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Financial Regulation and Transparency of Information:
first steps on new land

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Abstract

This article examines the relationship between the level of regulation and transparency of financial institutions from 37 countries and the impacts of the subprime crisis on the stock market, through a regulation and transparency index. Furthermore, with the objective of detecting reasons for the success of some emerging economies in avoiding the crisis, empirical evidence for the presence of market discipline in the Brazilian banking industry is shown. The results are that a higher degree of regulation and transparency is related to higher returns and lower volatility in the stock market during the subprime crisis. Moreover, one of the main reasons for the apparent success of the Brazilian case in facing the crisis is the combination of a strong regulation of the financial system and the presence of market discipline.

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1. Introduction

The financial turmoil at the end of the 2000 decade has stimulated several discussions concerning the model of financial regulation practiced in the world. The current model, based on New Basel Capital Accord (New Accord), fails as a mechanism for mitigating financial crises. One important point that is being considered on this subject is that an efficient regulation system, through specific and adequate legislation of central banks, eliminates problems caused by market imperfections.[1]

Government supervisions emphasize the existence of the systemic risk in the financial framework. A failure in a single institution can launch instability in the whole system provoking a confidence crisis in the market. As a consequence, the systemic risk associated with the presence of asymmetric information can justify regulation of the financial institutions by the government.

As highlighted by Flannery (1998), government agents have the advantage of lower costs and more access to the information. One justification is that there are no problems of coordination (government is the single regulator) and there exist instruments that force the institutions to disclose information. However, these advantages can be suppressed by the government with a policy of transparency of information, such as highlighted in the third pillar of the New Accord.

It is important to note that the lack of transparency of information in the financial market represented a non-negligible element for spreading the subprime crisis in 2008. Moreover, the necessity for information emerges as a relevant factor for the market discipline. According to the literature, an effective transparency in the information disclosed to the private agents is a tool for monitoring financial institutions.[2] Another advantage due to the transparency of information to the market is that it allows the private agents to analyze the key information on capital, risk exposure, and the evaluation process. As pointed out by Goodhart, Hoffmann, and Segoviano (2004) the equalization of the accounting data permits comparing the results of the financial institutions and thus facilitates the definition of criteria for the market's participants taking decisions.

In a general way, although several reports indicate the relevance of the market discipline, regulators are reluctant regarding this subject. This aversion is a consequence

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[1] About types of market imperfections which justify regulatory intervention, see Goodhart *et al.* (1998).
[2] See, Flannery (1998); Deyoung *et al.* (2001); Jagtiani, Kaufman, and Lemieux (2002).

of the regulators not believing in the market forces as true monitors. In opposition to this view, some authors such as Flannery and Sorescu (1996) argue that investors in the subordinated debt market can offer an adequate supervision to the banks. In fact, the substitution of supervision agencies by market discipline or vice versa is not recommended. The complementarity between them can be the key for mitigating the origin of financial crisis. In other words, to assure that market discipline is better than government supervision, or vice versa, is a mistake.

Among several countries, Brazil has been considered as an example where the effects caused by subprime crisis on the financial market were not destructive. It is important to note that Brazil, due to the experience of the financial crisis which occurred at the beginning of the 1990s with the failure of big banks, assumed a conservativeness position concerning prudential financial regulation greater than the other countries. In addition, the macroeconomic stabilization achieved, especially from 2003, has contributed to the development of the financial system.[3] An example is the significant increase in the negotiation of debentures (see www.debentures.com.br). This observation matters because the literature regarding market discipline highlights the subordinated debt holders as being able to monitor the financial industry. In short, it is possible that the good performance of the Brazilian economy in respect to the international crisis is a result of the combination of an adequate government regulation with the presence of market discipline.

This article contributes to the literature on financial regulation and transparency of information taking into account the subprime crisis. This article offers a regulation and transparency index (RTI) based on 37 countries. Considering RTI and stock market index of developed economies, BRICs economies, and developing economies, an empirical analysis is performed. The objective is to see if there exists a difference between the impact of the subprime crisis on countries with more transparency and a more regulated financial system than on others. Moreover, with the intention of finding the reasons for the success of the Brazilian case in escaping the financial crisis, an empirical analysis for detecting the presence of market discipline in the banking industry is made.

The remainder of the article proceeds as follows. The next section shows how the RTI of the financial institutions is built and an analysis for the performance of

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[3] For an analysis concerning macroeconomic variables and financial market developments concerning emerging markets, see Bokpin (2010).

developed economies, BRICs economies, and developing economies is made. Section 3 makes an empirical analysis, through cross-country estimations, regarding RTI and stock market performance. Section 4 presents the main characteristics of market discipline in the literature and the data used in the analysis for the Brazilian case. Section 5 makes an empirical analysis, through GMM panel data, concerning market discipline in Brazil based on subordinated debt holders.

2. Transparency and financial regulation

Kaminsky and Reinhart (1999) through an analysis of the relationship between banking and monetary crises which occurred in Mexico (1970s) and in Asia (1980s) present elucidative results. The authors observed that there exists a non-correlation between the financial crisis and payment balance crisis in the 1970s (period marked by a financial system with strong prudential regulation). On the other hand, the correlation is found in the 1980s due to the financial markets openness. In addition, according to this view, flexibility in the prudential regulation rules is a fact before financial crises.

As recognized by the U.S. Secretary of the Treasury Timothy Geithner, the international crisis observed since the second semester of 2008 had as one of its main reasons the lack of an adequate regulation.[4] In particular, the public made incorrect decisions due to the presence of asymmetric information. Hence, the objective of this section is to make an analysis regarding banking regulation, through transparency, for several big financial institutions with their home offices in several countries.

Taking into account the information made available by the World Bank and the International Monetary Fund, this analysis is made based on three groups of countries:
(i) Developed economies – Australia, Austria, Belgium, Canada, Denmark, France, Germany, Greece, Italy, Japan, Norway, Netherlands, New Zealand, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom, and USA;
(ii) BRICs economies - Brazil, Russia, India, and China; and
(iii) Emerging economies – Argentina, Brazil, Chile, China, Czech Republic, Hungary, India, Indonesia, Mexico, Philippines, Russia, Slovak Republic, South Africa, Sri Lanka, and Turkey.

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[4] See, http://www.nytimes.com/2010/02/21/opinion/21sun1.html?scp=2&sq=&st=nyt.

Studies concerning regulation and transparency of central banks are frequent in the literature. In a general way, the existence of asymmetric information between monetary authority and the other economic agents justifies the necessity of transparency in the management of the monetary policy.[5] A high degree of transparency attenuates uncertainties, improves the capacity of the private sector to understand the central bank's decisions and amplifies the monetary policy efficiency.[6] Using this interpretation for the financial institutions, the transparency can be defined as the presence of asymmetric information between the financial firms and the other economic agents. Therefore an improvement in the transparency of the banking system reduces the uncertainty of the financial market, improves the public's perception and can, through market discipline, lead to a better banking supervision.

Such as the types of transparency in the management of the monetary policy,[7] we make a classification of the financial institutional transparency in the following manner:

(i) Political transparency – can be understood as institutional transparency – refers to the access by the public in regard to the institutional objectives and organizational arrangements that classify the conduct of the financial policymakers; and

(ii) Economic transparency – focuses the financial information (data, risk models, and financial forecasts) which is used in the conduction of the financial policy adopted by the banking industry.

Due to the relevance of the transparency and regulation for the stability of the sector and taking into account the proposal in the New Accord, an index for evaluating the behavior of several banking institutions concerning the principles of Basel II is made. In order to create a "regulation and transparency index", the economic transparency was divided into two subgroups. The first is centered on the risks of the financial firms while the second is focused on the accounting information (the period of analysis includes the months of September, October, and November 2008).

Table 1 presents the method for calculating the degree of transparency and regulation of the financial institutions. The answers to the queries were classified obeying the following criteria: (i) degree "1" is ascribed to the institutions when the activity under consideration (from 1.1.1 to 2.4) is an exigency defined by the regulatory

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[5] Regarding this point, see de Mendonça and Simão Filho (2007).
[6] See, Siklos (2000), Clare and Courtenay (2001), and Bernanke (2004).
[7] See, Geraats (2002).

agencies; (ii) degree "0.5" is ascribed to the institutions when, although the activity is not an exigency of regulatory agencies, the banking institution carries it out in a regular way; and (iii) degree "0" is ascribed to the institutions when neither the institution performs the activity nor is it an exigency of the regulatory agencies.

Table 1
Regulation and transparency index (RTI)

Code	Queries	Degree
1	**Economic Transparency**	
1.1	*Concerning institutional risks and principles of Basel II*	
1.1.1	Institution calculates the credit risk	0, 0.5 or 1.0
1.1.2	Credit risk is disclosed in periodic reports	0, 0.5 or 1.0
1.1.3	Institution calculates the market risk	0, 0.5 or 1.0
1.1.4	Market risk is disclosed in periodic reports	0, 0.5 or 1.0
1.1.5	Institution calculates the operational risk	0, 0.5 or 1.0
1.1.6	Operational risk is disclosed in periodic reports	0, 0.5 or 1.0
1.2	*Concerning accounting information and policy of transparency*	
1.2.1	Reports are available quarterly	0, 0.5 or 1.0
1.2.2	Reports are available yearly	0, 0.5 or 1.0
1.2.3	Basel index is calculated and disclosed in the reports	0, 0.5 or 1.0
2	**Political Transparency**	
2.1	Capital structure of the institution is disclosed in the account reports	0, 0.5 or 1.0
2.2	Structure and risk management policies are disclosed	0, 0.5 or 1.0
2.3	Policies for mitigating risk (hedge) are disclosed	0, 0.5 or 1.0
2.4	Market environments and forecasts are disclosed	0, 0.5 or 1.0

Source: Authors' elaboration.

The focus on the developed economies shows the different levels of commitment with the introduction of the principles of Basel II (see table 2). Collecting information available in the sites of the main banks used in this study for the period from September 25, 2008 to November 30, 2008, a significant variation in the indices for the countries in the sample is detected. The countries with the worst performance are South Korea and Greece with a regulation and transparency index of 5.5 and 6.5, respectively. On the other hand, the highest indices (degree 11) are observed for the USA, New Zealand, and Sweden.

The main reason for the classification of South Korea and Greece is due to the lack of publication concerning market and operational risks by the banks and also because this publication is not compulsory (1.1.4 and 1.1.6). Another relevant point is that the banks in these countries do not disclose their policies for mitigating risk nor

market environments and forecasts (2.3 and 2.4). Contrary to these cases, USA and New Zealand have a classification greater than zero for almost all items (except for the publication of Basel index – 1.2.3), while Sweden had an evaluation greater than zero in all queries.

Table 2
RTI – developed and emerging economies

I/P	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5	1.1.6	1.2.1	1.2.2	1.2.3	2.1	2.2	2.3	2.4	Total
Australia	1	1	1	0.5	1	0.5	0	1	1	0	1	1	0.5	9.5
Austria	1	1	1	1	1	0.5	0.5	1	0	1	0.5	0	0.5	9.0
Belgium	1	0.5	1	0.5	1	0.5	0.5	1	1	0.5	0.5	0.5	0	8.5
Canada	1	1	0.5	0.5	1	0	1	1	1	0	0	0.5	0	7.5
Denmark	1	0.5	1	0.5	1	0.5	0.5	1	0.5	1	0.5	0.5	0	8.5
France	1	1	1	0	1	0	0.5	1	1	0	0	0.5	0.5	7.5
Germany	1	1	1	1	1	1	0.5	1	1	0	0.5	0.5	0.5	10.0
Greece	1	0.5	1	0	1	0	0.5	1	1	0	0.5	0	0	6.5
Italy	1	0.5	1	0.5	1	0.5	0.5	1	1	0.5	0.5	0.5	0.5	9.0
Japan	1	0.5	1	0	1	0	0.5	1	1	0	0.5	0.5	0.5	7.5
Netherlands	1	1	1	1	1	0	0	1	0	1	0.5	0	0.5	8.0
New Zealand	1	1	1	1	1	0.5	1	1	1	0	1	1	0.5	11.0
Norway	1	0.5	1	0.5	1	0.5	0.5	1	0	1	0.5	0	0	7.5
Portugal	1	1	1	0	1	0	1	1	1	0	1	0.5	0.5	9.0
Singapore	1	1	1	0	0	0	1	1	1	0	0.5	0.5	0.5	7.5
South Korea	1	1	0.5	0.5	0	0	0	1	0	1	0	0	0.5	5.5
Spain	1	0.5	1	0.5	1	0.5	0.5	1	1	1	0.5	0.5	0.5	9.5
Sweden	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5	0.5	11.0
Switzerland	1	1	1	0.5	1	0.5	0.5	1	1	0	0.5	0.5	0.5	9.0
Taiwan	1	1	1	0.5	1	0.5	0.5	1	1	0	0.5	0.5	0.5	9.0
United Kingdom	1	0.5	1	0.5	1	0.5	0	0	1	1	0.5	0.5	0.5	8.0
USA	1	1	1	1	1	1	1	1	1	0	1	0.5	0.5	11.0
Argentina	1	0	1	0	0	0	0	1	0	0	0	0	0	3.0
Brazil	1	0.5	1	0.5	1	0.5	0.5	1	1	1	0.5	0.5	0.5	9.5
Chile	1	1	1	0.5	0	0	1	1	1	0.5	0	0	0	7.0
China	1	1	1	0.5	1	0.5	1	1	1	0	0.5	0.5	0.5	9.5
Czech Republic	1	0.5	1	0.5	1	0.5	0	1	0.5	1	0.5	0.5	0	8.0
Hungary	1	1	1	1	0	0	0	1	0	1	0	0	0	6.0
India	1	0.5	1	0.5	1	0.5	0.5	1	1	0	0.5	0.5	0.5	8.5
Indonesia	1	1	1	1	0	0	0.5	1	0	1	0.5	0	0.5	7.5
Mexico	1	1	0	0	1	0	1	1	1	0	0	0	0	6.0
Philippines	1	1	1	1	0	0	1	1	0.5	1	0.5	0	0.5	8.5
Russia	1	0.5	1	0.5	0	0	0.5	1	1	0	0.5	0.5	0	6.5
Slovak Republic	1	1	1	0.5	1	0	1	1	0	1	0.5	0	0	8.0
South Africa	1	0.5	1	0.5	1	0.5	0	1	1	1	0.5	0.5	0	8.5
Sri Lanka	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	1	0.5	0	0.5	7.0
Turkey	1	0.5	1	0.5	1	0	0.5	1	1	0	0.5	0.5	0	7.5

Source: Authors' elaboration.

The principles of Basel II have been in practice since 2008 and have a timeline for adaptation of three more years. Notwithstanding, North American institutions, as the Citigroup, adopted a behavior that implied the highest index of regulation and transparency (degree 11).

Based on the information gathered from sites of the main banking institutions of

the developed countries, it is observed that there exists a lack of clarity and transparency regarding market and operational risks as well as the Basel index. Therefore, the regulatory agencies may define what information must be made available by internationally active banks and that it must be standardized in a manner which allows a better comparison among them. Indeed, if the institutional transparency is amplified it is possible for the public to have accurate expectations and thus the market tends to work with greater stability.

The BRICs countries deserve attention because, according to Goldman Sachs (2001), these economies can become the most important economies in the world by 2050. The classification in table 2 indicates that Brazil and China have the highest regulation and transparency index (9.5) among the BRICs. The highlight for Brazil is that only this country in this group discloses information about forecasts and market environments (2.4). Moreover, Brazil received a classification greater than zero for all items. Regarding China, it is important to note that the entry of foreign institutions was only permitted after the conclusion of the restructuring of the domestic banking system, especially concerning the four biggest public banks: Bank of China, Agricultural Bank of China, China Construction Bank, and Industry and Commerce Bank of China (ICBC). Furthermore, until April 2008, only two Chinese banks (the Bank of China and the Bank of Communications) were present in the USA. Notwithstanding, at least six other Chinese banks, such as the ICBC, are planning to ask the Fed's authorization to open for business in American territory and thus will be adjusted based on the regulation criteria determined by this country.

Such as for the case of developed countries, a significant divergence among the regulation and transparency indices is observed (minimum of 6.5 and maximum of 9.5). In a general way, it is observed that the central banks in the BRICs constrain the calculation of regulatory capital for covering risk (credit, market, and operational). However, there exists only the requirement for disclosure of the credit risk although the disclosure of the others is encouraged. In this group, only the Central Bank of Brazil discloses a quarterly Basel index. The negative highlight is the Russian case with a regulation and transparency index of only 6.5. This result is explained by the fact that the Russian banks did not disclose their operational risk (1.1.5 and 1.1.6), forecasts and market environments (2.4).

Besides the BRICs countries the following developing countries were considered in the sample: Argentina, Chile, Czech Republic, Hungary, Indonesia, Mexico,

Philippines, Slovak Republic, South Africa, Sri Lanka, and Turkey. The findings indicate that the BRICs economies had better results in comparison with other emerging economies. Besides the BRICs countries, South Africa presented a good performance (degree of 8.5 – see table 2). This result is explained by the performance of the Standard Bank (biggest South African bank) which presents publication of its risk exposition (credit, market, and operational).

The worst performance, considering all countries, is the Argentinean case with a degree of 3. The reason for this result is that in this country the regulatory agency only requires the disclosure of the balance sheet of the banking firms. Further, Argentina was the only country that did not present a capital structure of its financial institutions (2.1). The other countries with a performance lower than the average were Hungary and Mexico (6.0). The Mexican banks neither calculate nor disclose data concerning market risk (1.1.3 and 1.1.4) and the Hungarian banks neither calculate nor disclose data concerning operational risk (1.1.5 and 1.1.6). Moreover, there are no disclosures in these countries in regard to their risk management policies, forecasts and market environments (2.2, 2.3, and 2.4). In the other countries the results are medians and thus suggest the necessity of an increase in the rigor for the regulatory agencies in the supervision of the financial institutions.

3. Regulation and transparency index and stock market performance

With the objective of making a connection of the regulation and transparency index (*RTI*) with the subprime crisis, an analysis which considers the *RTI* with the most known stock market index of each one of the 37 countries is made. The justification for the use of the stock market indices is because they respond quickly to a financial crisis. Moreover, as recognized by Kaminsky and Reinhart (1999), the weakening in equity prices most likely, reflects both the deteriorating cyclical position of the economy and the worsening balance sheets of firms.

The period under analysis comprises the months of September and October 2008 (daily data). The justification for the use of these months is that they represent an intensification of the subprime crisis after the failure of Lehman Brothers.[8] As can be seen by figure 1, September and October 2008 are the months with the deepest fall in the stock markets and thus represent the peak of the subprime crisis. Furthermore, after

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[8] See BBC news, http://news.bbc.co.uk/2/hi/business/7096845.stm.

this period several measures were adopted by the main central banks in the world as an attempt to mitigate the crisis.

Figure 1
Yield of the Stock Market Index (SR) – Monthly[9]
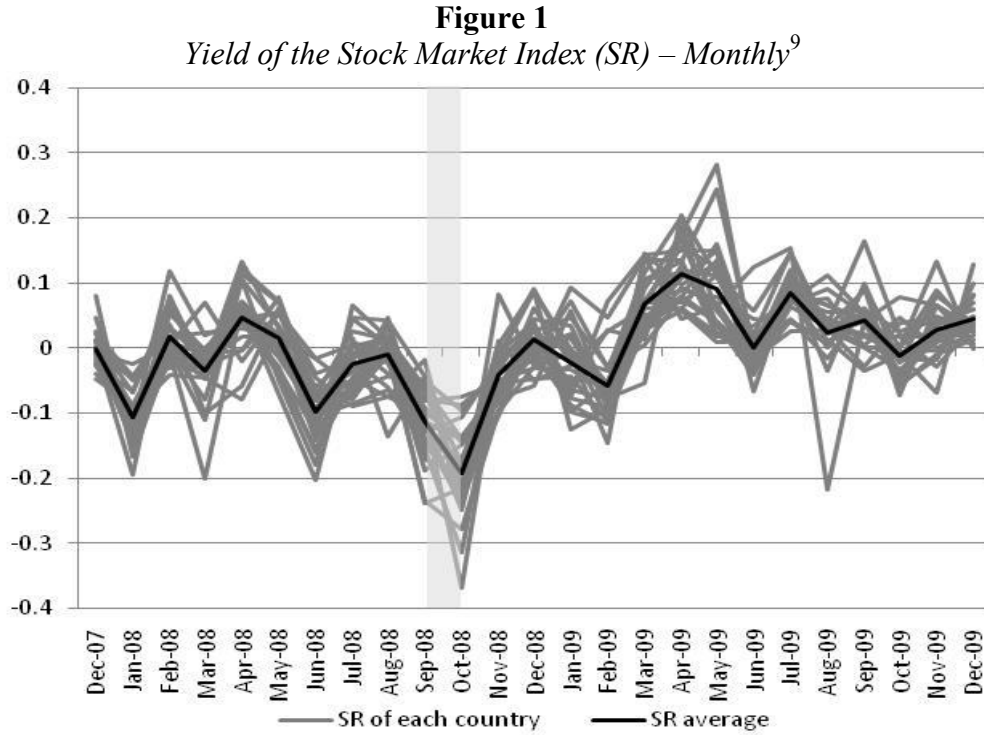
Source: Authors' elaboration.

Firstly, the yield of the stock market index (*SR*) is obtained through the division of price (points) of the index at time *t+n* (IP_{t+n}) and the price of index at time *t* (IP_t), that is,

(1) $\quad SR = \left(\dfrac{IP_{t+n}}{IP_t} \right) - 1$.

For an analysis regarding the volatility in the stock markets, the coefficient of variation of the stock market indices (*CV*) was used as a proxy. In other words, the ratio between the standard deviation (SD_{IP}) and the mean ($\overline{IP}$) of the index,

(2) $\quad CV = \left(\dfrac{SD_{IP}}{\overline{IP}} \right)$.

Focusing the analysis for the relation between *RTI* and *SR*, and between *RTI* and *CV*, it is observed in both cases that there exists a non-negligible correlation between the variables (0.37 and -0.40 respectively – see figure 2). This observation suggests that countries with a higher accountability in banking regulation (high values of *RTI*) have

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[9] Figure 1 considers the path of the 37 countries under analysis (see table 2).

attenuated the effects caused by the crisis. In fact, these markets registered less financial losses and less volatility in comparison with countries where the *RTI* was lower. Table 3 shows, besides the *RTI*, *SR, and CV*, the descriptive statistics for those variables.

Figure 2
RTI and Stock Market Performance[10]

Source: Authors' elaboration.
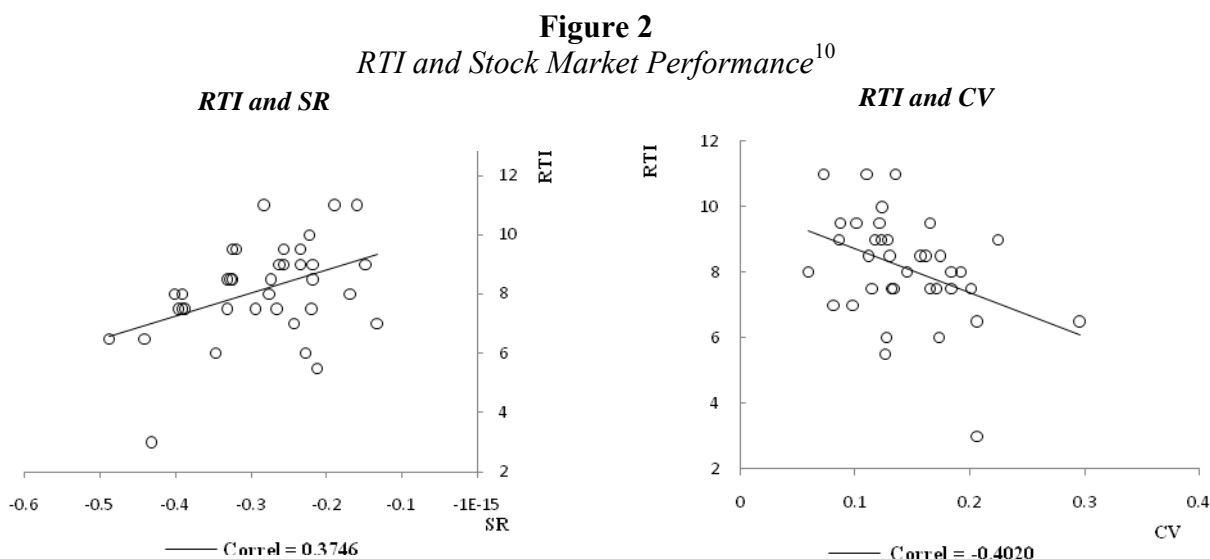
Based on the aforementioned arguments, it is possible to assume that a greater accountability of the financial institutions in response to the greater rigor in the rules, imposed by regulatory and supervision agencies, together with the transparency rules proposed by the New Accord promoted less vulnerability in this period of crisis.

As a robustness check for the result above, cross-country estimations (OLS) for analyzing the effects from regulation and transparency (*RTI*) on return of stock market (*SR*) and volatility in the stock markets (*CV*) were made (see table 4). Due to the fact that in the period under analysis all returns of stock market indices were negative, the modulus of the variable *SR* is considered (greater values of |*SR*| mean greater losses). Furthermore, the following variables were used as control variables in the analysis: regulatory quality (RQ) – available from World Bank (www.govindicators.org); a dummy variable (*DIT*) which takes value one for countries which adopts inflation targeting and zero otherwise; Based on Reinhart and Rogoff (2004), a dummy variable (*DEXA*) which takes value equal one when the country has some control over the exchange rate (e.g., currency board, crawling peg, de facto peg, etc.) and zero otherwise

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[10] Both graphs in figure 2 consider data from the 37 countries under analysis (see table 2).

(e.g., managed floating, freely floating, etc.).[11]

Table 3
RTI, SR, and CV

Country	Index	RTI	SR	CV
Argentina	Merval	3.0	-0.43	0.21
Australia	All Ordinaries	9.5	-0.23	0.10
Austria	ATX	9.0	-0.44	0.23
Belgium	Bel – 20	8.5	-0.33	0.17
Brazil	Ibovespa	9.5	-0.32	0.17
Canada	S&P TSX Composite	7.5	-0.27	0.13
Chile	IPSA	7.0	-0.13	0.08
China	Shanghai Composite	9.5	-0.26	0.09
Czech Republic	PX	8.0	-0.40	0.19
Denmark	KFX 20	8.5	-0.33	0.16
France	CAC 40	7.5	-0.22	0.11
Germany	DAX	10.0	-0.22	0.12
Greece	General Share	6.5	-0.44	0.21
Hungary	BUX	6.0	-0.35	0.17
India	BSE 30	8.5	-0.32	0.16
Indonesia	Composite	7.5	-0.40	0.13
Italy	Milan MIBTel	9.0	-0.26	0.13
Japan	Nikkei 225	7.5	-0.33	0.17
Mexico	IPC	6.0	-0.23	0.13
Netherlands	AMEX	8.0	-0.28	0.15
New Zealand	NZSE 50	11.0	-0.16	0.07
Norway	Total Share	7.5	-0.39	0.18
Philippines	PSE	8.5	-0.27	0.13
Portugal	PSI 20	9.0	-0.26	0.12
Russia	Moscow Times	6.5	-0.49	0.30
Singapore	Straits Times	7.5	-0.39	0.17
Slovak Republic	SAX	8.0	-0.17	0.06
South Africa	JSE	8.5	-0.22	0.11
South Korea	Composite	5.5	-0.21	0.13
Spain	Madri General	9.5	-0.32	0.12
Sri Lanka	All Share	7.0	-0.24	0.10
Sweden	Stockholm General	11.0	-0.28	0.13
Switzerland	Swiss Market	9.0	-0.15	0.09
Taiwan	Weighted	8.0	-0.39	0.18
Turkey	IMKB 100	7.5	-0.29	0.20
United Kingdom	FTSE 100	9.0	-0.22	0.12
USA	Dow Jones	11.0	-0.19	0.11
Mean		8.12	0.28	0.14
Median		8.00	0.27	0.13
Maximum		11.00	0.49	0.30
Minimum		3.00	0.13	0.06
Std. Dev.		1.61	0.08	0.05

Source: Authors' elaboration.

Hence, the equations to be estimated are:

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[11] Other variables concerning political stability, government effectiveness, rule of Law, control of corruption, commercial openness, were used in the estimations, but due to the parsimonious principle, this information was not considered in the final specifications of the models.

$$(3) \quad |SR| = \beta_0 + \beta_1 RTI + \beta_2 RQ + \beta_3 DIT + \beta_4 DEXA + \varepsilon,^{12} \qquad \text{and}$$

$$(4) \quad CV = \alpha_0 + \alpha_1 RTI + \alpha_2 RQ + \alpha_3 DIT + \alpha_4 DEXA + \alpha_5 dummy + \xi.^{13}$$

Table 4
Cross-country estimations (OLS)

	Dependent variable – *SR*			Dependent variable - *CV*		
	Coef.	Std. Error	Prob.	Coef.	Std. Error	Prob.
Constant	0.4630	0.0488	0.0000	0.2289	0.0343	0.0000
RTI	-0.0149	0.0058	0.0152	-0.0093	0.0044	0.0444
RQ	-0.0294	0.0129	0.0300	0.0020	0.0096	0.8377
DIT	-0.0360	0.0170	0.0420	-0.0204	0.0128	0.1209
DEXA	-0.0259	0.0209	0.2233	-0.0101	0.0129	0.4400
Dummy				0.1281	0.0419	0.0046
F-statistic		4.1134	0.0084		5.1096	0.0016
Jarque-Bera		0.4017	0.8180		0.1215	0.9411
Ram.Reset (1)		0.0007	0.9793		0.0186	0.8923
Ram.Reset (2)		0.0050	0.9950		0.0274	0.9730
Arch LM (1)		0.0216	0.8841		1.0104	0.3219
Arch LM (2)		0.0535	0.9480		0.5789	0.5663
Arch LM (3)		0.1018	0.9583		0.4338	0.7304
Arch LM (4)		0.6183	0.6532		1.9103	0.1365
LM (1)		0.6400	0.4298		0.0078	0.9300
LM(2)		1.0029	0.3788		0.3060	0.7387
Adjusted R²		0.2570	N=37		0.3634	N=37

The evidence indicates the existence of a significant negative relation between *SR* and *RTI* which in turn confirms the interpretation above. In other words, countries with a greater level of accountability concerning transparency and banking regulation presented a lower loss in their stock markets than countries with less accountability. In regard to the second estimation, which considers the relation between *CV* and *RTI*, the evidence denotes a negative relation between the volatility in the stock markets and the regulation and transparency index. The statistical significance of the coefficient for *RTI* reveals that countries with a greater accountability concerning transparency and banking regulation had less volatility in their financial markets.

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[12] Box plot for the variable *SR* does not show presence of outliers (see appendix, figure A.1).
[13] A dummy variable is introduced in the model for eliminating the distortion caused by presence of one outlier (see box plot in appendix – figure A.1).

4. Market discipline and the Brazilian financial system

Market discipline is a regulation mechanism that delegates monitoring power not only to regulation agencies but also to market players which may have their wealth affected by the conduct of the financial institution (Ceuster and Masschelein, 2003). According to Flannery and Sorescu (1996) market discipline is the process where the market uses the information from the system to minimize losses in negotiation.

In a general way, market discipline considers two different aspects (Bliss and Flannery, 2000): skill of investors in the evaluation of the financial health of the institutions and the competence of bank directors in response to the market position. Furthermore, for the effectiveness of the market discipline four conditions are needed (Lane, 1993): (i) free and open financial markets; (ii) publicity regarding debt management and solvency by financial institutions; (iii) market agents believe that managers never will be acquitted in the case of financial failure; and (iv) necessity of institutional managers response to market's signals before they are excluded.

The empirical literature concerning market discipline has as its main objective the study of the perception of private agents in relation to the financial wealth of banks in the moment of pricing their assets. The majority of the empirical studies was made for the U.S.A. and assumes subordinated debt holders as regulation agents. These works were based on the attempt of observing a positive relation between credit risk and subordinated debts spreads. In regard to the identification of the risk, most of the studies used ratings from private agencies (as Moody's and Standard & Poor's) or central banks. Among several articles in the literature, those of Bliss and Flannery (2000); Morgan and Stiroh (2001); and Krishnan, Ritchken, and Thomson (2005), whose main objective is the analysis of the influence of private agents on management of financial institutions, deserve to be highlighted. Bliss and Flannery (2000) and Krishnan, Ritchken, and Thomson (2005) do not find strong evidence for the influence of the agents. On the other hand, Morgan and Stiroh (2001) prove the existence of market discipline.

Flannery and Sorescu (1996) used debentures spreads and data from Consolidated Financial Statements reports and Call Report for 83 different bank institutions (1983 to 1991). The empirical evidence, based on regressions with fixed regression panel and cross-section, indicated a strong correlation between subordinated debts spreads and credit ratings. Deyoung *et al.* (2001) based on CAMEL ratings and

data extracted from FR Y-9 and Call Report from 1986 (second quarter) to 1995 (first quarter) built a sample with 1079 banks from different countries and 67 holding banks. One result was the identification of a positive correlation between the exposure to the risk and the subordinated debts spreads.

According to the literature concerning market discipline, the key for proving its existence is through the confirmation of the relation between the profitability of subordinated debts funds and the risk of financial institutions. Hence, based on Morgan and Stiroh (2001), an *ex post* analysis of variables and two types of data are necessary for analyzing market discipline: the spread premium paid by debentures and the financial health of banks.

For the Brazilian case, empirical evidence which proves the market discipline through subordinated debt holders is still reduced. Notwithstanding, there exists information that permits an evaluation. The Debentures National System (DNS) releases a daily report of the unitary price (UP) of the subordinated debts negotiated in the secondary market. For this study, debentures regarding banks from the second quarter of 2001 to the second quarter of 2009 were considered. The sample takes into account 40 debentures of 11 different banks totaling 570 observations for panel data (unbalanced).[14] With the objective of calculating the spread premium (SP) paid by debentures in the quarter *t*, the UP of the assets on the last day of the quarter was divided by the UP of the same assets for the last day of the previous quarter and the results are deducted from the interest rate free of risk,[15] i.e.:

(5) $\qquad SP_t = \dfrac{UP_t}{UP_{t-1}} - r.$

It is assumed that the spread of debentures has a positive relation with the banking risk, that is, an increase in risk for institutions implies an increase in the return for private agents (Flannery and Sorescu, 1996). Here, two different perspectives are considered for the analysis of risk incurred by firms. The first is concerning the ratings of debentures (*R*). Under this view, the analysis considers 11 levels of risk based on ratings disclosed by Moody's, Standard & Poor's, Fitch, Atlantic, Austin, SR, and Fitch

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[14] The banks are: ABM Arom Bank, Banco Francês e Brasileiro, Itaú, Banco BMG, BIC, Bradesco, Dibens, HSBC, Panamericano, Safra, and Santander.

[15] In the Brazilian case, the interest rate free of risk corresponds to the over/Selic rate (Brazilian Treasury bond).

Atlantic.[16] The debenture ratings were extracted from DNS (www.debentures.com.br). The second view takes into consideration indicators calculated through data from financial institutions' accountability reports.

This study is based on quarterly data from Securities and Exchange Commission of Brazil (CVM) and Central Bank of Brazil (CBB) for the banking conglomerate. It is important to note that the main objective of this section is to analyze the behavior of the whole financial institution in relation to the risk incurred by firms considering the power of influence of the private agents. As a consequence, four indices which represent the health of banks were selected:

(i) Level of default (*LD*) – considers all credits default with a period greater than 15 days. Moreover, for patterning the index, taking into account the size of banking firms, the amount of credit default (*ACD*) was divided by the total assets (*AT*) less intermediation of the institutions (*INT*), that is,

$$(6) \qquad LD = \frac{ACD}{AT - INT}.$$

Hence, an increase in the level of default of banking institutions increases the exposition to the credit risk and thus a higher spread premium is demanded by investors.

(ii) Immobilization index (*II*) – denotes the level of immobilization of capital of the financial firm. It is the division between permanent asset (*PA*) and banking capital requirements (*CR*),[17]

$$(7) \qquad II = \frac{PA}{CR}.$$

Therefore, a higher index indicates a low liquidity, which in turn suggests a higher exposition to the risk and thus a higher return is demanded by private agents.

(iii) Net profit index (*NPI*) – high profits are associated with higher risks assumed by financial institutions (Estrella, 2004) and thus a higher spread is demanded in this case. Moreover, with the intention of patterning the index taking into consideration the size of banking firms, the net profits are divided by the total assets less intermediation of the banks. Thus,

$$(8) \qquad NPI = \frac{NP}{AT - INT} + 1.$$

(iv) Basel index (*BI*) – capital over assets measured by risks. A higher indicator

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[16] Due to the scarcity of data provided by a single agency, the use of all information provided by several agencies regarding risk was considered in this analysis.
[17] See resolution National Monetary Council 3,490, August 29, 2007.

indicates a higher solvency of the bank, which in turn reveals a lower credit risk and thus lower debentures spreads. The indicator corresponds to:

$$(9) \qquad BI = 0.11 \left(\frac{Capital \times 100}{regulatory \quad capital} \right).$$

The Brazilian current capital obligation is 11% of exposures net of provision (Basel Committee defines 8%) and it obeys Circular N. 3.360/2007 which prescripts minimum provisioning percentages according to a classification criteria. Capital is defined as the sum of: equity, net income, reserves, preferred stocks, subordinated debts, and hybrid instruments. Regulatory capital is the sum of risk weighted assets and other capital requirements (capital for credit risk of swaps, capital for interest rate market risk, and capital for foreign exchange rate market risk).

Table 5 surveys the descriptive statistics of the variables for the panel data.

Table 5
Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Standard deviation	Observ.
SP	-0.0197	-0.0001	0.3605	-0.6566	0.0661	570
R	9.0000	8.0000	11.0000	3.0000	1.7649	510[18]
BI	15.9680	15.7400	25.8500	11.7500	2.5876	570
LD	0.0235	0.0079	1.0278	0.0000	0.1111	570
II	36.7394	41.9100	74.8900	0.9200	16.4697	570
NPI	1.0085	1.0077	1.0409	0.9938	0.0055	570

5. Empirical evidence

With the objective of testing the market discipline through subordinated debt holders for the Brazilian case, the panel data method proposed by Arellano and Bond (1991) is employed. This method corresponds to the estimation of a first difference General Method of Moments (GMM) panel data as a manner of eliminating the non-observed effects in the regressions. In particular, this method is adequate for this study because it avoids the possibility of simultaneity problem being a consequence of the financial wealth of banking firms may be influenced by debentures spreads. An advantage of GMM in comparison with the traditional regressions in cross-section and

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[18] The number of observations is lower than the other variables because HSBC and Santander do not have ratings.

panel is that GMM estimators are not inconsistent with omitted variables (Bond, Hoeffler, and Temple, 2001). In addition, the use of instrument variables allows the estimation of robust parameters even in the presence of endogenous variables.

Data frequency is quarterly and spans from first quarter 2001 to second quarter 2009. Furthermore, the spread premium paid by debentures (*SP*) is used as the dependent variable based on two specifications: (i) with accounting information and (ii) with ratings of the debentures and accounting information.

Before the estimation of the dynamic panel data, the GMM panel data parameters were estimated with a static model. Furthermore, the results of the estimations for two specifications are considered (see table 6).[19] The results of the Sargan test and serial autocorrelation test of first (m1) and second order (m2) are satisfactory for both specifications.

Both results in specification 1 (which considers accounting information) and specification 2 (which includes the ratings of the debentures), show that all coefficients have statistical significance and the sign of the coefficients are consonant with the theoretical argument. As a consequence, this result indicates the presence of market discipline in Brazil.

For application of the Arellano and Bond (1991) methodology (dynamic GMM), the variable *SP* with 1 lag was considered in the estimations (see table 6). The Sargan test for both specifications indicates that the instruments as a group are exogenous. In addition, the tests of first-order (m1) and second-order (m2) serial correlation do not denote autocorrelation problem. Besides, all coefficients, in both specifications, are statistically significant and are in agreement with the theoretical perspective. In short, the result confirms the one presented in the static GMM, that is, both account information and ratings are relevant in the explanation of spread premium paid by debentures and thus indicate the presence of market discipline in the Brazilian banking industry.

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[19] Dummy variable is introduced in both estimations (static and dynamic) for avoiding the effect caused by the presence of outliers (see box plot in appendix – figure A.2).

Table 6

Debenture spread - static and dynamic panel data (GMM)

Regressors	Static GMM				Dynamic GMM			
	Specification 1		Specification 2		Specification 1		Specification 2	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
SP_{t-1}					0.1651***	0.0001	0.0686***	0.0007
R_{t-1}			-0.0198***	0.0001			-0.0195***	0.0001
BI_t	-0.0041***	0.0000	-0.0011***	0.0001	-0.0040***	0.0000	-0.0009***	0.0000
LD_{t-1}	0.2344***	0.0001	0.3447***	0.0105	0.4000***	0.0020	0.4235***	0.0080
II_{t-1}	0.0007***	0.0000	0.0012***	0.0000	0.0004***	0.0000	0.0012***	0.0000
NPI_{t-1}	1.4195***	0.0004	0.8369***	0.0056	1.5420***	0.0019	0.8772***	0.0093
dummy	-0.0811***	0.0000	-0.0675***	0.0000	-0.0918***	0.0000	-0.0724***	0.0001
N. instrum.	11		16		11		16	
Obs.	338		304		338		304	
Sargan test	29.676		24.0404		28.2475		25.5349	
(p-value)	(0.482)		(0.4593)		(0.3983)		(0.3772)	
m1	-2.243		-2.0060		-3.3127		-2.4215	
(p-value)	0.026		0.0461		0.0011		0.0163	
m2	-1.319		-1.0941		-0.7772		-0.8666	
(p-value)	(0.189)		(0.2752)		(0.4379)		(0.3872)	

Note: Asterisks (***) denote significance at the 1%.

6. Concluding remarks

In regard to financial regulation, as a manner of preventing the occurrence of new crisis, supervising agencies maintain the strategy of reacting to causes of crisis after the fact. The subprime crisis (2008) revealed that the model, which was valid in Greenspan's time at the Fed, based on trust, on market regulation, and on the discernment of the managers of credit portfolios of the financial institutions was not approved in the market test. The "invisible hand", alone, is incapable of eliminating every imbalance. The financial market, especially in the USA and Europe, paid a high price due to the presence of an agile system, less regulation, and, at first, a more efficient system which became more exposed to risks and financial shocks. The regulators neglected their main function and excessively loosened the rules in the financial market.

Although the argumentation above represents the core of the idea of the group which are nihilists regarding the market forces, there exists a growing literature which shows evidence that the transparency concerning disclosure of information to the private agents represents an important mechanism for monitoring financial institutions. Furthermore, assuming that transparency is capable of eliminating asymmetric information of the economic agents, a connection with the first welfare theorem is possible. Hence, an increase in the transparency would increase the welfare because it would cause a decrease in the forecasts errors and in the expected volatility of the variables subject to uncertainty. Therefore, the third pillar of the Basel II, which stimulates the market discipline by the disclosure of information, provides the market agents with conditions for themselves to develop mechanisms regarding risk.

The empirical evidence in this study puts light on the relevance of the regulation of the financial system and of the transparency of information by the banking sector. Countries which have a higher index of transparency and in which the financial system was more regulated, suffered fewer negative effects caused by the subprime crisis. The findings denote that a greater commitment by the supervision agencies implied less vulnerability of the financial market.

In particular, for the Brazilian case, it is observed that, contrary to the case of the countries at the time of the subprime crisis, Brazil was a country with over-regulation in the financial market and the banking sector worked under leverage. Moreover, the country presented a comfortable situation with international reserves, high compulsory reserves, and

high interest rates which offered an adequate condition for the monetary authority to respond to the tightening credit supply after the crisis. It is important to note that an important factor that cannot be neglected for the apparent success in going around the subprime crisis, which is confirmed by the empirical evidence, is the presence of market discipline in Brazil.

Although Brazil has been successful with the strategies adopted at the critical phase in the subprime crisis, there exist several points that demand reflection in regard to regulation and supervision agencies. As highlighted by Basel II, a good supervision may consider a regulation system as not the only instrument of supervision. Hence, market discipline is an important part of the regulatory system with the main objective to punish the bad management risk in the financial institutions. In brief, regulation and transparency of the Brazilian financial system can be improved through an optimal balance between government regulation and market discipline.

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Figure A.1
Box-Plot

SR   *CV*

Figure A.2
Box-Plot

SP
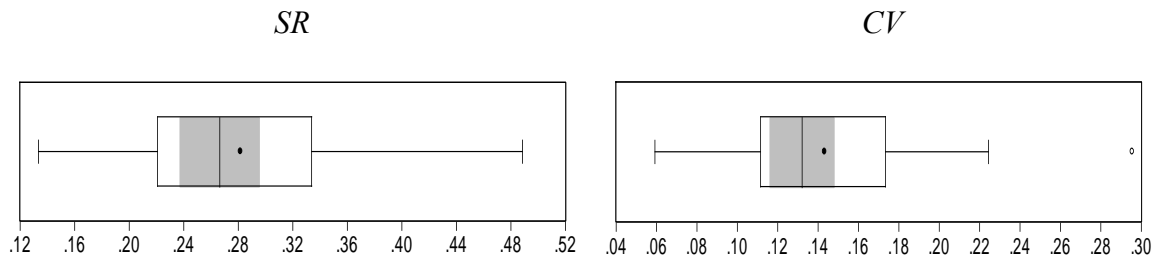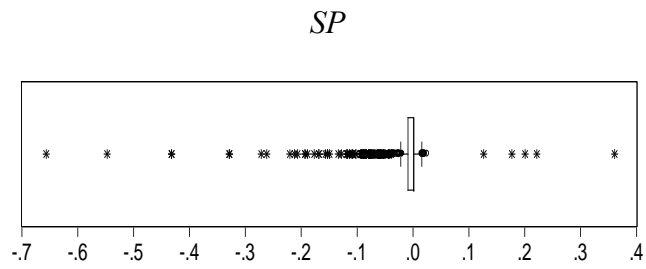
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