*, 4, 141.
- Lima, J. (2010). *A relevância da informação contábil e o processo de convergência para as normas IFRS no Brasil* (Doctoral dissertation, University of São Paulo, São Paulo).
- Lima, V. (2011). *Incentivos no nível da firma e consequências econômicas da convergência ao IFRS no Brasil* (Master's thesis, University of São Paulo, São Paulo).

- Ljung, G. M. & Box, G. E. (1978). On a measure of lack of fit in time series models. *Biometrika*, 65(2), 297–303.
- Lopes, A. B. (2002). *Informação contábil e o mercado de capitais*. São Paulo: Cengage Learning Editores.
- Lopes, A. B. & Walker, M. (2010). The relation between firm-specific corporate governance arrangements, cross-listing and the informativeness of accounting reports: the Brazilian case. *Manchester Business School Working Paper*.
- Lourenço, I., Branco, M. C., & Dias Curto, J. (2013). Do IFRS matter in emerging countries? An exploratory analysis of Brazilian firms. *Working Paper*. Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2373112](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2373112)
- Mackenzie, B., Coetsee, D., Njikizana, T., Chamboko, R., Colyvas, B., & Hanekom, B. (2013). *IFRS 2012: interpretação e aplicação*. Bookman.
- Malkiel, B. G. & Fama, E. F. (1970). Efficient capital markets: a review of theory and empirical work. *The Journal of Finance*, 25(2), 383–417.
- Martins, E., Gelbcke, E. R., Santos, A., & Iudícibus, S. (2013). *Manual de contabilidade societária: aplicável a todas as sociedades*. São Paulo: Atlas.
- Mondria, J. (2010). Portfolio choice, attention allocation, and price comovement. *Journal of Economic Theory*, 145(5), 1837–1864.
- Morck, R., Yeung, B., & Yu, W. (2000). The information content of stock markets: why do emerging markets have synchronous stock price movements? *Journal of Financial Economics*, 58(1), 215–260.
- Pang, J. & Wu, H. (2009). Financial markets, financial dependence, and the allocation of capital. *Journal of Banking & Finance*, 33(5), 810–818.
- Paulo, E., Girão, L. P., Carter, D., & Souza, R. S. (2013). The impact of the adoption of International Financial Reporting Standards on the quality of accounting information of the Brazilian and European public firms. *Working Paper*. Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2270678](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2270678)
- Peng, L., Xiong, W., & Bollerslev, T. (2007). Investor attention and time-varying comovements. *European Financial Management*, 13(3), 394–422.
- Perez Junior, J. H. (2009). *Conversão de demonstrações contábeis*. Atlas.

- Perron, P. (1989). The great crash, the oil price shock, and the unit-root hypothesis. *Econometrica: Journal of the Econometric Society*, 1361–1401.
- Phillips, P. C. & Perron, P. (1988). Testing for a unit-root in time series regression. *Biometrika*, 75(2), 335–346.
- Pindyck, R. S. & Rotemberg, J. J. (1993). The comovement of stock prices. *The Quarterly Journal of Economics*, 108(4), 1073–1104.
- Reese Jr, W. A. & Weisbach, M. S. (2002). Protection of minority shareholder interests, cross-listings in the United States, and subsequent equity offerings. *Journal of Financial Economics*, 66(1), 65–104.
- Rhoades, S. A. (1993). The Herfindahl-Hirschman index. *Federal Reserve Bulletin*, 79, 188.
- Roll, R. (1988). R-squared. *The Journal of Finance*, 43(3), 541–566.
- Roll, R. (1992). Industrial structure and the comparative behavior of international stock market indices. *The Journal of Finance*, 49(1), 3–41.
- Ross, S. A. (1973). The economic theory of agency: the principal's problem. *The American Economic Review*, 63(2), 134–139.
- Silva, A., Weffort, E. F. J., Flores, E. S., & Silva, G. P. (2014). Earnings management and economic crises in the Brazilian capital market. *Revista de Administração de Empresas*, 54(3), 268–283.
- Silva, R. (2013). *Adoção completa das IFRS no Brasil: qualidade das demonstrações contábeis e o custo de capital próprio* (Doctoral dissertation, University of São Paulo, São Paulo).
- Silveira, A. D., Barros, L. A., & Famá, R. (2008). Atributos corporativos e concentração acionária no Brasil. *Revista de Administração de Empresas*, 48(2), 51–66.
- Sims, C. A. (2003). Implications of rational inattention. *Journal of Monetary Economics*, 50(3), 665–690.
- Sun, J., Cahan, S. F., & Emanuel, D. (2011). How would the mandatory adoption of IFRS affect the earnings quality of U.S. firms? Evidence from cross-listed firms in the U.S. *Accounting Horizons*, 25(4), 837–860.

- The World Bank Group. (2014a, October). Market capitalization of listed companies (% of GDP). Retrieved from <http://data.worldbank.org/indicator/CM.MKT.LCAP.GD.ZS>
- The World Bank Group. (2014b, October). Worldwide governance indicators. Retrieved from <http://info.worldbank.org/governance/wgi/index.aspx#home>
- Tsay, R. S. (2010). *Analysis of financial time series* (3rd). John Wiley & Sons.
- Tweedie, D. (2006, January). Prepared statement of Sir David Tweedie, Chairman of the International Accounting Standards Board before the Economic and Monetary Affairs Committee of the European Parliament. Retrieved from <http://www.iasplus.com/en/binary/resource/0601tweedieeuspeech.pdf/view>
- Veldkamp, L. (2006). Information markets and the comovement of asset prices. *The Review of Economic Studies*, 73(3), 823–845.
- Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). The MIT Press.
- Wurgler, J. (2000). Financial markets and the allocation of capital. *Journal of Financial Economics*, 58(1), 187–214.
- Xing, X. & Anderson, R. (2011). Stock price synchronicity and public firm-specific information. *Journal of Financial Markets*, 14(2), 259–276.
- Yin-Wong, C. & Chinn, M. D. (1996). Deterministic, stochastic, and segmented trends in aggregate output: a cross-country analysis. *Oxford Economic Papers*, 48(1), 134–162.
- Zeff, S. A. (2012). The evolution of the IASC into the IASB, and the challenges it faces. *The Accounting Review*, 87(3), 807–837.



# A Firms included in the Sample

**Table A.1**  
**Firms Included in the Sample**

	<b>Firm</b>	<b>Ticker</b>	<b>Industry</b>	<b>One-Digit SIC Code</b>
1	Abril Educação S.A.	ABRE11	Wholesale and Retail Trade	5
2	AES Tietê S.A.	GETI4	Transportation and Public Utilities	4
3	Aliansce Shopping Centers S.A.	ALSC3	Finance, Insurance, Real State	6
4	Alpargatas S.A.	ALPA4	Manufacturing	3
5	Ambev S.A.	ABEV3	Manufacturing	2
6	Arezzo S.A.	ARZZ3	Manufacturing	3
7	Arteris S.A.	ARTR3	Transportation and Public Utilities	4
8	Autometal S.A.	AUTM3	Manufacturing	3
9	B2W Companhia Digital	BTOW3	Wholesale and Retail Trade	5
10	Banco ABC Brasil S.A.	ABCB4	Finance, Insurance, Real State	6
11	Banco Bradesco S.A.	BBDC4	Finance, Insurance, Real State	6
12	Banco Daycoval S.A.	DAYC4	Finance, Insurance, Real State	6
13	Banco do Brasil S.A.	BBAS3	Finance, Insurance, Real State	6
14	Banco Industrial e Comercial S.A.	BICB4	Finance, Insurance, Real State	6
15	Banco Pine S.A.*	PINE4	Finance, Insurance, Real State	6
16	Banco Sofisa S.A.	SFSA4	Finance, Insurance, Real State	6
17	Banestes S.A.	BEES3	Finance, Insurance, Real State	6
18	Banrisul S.A.	BRSR6	Finance, Insurance, Real State	6
19	Battistella S.A.	BTTL4	Finance, Insurance, Real State	6
20	Bematech S.A.	BEMA3	Manufacturing	3
21	BHG S.A.	BHGR3	Services	7
22	BM& F Bovespa S.A.	BVMF3	Finance, Insurance, Real State	6
23	Bombril S.A.*	BOBR4	Manufacturing	2
24	BR Malls S.A.	BRML3	Finance, Insurance, Real State	6
25	BR Properties S.A.	BRPR3	Finance, Insurance, Real State	6
26	Bradespar S.A.*	BRAP4	Finance, Insurance, Real State	6
27	Brasil Brokers S.A.	BBRK3	Finance, Insurance, Real State	6

*Continued on next page*

Table A.1 – Continued from previous page

	<b>Firm</b>	<b>Ticker</b>	<b>Industry</b>	<b>One-Digit SIC Code</b>
28	Brasil Insurance S.A.	BRIN3	Finance, Insurance, Real State	6
29	Brasil Pharma S.A.	BPHA3	Wholesale and Retail Trade	5
30	Brasilagro S.A.	AGRO3	Finance, Insurance, Real State	6
31	Braskem S.A.	BRKM5	Manufacturing	2
32	BRF S.A.	BRFS3	Wholesale and Retail Trade	5
33	Brookfield S.A.	BISA3	Finance, Insurance, Real State	6
34	BTG Pactual Group	BBTG11	Manufacturing	3
35	CCR S.A.	CCRO3	Transportation and Public Utilities	4
36	Celesc S.A.	CLSC4	Transportation and Public Utilities	4
37	Cemig S.A.	CMIG4	Transportation and Public Utilities	4
38	CETIP S.A.	CTIP3	Finance, Insurance, Real State	6
39	Cia. Hering	HGTX3	Manufacturing	2
40	Cielo S.A.	CIEL3	Services	7
41	Coelce*	COCE5	Transportation and Public Utilities	4
42	COMGÁS	CGAS5	Transportation and Public Utilities	4
43	Companhia Brasileira de Distribuição*	PCAR4	Wholesale and Retail Trade	5
44	Companhia de Locação das Américas S.A.	LCAM3	Services	7
45	Companhia Providência Indústria e Comércio S.A.	PRVI3	Manufacturing	3
46	Companhia Siderúrgica Nacional	CSNA3	Manufacturing	3
47	Construtora Lix da Cunha S.A.*	LIXC4	Mining and Construction	1
48	Contax S.A.	CTAX4	Services	7
49	COPASA S.A.	CSMG3	Transportation and Public Utilities	4
50	Copel S.A.	CPLE6	Transportation and Public Utilities	4
51	Cosan Ltd.	CZLT33	Wholesale and Retail Trade	5
52	Cosan S. A.	CSAN3	Wholesale and Retail Trade	5
53	Coteminas	CTNM4	Manufacturing	2
54	CPFL Energia S.A.	CPFE3	Transportation and Public Utilities	4
55	CR2 S.A.*	CRDE3	Finance, Insurance, Real State	6
56	Cremer S.A.	CREM3	Manufacturing	3
57	CSU Cardsystem S.A.	CARD3	Services	7
58	CTEEP	TRPL4	Transportation and Public Utilities	4
59	Cyrela Brazil Realty S.A.	CYRE3	Finance, Insurance, Real State	6
60	Diagnósticos da América S.A.	DASA3	Services	8
61	Direcional Engenharia S.A.	DIRR3	Finance, Insurance, Real State	6
62	Duratex S.A.	DTEX3	Manufacturing	2

*Continued on next page*

Table A.1 – *Continued from previous page*

	<b>Firm</b>	<b>Ticker</b>	<b>Industry</b>	<b>One-Digit SIC Code</b>
63	EcoRodovias S.A.	ECOR3	Transportation and Public Utilities	4
64	EDP Energias do Brasil S.A.	ENBR3	Transportation and Public Utilities	4
65	Eletrobras S.A.	ELET6	Transportation and Public Utilities	4
66	Eletropaulo S.A.	ELPL4	Transportation and Public Utilities	4
67	Embratel S.A.*	EBTP4	Transportation and Public Utilities	4
68	Eneva S.A.	ENEV3	Transportation and Public Utilities	4
69	Equatorial Energia S.A.	EQTL3	Transportation and Public Utilities	4
70	Estácio Participações S.A	ESTC3	Services	8
71	Eternit S.A.	ETER3	Manufacturing	3
72	Eucatex S.A.	EUCA4	Manufacturing	2
73	Even S.A.	EVEN3	Finance, Insurance, Real State	6
74	EZTEC S.A.	EZTC3	Finance, Insurance, Real State	6
75	Ferbasa *	FESA4	Manufacturing	3
76	Fertilizantes Heringer S.A.*	FHER3	Manufacturing	2
77	Fibria Celulose S.A.*	FIBR3	Manufacturing	2
78	Fleury S.A.	FLRY3	Manufacturing	2
79	Forjas Taurus S.A.	FJTA4	Manufacturing	3
80	Fras-le S.A.*	FRAS4	Manufacturing	3
81	Gafisa S.A.	GFS3	Mining and Construction	1
82	General Shopping Brasil S.A.	GSHP3	Finance, Insurance, Real State	6
83	Gerdau S.A.*	GGBR4	Mining and Construction	1
84	GOL Linhas Aéreas Inteligentes S.A.	GOLL4	Transportation and Public Utilities	4
85	GP Investments*	GPIV33	Finance, Insurance, Real State	6
86	GPC Participações S.A.*	GPCP3	Manufacturing	2
87	Graziotin S.A.	CGRA4	Wholesale and Retail Trade	5
88	Grendene S.A.	GRND3	Manufacturing	3
89	Guararapes S.A.	GUAR3	Manufacturing	2
90	HAGA S.A.	HAGA4	Manufacturing	3
91	Helbor S.A.	HBOR3	Finance, Insurance, Real State	6
92	HRT S.A.	HRT3	Mining and Construction	1
93	Hypermarcas S.A.	HYPE3	Manufacturing	2
94	IdeiasNet S.A.	IDNT3	Finance, Insurance, Real State	6
95	IGB Eletrônica S.A.	IGBR3	Wholesale and Retail Trade	5
96	Iguatemi Shopping Centers S.A.	IGTA3	Finance, Insurance, Real State	6
97	Indústrias Romi S.A.*	ROMI3	Manufacturing	3
98	Inepar Indústria e Construções S.A.	INEP4	Manufacturing	3

*Continued on next page*

Table A.1 – Continued from previous page

	<b>Firm</b>	<b>Ticker</b>	<b>Industry</b>	<b>One-Digit SIC Code</b>
99	Inepar Telecomunicações S.A.*	INET3	Transportation and Public Utilities	4
100	International Meal Company Holdings S.A.	IMCH3	Wholesale and Retail Trade	5
101	Iochpe-Maxion S.A.	MYPK3	Manufacturing	3
102	Itaú Unibanco Holding S.A.	ITUB4	Finance, Insurance, Real State	6
103	Itausa S.A.	ITSA4	Finance, Insurance, Real State	6
104	JBS S.A.*	JBSS3	Manufacturing	2
105	Jereissati S.A.*	MLFT4	Transportation and Public Utilities	4
106	JHSF S.A.*	JHSF3	Finance, Insurance, Real State	6
107	João Fortes Engenharia S.A.*	JFEN3	Mining and Construction	1
108	JSL S.A.	JSLG3	Transportation and Public Utilities	4
109	Kepler Weber S.A.	KEPL3	Manufacturing	3
110	Klabin S.A.	KLBN4	Manufacturing	2
111	Kroton Educacional S.A.	KROT3	Services	8
112	Light S.A.	LIGT3	Transportation and Public Utilities	4
113	Localiza Rent a Car S.A.	RENT3	Services	7
114	Log-In Logística Intermodal S.A.*	LOGN3	Transportation and Public Utilities	4
115	Lojas Americanas S.A.*	LAME4	Wholesale and Retail Trade	5
116	Lojas Renner S.A.*	LREN3	Wholesale and Retail Trade	5
117	LPS Brasil S.A.	LPSB3	Finance, Insurance, Real State	6
118	Lupatech S.A.*	LUPA3	Manufacturing	3
119	M. Dias Branco S.A.	MDIA3	Manufacturing	2
120	Magazine Luiza S.A.	MGLU3	Wholesale and Retail Trade	5
121	Magnesita Refratários S.A.	MAGG3	Manufacturing	3
122	Mangels Industrial S.A.*	MGEL4	Manufacturing	3
123	Manufatura de Brinquedos Estrela S.A.*	ESTR4	Manufacturing	3
124	Marcopolo S.A.	POMO4	Manufacturing	3
125	Marfrig Global Foods S.A.*	MRFG3	Manufacturing	2
126	Marisa Lojas S.A.	AMAR3	Wholesale and Retail Trade	5
127	Metalúrgica Gerdau S.A.	GOAU4	Manufacturing	3
128	Metalfrio Solutions S.A.*	FRIO3	Manufacturing	3
129	Mills Estruturas e Serviços de Engenharia S.A.	MILS3	Wholesale and Retail Trade	5
130	Minerva S.A.*	BEEF3	Manufacturing	2

Continued on next page

Table A.1 – *Continued from previous page*

	<b>Firm</b>	<b>Ticker</b>	<b>Industry</b>	<b>One-Digit SIC Code</b>
131	MMX S.A.*	MMXM3	Mining and Construction	1
132	MRV Engenharia e Participações S.A.*	MRVE3	Finance, Insurance, Real State	6
133	Multiplan S.A.	MULT3	Finance, Insurance, Real State	6
134	Multiplus S.A.*	MPLU3	Services	7
135	Mundial S.A.*	MNDL4	Manufacturing	3
136	Natura Cosméticos S.A.	NATU3	Manufacturing	2
137	Net S.A.	NETC4	Transportation and Public Utilities	4
138	Odontoprev S.A.	ODPV3	Services	8
139	OGX S.A.	OGXP3	Mining and Construction	1
140	Oi S.A.	OIBR4	Transportation and Public Utilities	4
141	OSX Brasil S.A.	OSXB3	Transportation and Public Utilities	4
142	Paraná Banco S.A.*	PRBC4	Finance, Insurance, Real State	6
143	Paranapanema S.A.	PMAM3	Manufacturing	3
144	PDG Realty S.A.	PDGR3	Finance, Insurance, Real State	6
145	Petrobras	PETR4	Manufacturing	2
146	Plascar S.A.*	PLAS3	Manufacturing	3
147	Porto Seguro S.A.	PSSA3	Finance, Insurance, Real State	6
148	Portobello S.A.	PTBL3	Manufacturing	3
149	Positivo Informática S.A.	POSI3	Manufacturing	3
150	Profarma S.A.	PFRM3	Wholesale and Retail Trade	5
151	QGEP S.A.	QGEP3	Mining and Construction	1
152	Qualicorp S.A.	QUAL3	Finance, Insurance, Real State	6
153	Raia Drogasil S.A.	RADL3	Wholesale and Retail Trade	5
154	Randon S.A.*	RAPT4	Manufacturing	3
155	Recrusul S.A.*	RCSL4	Manufacturing	3
156	Refinaria de Petróleos de Manguinhos S.A.	RPMG4	Manufacturing	2
157	Renar Maçãs S.A.	RNAR3	Mining and Construction	1
158	Restoque S.A.*	LLIS3	Manufacturing	2
159	Rodobens S.A.*	RDNI3	Finance, Insurance, Real State	6
160	Rossi Residencial S.A.	RSID3	Mining and Construction	1
161	São Carlos S.A.	SCAR3	Finance, Insurance, Real State	6
162	São Martinho S.A.	SMTO3	Manufacturing	2
163	Sabesp S.A.	SBSP3	Transportation and Public Utilities	4
164	SANEPAR S.A.	SAPR4	Transportation and Public Utilities	4
165	Sansuy S.A.*	SNSY5	Manufacturing	3
166	Saraiva S.A.	SLED4	Manufacturing	2
167	SLC Agrícola S.A.	SLCE3	Services	7
168	Sonae Sierra Brasil S.A.	SSBR3	Finance, Insurance, Real State	6
169	Souza Cruz S.A.	CRUZ3	Manufacturing	2
170	Springs Global S.A.	SGPS3	Manufacturing	2

*Continued on next page*

Table A.1 – *Continued from previous page*

	<b>Firm</b>	<b>Ticker</b>	<b>Industry</b>	<b>One-Digit SIC Code</b>
171	Suzano Papel e Celulose S.A.	SUZB5	Manufacturing	2
172	T4F Entretenimento S.A.	SHOW3	Services	7
173	Technos S.A.	TECN3	Manufacturing	3
174	Tecnisa S.A.	TCSA3	Finance, Insurance, Real State	6
175	Tegma Gestão Logística S.A.	TGMA3	Transportation and Public Utilities	4
176	Teka Tecelagem Kuehnrich S.A.	TEKA4	Manufacturing	2
177	Telebras	TELB4	Services	7
178	Telefônica Brasil, S.A.	VIVT4	Transportation and Public Utilities	4
179	Tempo Participações S.A.	TEMP3	Services	8
180	Tereos Internacional S.A.	TERI3	Manufacturing	2
181	TIM Participações S.A.	TIMP3	Transportation and Public Utilities	4
182	TOTVS S.A.	TOTS3	Services	7
183	Tractebel Energia S.A.	TBLE3	Transportation and Public Utilities	4
184	Trisul S.A.*	TRIS3	Finance, Insurance, Real State	6
185	Triunfo S.A.*	TPIS3	Finance, Insurance, Real State	6
186	Unicasa S.A.	UCAS3	Manufacturing	2
187	Unipar Carbocloro S.A.	UNIP6	Manufacturing	2
188	Usiminas	USIM5	Manufacturing	3
189	Vale S.A.	VALE5	Mining and Construction	1
190	Valid S.A.	VLID3	Manufacturing	2
191	Vanguarda Agro S.A.	VAGR3	Manufacturing	2
192	Viver S.A.	VIVR3	Finance, Insurance, Real State	6
193	Weg S.A.*	WEGE3	Manufacturing	3
194	Wilson Sons Limited	WSO33	Transportation and Public Utilities	4

Firms marked with an asterisk are the ones which were excluded from the empirical model due to lack of data relative to at least one of the control variables.

# B Factor Analysis

The first criterion for defining which variables I should group into factors were choosing variables with correlations higher than  $|0.4|$ . The first thing to note is that, due to this criterion, the variables were grouped into their own classification of country and firm-level. That is, country-level variables are high correlated only among themselves, so as the firm-level variables. Tables 4.2, 4.3 and 4.4, discussed in the Chapter 4, provide these information.

## B.1 Country-Level Variables

The first group of variables from which I extract factors is composed by the ten country-level variables, including the Variance of GDP (*VarGDP*) and of the Exchange Rate (*VarEx*), which are alternative proxies for macroeconomic instability, instead of the Variance of Inflation (*VarInfl*).

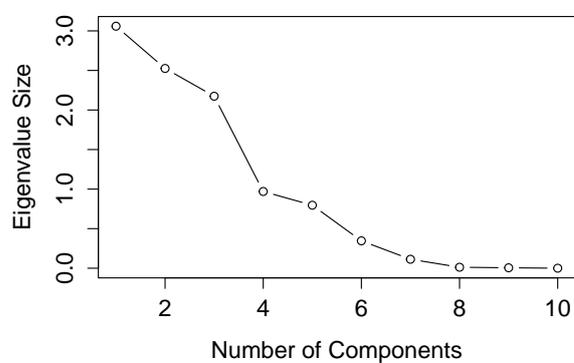
While the literature suggests that only the factors with eigenvalues higher than 1 (one) should be extracted, I also impose that these factors should explain at least 85% of the total variance, in order to avoid losing information. Extracting only factors which eigenvalues are higher than 1 can let important variance out of the model.

The Principal Component Analysis applied to the country-level variables extracted four factors which eigenvalues and percentage of variance explained are shown in Table B.1. If only three factors are extracted, according to the criterion of eigenvalue higher than 1, 22% of the variance of these ten variables would be out of the model. Therefore, I included four factors, achieving 87.28% of variance explained. Figure B.1 shows the scree plot of these variables, that is, the number of factors extracted and their eigenvalues.

Table B.2 shows the communalities of each variable after the extraction, that is, the percentage of variance of each one of them captured by the four factors. From it, it is

**Table B.1**  
**Country-Level Variables: Factors Extracted**

Component	Eigenvalues	Variance Explained (%)	Variance Explained (% Cumulative)
1	3.06	30.59	30.59
2	2.53	25.25	55.84
3	2.17	21.74	77.58
4	0.97	9.70	87.28



**Figure B.1**  
**Country-Level Variables: Scree Plot**

**Table B.2**  
**Country-Level Variables: Communalities**

Variable	Communality
<i>MktSize</i>	0.88
<i>RegQual</i>	0.97
<i>Voice</i>	0.92
<i>Corrupt</i>	0.96
<i>PolStab</i>	0.83
<i>GovEff</i>	0.72
<i>Law</i>	0.98
<i>VarInfl</i>	0.81
<i>VarGDP</i>	0.98
<i>VarEx</i>	0.66

possible to see that those four factors captured a relative high variance of each variable. For example, the four factors explain the variables Rule of Law and the Variance in GDP in 98%, while the less explained is the Variance in the Exchange Rate, 66%.

**Table B.3**  
**Country-Level Variables: Rotated Component Matrix**

	Component			
	1	2	3	4
<i>MktSize</i>	0.07	-0.93	-0.07	-0.02
<i>RegQual</i>	0.90	0.08	0.24	0.31
<i>Voice</i>	0.38	0.85	0.10	0.23
<i>Corrupt</i>	0.93	0.23	-0.17	-0.13
<i>PolStab</i>	0.23	0.16	0.81	0.31
<i>GovEff</i>	0.13	-0.04	-0.03	0.84
<i>Law</i>	0.78	-0.47	0.12	0.37
<i>VarInfl</i>	0.20	0.03	-0.71	0.52
<i>VarGDP</i>	0.03	-0.15	0.97	-0.10
<i>VarEx</i>	-0.04	0.74	-0.20	-0.28

Finally, Table B.3 shows the loadings of each factor for each variable after rotated through the Varimax technique. According to it, the variables Regulatory Quality, Control of Corruption and Rule of Law are mostly represented by the first factor; while Market Size, Voice and Accountability and Variance of the Exchange Rate are mostly represented by the second factor; Political Stability, Variance of Inflation and Variance of GDP are mostly represented by the third factor; and, finally, the variable Government Effectiveness is mostly represented by the fourth factor.

## B.2 Firm-Level Variables

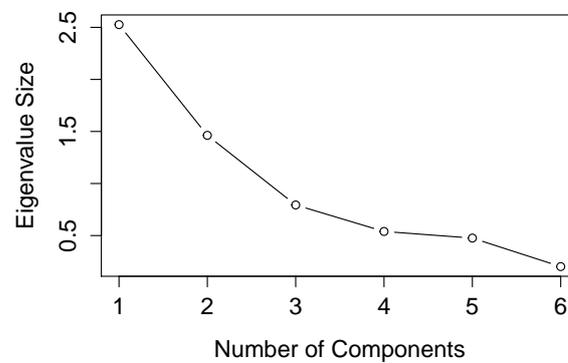
Following the same criteria for the country-level variables, I also extracted four factors from the following firm-level variables: Trading Volume (*TradVol*), the Herfindahl-Hirschman Index by firm ( $H_i$ ), Size (*Size*), Return on Assets (*ROA*), the Market-to-Book ratio (*MTB*), and *ADR*.

Table B.4 shows the four factors extracted, their eigenvalues and the percentage of variance explained by them. By the criterion of eigenvalue higher than 1, only two factors would have been extracted. However, they would be able to convey only 66% of the information brought by these variables, therefore, I extracted four factors in order to explain at least 85% of the total variance. Figure B.2 shows the scree plot, that is, the relation of the number of factors extracted and their eigenvalues.

Table B.5 shows the communalities of each variable after the extraction. It shows that

**Table B.4**  
**Firm-Level Variables: Factors Extracted**

Component	Eigenvalues	Variance Explained (%)	Variance Explained (% Cumulative)
1	2.53	42.10	42.10
2	1.46	24.38	66.48
3	0.79	13.23	79.71
4	0.54	8.99	88.70



**Figure B.2**  
**Firm-Level Variables: Scree Plot**

**Table B.5**  
**Firm-Level Variables: Communalities**

Variable	Communality
<i>TradVol</i>	0.86
<i>H<sub>i</sub></i>	0.87
<i>Size</i>	0.82
<i>ROA</i>	0.95
<i>MTB</i>	0.93
<i>ADR</i>	0.89

that those four factors captured a relative high variance of each variable. For example, the four factors explain the variables Return on Assets in 95% and the Market-to-Book ratio in 93%, while the less explained is  $H_i$ , 87%.

And finally, Table B.6 shows the loadings of each factor for each variable after rotated through the Varimax technique. From it, the variables Trading Volume and *ADR* are

**Table B.6**  
**Firm-Level Variables: Rotated Component Matrix**

	Component			
	1	2	3	4
<i>TradVol</i>	0.67	0.47	0.38	-0.22
<i>H<sub>i</sub></i>	0.09	0.92	-0.08	0.08
<i>Size</i>	0.56	0.69	-0.12	-0.10
<i>ROA</i>	-0.03	0.04	0.26	0.94
<i>MTB</i>	-0.05	-0.13	0.90	0.31
<i>ADR</i>	0.93	0.09	-0.11	0.04

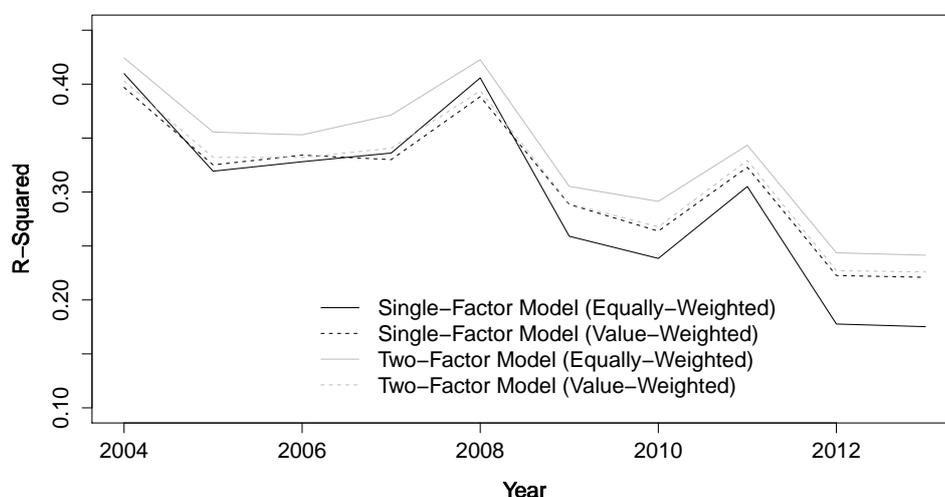
mostly represented by the first factor; while  $H_i$  and Size are mostly represented by the second factor; the Market-to-Book ratio,  $MTB$  is mostly represented by the third factor and, finally, the variable  $ROA$  is mostly represented by the fourth factor.



# C Results with Alternative Measures

## C.1 Synchronicity Analysis

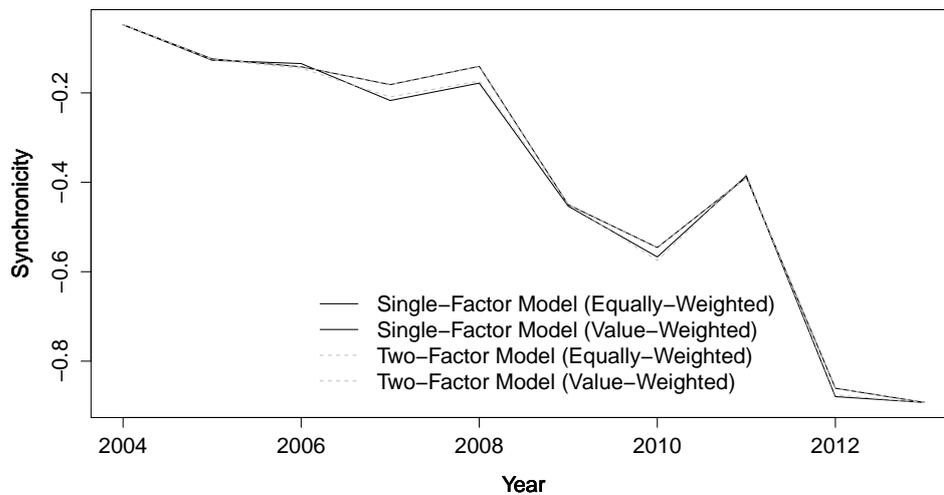
Figure C.1 shows each one of the four series of average R-Squared generated according to the one-factor (including only a Brazilian Market Index) and to the two-factors (including S&P 500) models and their respective equally and value-weighted versions. From it, one



**Figure C.1**  
**R-Squared Comparison: Four Alternative Models**

can see that the equally-weighted indexes generate higher R-squared, on average, and that including S&P 500 in the market model increases the average explanatory power.

Figure C.2 shows the average synchronicity values according to each one of the four models. It shows that the differences between the value-weighted versions of the one-factor and the two-factors models are similar to the differences observed for the R-Squared. How-



**Figure C.2**  
Synchronicity Comparison: Four Alternative Models

ever, the logistic transformation neutralize the differences between the equally-weighted versions for these models, once the lines overlap each other.

Finally, Table C.1 shows the regression results using each one of the four models for calculating stock price synchronicity. The Model (1) is the same shown in Table 4.5, that is, the one according to the criterion of higher explanatory power to define the better measure of stock price synchronicity. It is exactly the same as the Model (3) which incorporates the equally-weighted version of S&P 500, consistently with Figure C.2. The three other models do not produce relevant different results. Regarding the variables of interest, the interpretation remains the same, only with slightly changes in the size of the coefficient of *Post*. The same is perceived about the control variables, except for *Grow*, that loses significance for the one-factor model with value-weighted indexes.

**Table C.1**  
**Regression Results: Four Alternative Models to Calculate Synchronicity**

	<i>Dependent variable:</i>			
	<i>Syn</i> (1)	<i>Syn</i> (2)	<i>Syn</i> (3)	<i>Syn</i> (4)
<i>Trans</i>	-0.168 (0.222)	-0.123 (0.241)	-0.168 (0.222)	-0.141 (0.264)
<i>Post</i>	-1.186*** (0.434)	-1.513*** (0.499)	-1.186*** (0.434)	-1.644*** (0.559)
<i>Macro1</i>	0.316*** (0.077)	0.439*** (0.086)	0.316*** (0.077)	0.469*** (0.097)
<i>Macro2</i>	0.089 (0.118)	-0.030 (0.126)	0.089 (0.118)	-0.041 (0.137)
<i>Macro3</i>	-0.243*** (0.041)	-0.263*** (0.046)	-0.243*** (0.041)	-0.261*** (0.051)
<i>Macro4</i>	0.020 (0.056)	0.041 (0.059)	0.020 (0.056)	0.062 (0.068)
<i>Micro1</i>	0.219* (0.123)	0.231* (0.134)	0.219* (0.123)	0.228* (0.137)
<i>Micro2</i>	0.523*** (0.188)	0.480** (0.216)	0.523*** (0.188)	0.545** (0.227)
<i>Micro3</i>	0.151** (0.067)	0.163** (0.077)	0.151** (0.067)	0.139* (0.081)
<i>Micro4</i>	0.001 (0.085)	0.005 (0.100)	0.001 (0.085)	-0.055 (0.118)
<i>OwnStruct</i>	-0.651*** (0.228)	-0.535** (0.271)	-0.651*** (0.228)	-0.552** (0.278)
<i>H<sub>j</sub></i>	3.121*** (1.204)	2.184* (1.266)	3.121*** (1.204)	2.664** (1.322)
<i>Lev</i>	-0.213 (0.145)	-0.052 (0.208)	-0.213 (0.145)	-0.064 (0.214)
<i>Grow</i>	-0.032*** (0.009)	-0.021*** (0.008)	-0.032*** (0.009)	-0.017 (0.011)
<i>Aud</i>	-0.077 (0.097)	-0.026 (0.106)	-0.077 (0.097)	-0.029 (0.112)
Observations	523	523	523	523
R <sup>2</sup>	0.401	0.357	0.401	0.342
Adjusted R <sup>2</sup>	0.275	0.245	0.275	0.234
F Statistic (df = 15; 358)	15.992***	13.273***	15.992***	12.418***

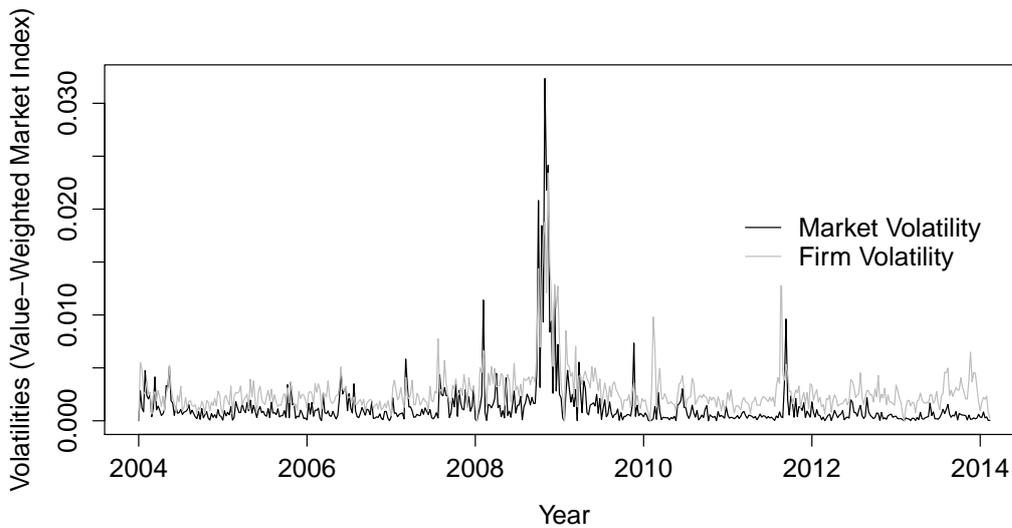
Model (1) uses synchronicity calculated according to the model with equally-weighted indexes, including S&P 500; Model (2) uses synchronicity calculated according the model with value-weighted indexes, including S&P 500; Model (3) uses synchronicity calculated according to the model that only includes the equally-weighted market index; and Model (4) uses synchronicity calculated according to the model that only includes the value-weighted market index.

*Note:*

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

## C.2 Volatility Analysis

Figure C.3 shows the firm and market-level volatilities evolution through the whole period of analysis according to the calculations involving a value-weighted market index. Likewise the results presented in Chapter 4, both series have stayed relatively stable through the period with peaks around the financial crises. A visual analysis may find a slightly increase in firm volatility from the Post-Adoption period, but any of the tests could identify the existence of statistically significant trends in any of the series, as seen in Table C.2.



**Figure C.3**  
**Firm and Market Volatility**  
 (Market Capitalization Weighing Criterion)

**Table C.2**  
**Tests for Identifying Trends – Full Period**  
 (Series with Market Capitalization Weighing Criterion)

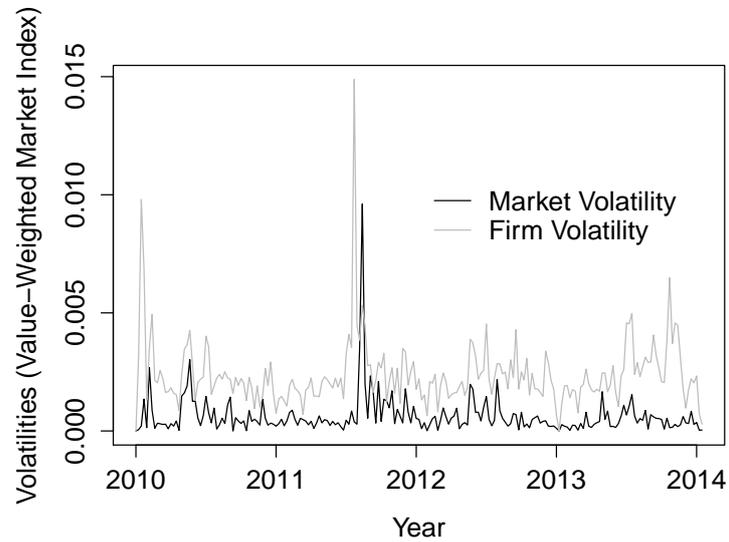
	KPSS	ADF	PP
Market-level Volatility	0.3072***	-5.569***	-12.778***
Firm-level Volatility	0.4188***	-4.8981***	-10.374***

*Note:* KPSS null hypothesis: deterministic trend; ADF null hypothesis: stochastic trend; PP null hypothesis: stochastic trend.

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Figure C.4 shows the volatilities for only the Post-Adoption period. From it, one can see a slightly increase in firm volatility over market volatility. However, the tests for trends

could not also identify any significant evolution of any of the series, as seen in Table C.3.



**Figure C.4**  
Firm and Market Volatility at the Post-Adoption Period  
(Market Capitalization Weighing Criterion)

**Table C.3**  
Tests for Identifying Trends – Post Adoption Period  
(Series with Market Capitalization Weighing Criterion)

	KPSS	ADF	PP
Market-level Volatility	0.1097*	-4.582***	-9.8744***
Firm-level Volatility	0.0834*	-4.5705***	-9.6463***

*Note:* KPSS null hypothesis: deterministic trend; ADF null hypothesis: stochastic trend; PP null hypothesis: stochastic trend.

*Note:* \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$