Market discipline in Brazilian banking: an analysis for the subordinated debt holders

Abstract

Market discipline is a regulatory mechanism which has as its main task the punishment of bad risk management by financial institutions. Subordinated debt holders are considered by the literature as the most propitious private agent to discipline the financial institutions. The key to prove the existence of market discipline is to show the relationship between banks' asset prices and its respective risks. The main objective of this article is an empirical analysis of the relation between credit risk (ratings and accounting information) and debentures return for the Brazilian case. The results denote a weak presence of market discipline in Brazil.

Key words: Market Discipline; Banking Regulation; Subordinated Debts.

JEL classification: G21, G28.

1. Introduction

Due to the increase in the bank insolvency and bank risk since the 1980s, the analysis concerning financial regulation emerged. In particular, special attention was given to the auto-regulation where investors and depositors are responsible for the monitoring bank (market discipline).[1] Although the market discipline represents an object of study by most of financial economists, there is no empirical evidence for validating it. The auto-regulation is the main monitoring system of industrial corporations. However, besides the monitoring by depositors and investors, banks are under government supervision. The justification for this special regulation is a consequence of the policymakers considering the private agents incapable of assuring a safe financial system.

The exigency of a minimum capital requirement as the unique instrument is not sufficient to protect banks from credit flaw. The New Basel Accord included two new pillars. Besides the exigency of a minimum capital requirement, the instruments of regulation were revised and criteria of transparency were defined for the financial institutions. It is important to note that the last point has as its objective the increase of market discipline.

In the beginning of the 1980s the American regulators protected, in a virtual way, all credit holders of the financial institutions. This situation implied a decrease in the monitoring of the institutions through market instruments. Nowadays, the American government is reducing the guarantee for bank creditors. Notwithstanding, the doubt in relation to the presence of market discipline was not avoided. In some emergent economies, such as Brazil, the governmental supervision guarantees some deposits, but there is no confirmation of the presence of auto-regulation in banking industry.

The incentive for bank competition may generate more exposition to the risk (Nier and Baumann, 2006). On the other hand, under environments with more competition the market discipline can reduce this exposition. Therefore, in economies where there is weak market discipline, the competition can put the stability of the banking system at risk. The literature regarding market discipline is undervalued for emergent economies. As a consequence the analysis of the existence and power of discipline of the private agents in these economies is relevant. Some special characteristics must be considered for analyzing market discipline in these economies. Due to the high transaction costs and the presence of a large number of

[1] As pointed out by Flannnery and Sorescu (1996) the debenture market offers an efficient supervision to the banks.

small firms the secondary markets are small. It is important to note that the volatilities in small markets can be explained only by macroeconomic and systemic risks. Therefore, institutional risks can be neglected thus hiding the market discipline (Yeyati, Pería, and Schmukler, 2004).

Environments with more economic stability tend to foster the financial markets, increasing the amount of business. The Brazilian economy, in June of 1999, adopted inflation targeting increasing the transparency in the conduction of the monetary policy which in turn implied a significant fall in the basic interest rate (see, de Mendonça and Simão Filho, 2008). Under this environment, with more stability in the economy, the private agents tend to migrate for riskier investments (stock market, subordinated debts, etc.) with more profitability. Hence, the environment of macroeconomic stability observed in Brazil in the last years justifies an analysis of the presence of market discipline.

For the Brazilian economy there is no empirical evidence that reveals market discipline through subordinated debt holders. The lack of a developed financial system can be one of the justifications. Notwithstanding, some agencies, such as Moody's and Standard & Poor's, provide credit ratings for most of the financial institutions in Brazil and the country has a secondary market of debentures. In the same way as the studies for USA, these two instruments together can be used to confirm the auto-regulation. Therefore, the main objective of this article is the empirical analysis of the relation between credit risk (ratings and accounting information) and the return of debentures. In the case of confirmation of this relation, the banking regulation can occur through debenture holders which in turn confirm the auto-regulation. Furthermore, this analysis is an important instrument for national regulators because it contributes to the definition of parameters and limits for the government supervision of financial institutions. This paper is organized as follows: next section presents the review of literature, regarding market discipline in banking; section 3 presents the data and methodology which is applied in this study; section 4 makes an empirical analysis for the Brazilian case, taking into consideration subordinated debts (debentures); and section 5 concludes the article.

2. Review of literature

For comprehending the market discipline it is necessary to know the different manners of banking supervision and how the supervision agencies adopt the auto-regulation in their

reports. One of the first formal mechanisms of banking regulation was the Lender of Last Resort (LLR). Banks suffer, even if in the transitory way, oscillations in their reserves. Therefore, banks which do not attend the minimum capital requirement need to borrow from other institutions. As pointed out by Freixas and Rochet (1997) one function of the central bank is to be a LLR, lending capital for avoiding systemic risks during turmoil.

Together with the LLR, the deposit insurance is considered as the main security system which has been practiced by supervision agencies constituting the regulation of protection (Flannery, 1998). The first country to develop this system, the USA, created an agency - Federal Deposit Insurance Corporation (FDIC) – with the function of managing a fund which was established from the capital of its own banks.[2] One of the main problems caused by the FDIC due to the protection against the risk of credit (in the 1980's) was the incentive for financial institutions to increase their risk. As a consequence, the FDIC was improved and in 1991 the Improvement Act (FDICIA) determined that the subordinated debts would not be guaranteed by supervision agency (Jagtiani, Kaufman, and Lemieux, 2002).[3]

Another type of regulation of the financial system is market discipline. This subject has gained attention since the beginning of the 1980s due to the failure of conventional systems in the prevention of bank losses. The auto-regulation represents a common practice for the corporations, but is not a simple system for banks. One justification is the complexity of operations and due to the fact there does not exist an information policy in the financial system.

The necessity for information is an important factor for the success of auto-regulation. The literature suggests that only with transparency the private agents will be capable of monitoring the financial institutions (Flannery, 1998; Deyoung, Flannery, Lang, and Sorescu, 2001; Jagtiani, Kaufman, and Lemieux, 2002). Another advantage from an increase in transparency is the standardization of the published accounting data. As pointed out by BIS (2004) this procedure will permit the comparison among financial firms simplifying the definition of criteria for making decisions in the market which in turn will contribute to auto-regulation.

According to Estrella (2004) there is a conflict of interests between banking industry and supervision agencies. The banks covet high profits which in general are associated with an increase in risks for shareholders and depositors. On the other hand, the supervision

[2] The FDIC was created in response to the great depression of 1929.
[3] In Brazil the system of assurance is entitled Fundo Garantidor de Crédito (FGC) and was introduced in 1995.

agencies try to avoid the occurrence of a situation capable of creating a systemic risk. The empirical analysis made by Estrella denotes that the financial institutions are not sufficiently transparent for completely filling the attributes of supervision and market discipline. Therefore, there is the necessity of a system that constrains the financial institutions to practice transparency in their operations.

The New Basel Accord puts the market discipline on the same level as the governmental supervision. However, the auto-regulation is not the unique system of monitoring financial institutions. For the Committee, the role of the market discipline is to facilitate the punishment of banks in cases of bad risk management. According to BIS (2004) the objective of the auto-regulation is to complement the capital minimum requirement (first pillar) and the revision of the supervision process (second pillar).

It is important to note that 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. According to Flannery and Sorescu (1996) market discipline is the process where the market uses the information from the system to minimize losses. Furlong and Kwan (2007) highlight that the presence of private sectors subject to financial risks regarding institutional decision is necessary for the presence of market discipline. Moreover, market discipline presents two different aspects: 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 (Bliss and Flannery, 2000).

The development of the literature regarding market discipline promoted several researches for testing the presence of auto-regulation in the financial institutions. Furthermore, an analysis to determine the real power of the private agents on financial institutions as way for the official regulators to determine the limits to be adopted in their supervision is needed. Most of the empirical studies were made for the USA from the 1980s. The analyses of Bliss and Flannery (2000), Morgan and Stiroh (2001), and Krishnan, Ritchken and Thomson (2005) have as an objective to analyze the influence of private agents on the administration of financial institutions. The influence of the private agents was identified only in the Morgan and Stiroh' study.

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 its assets.[4] Most of the literature proves the existence of market discipline through private agents. However, there is evidence that the insured assets holders do not monitor the financial institutions because they have the perception that they are not exposed to the default risk. Therefore the managers of financial institutions decide between insuring their assets or exposing their assets to market discipline. The literature presents three main regulation agents: holders of subordinated debts, shareholders, and non-guaranteed depositors.

The subordinated debts holders are used in most of the studies with the objective of observing a positive relation between credit risk and the debentures spreads.[5] In relation to the criterion of identification of risk, most of the studies use the ratings from Moody's and Standard & Poor's, or regulation agencies (central bank). The seminal studies that tried to prove the existence of market discipline, Avery, Belton, and Goldberg (1988), and Gorton and Santomero (1990), used data regarding debentures spreads, credit ratings from Moody's, Standard & Poor's, and FDIC, and accounting information of banks for the period 1983 to 1984. The samples take into consideration the 100 largest banks in USA totalizing 200 observations. The results denote a weak relation between debentures spreads and credit risk.

The above-mentioned articles used price models and linear estimation models in an attempt to prove the existence of market discipline. The methodological difference between them is the composition of the dependent variable. Avery, Belton, and Goldberg (1988) take into account the average of the debentures spreads as the dependent variable. Gorton and Santomero (1990), on the other hand, calculated first the average of the premiums which were paid for each debenture in each year. After, the variance of the observed average was calculated and used as the dependent variable. In both studies the ratings and accounting information were considered to be explicative variables. The justification for the failure in proving the market discipline can be justified through two main points: (i) the methodology is very simple and does not apply panel data; and (ii) the researches were made before the introduction of FDICIA.

Flannery and Sorescu (1996) using debentures spreads and data from Consolidated Financial Statements reports and Call Report for 83 different bank institutions (1983 to 1991) found a strong correlation between debentures spreads and credit ratings. The authors used in the analysis regressions with fixed regression panel and cross-section. The result denotes that

[4] The financial wealth can be perceived through balance sheets and ratings disclosed by private agencies such as Mood's, Standard & Poor's, and Fich.

[5] For an analysis taking into consideration shareholders and non-guaranteed depositors, see Bliss and Flannery (2000), Park and Peristiani (2001), Distinguin, Ross, and Tarazi (2006), Murata and Hori (2006), Park (1994), Park and Peristiani (1998), and Peria and Schmukler (2001).

the banks with poor quality of credit are considered more at risk which in turn means they must pay high spreads in their subordinated debts.

Deyoung, Flannery, Lang, and Sorescu (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 of different countries and 67 holding banks. Such as Flannery and Sorescu (1996) the fixed regression panel was applied in the study. One result was the identification of a positive correlation between the exposition to the risk and the debentures spreads. Moreover, it was observed that the CAMEL ratings imply relevant information in relation to the financial health of banks.

Jagtiani, Kaufman, and Lemieux (2002) analyzed the relation between the ratings from Moody's, Standard & Poor's, FDIC, and the accounting information with the subordinated debts for the period after the introduction of the FDICIA. The period under analysis is from 1992 to 1997 and the sample is constituted by 39 holding banks and 19 banks. Furthermore, the study took into consideration panel data estimation by Feasible Generalized Least Squares (FGLS). The result indicates the presence of a positive correlation between ratings and debentures spreads.

Morgan and Stiroh (2001) analyzed the relation between data regarding asset portfolio of the financial institutions and the spreads of subordinated debts. Under this perspective the analysis is different from the previous because it represents an ex post analysis. The justification is that the ratings and indices used apprehend the past risk of the banks which in turn permits the evaluation of the monitoring capacity. The study was made for the period from 1993 to 1998, taking into account 81 assets and cross-section by Ordinary Least Squares estimation (OLS). The result indicates the relation between the spreads and the asset portfolio of financial institutions.

Sironi (2003) based on ratings from Moody's, Standard & Poor's, Fich, and accounting information, made an analysis of the relation between these variables and subordinated debts for the period from 1991 to 2000 in Europe. Taking into account 290 debentures belong to European financial institutions and making use of cross-section by OLS estimation and fixed data panel, the presence of market discipline was proved.

In an attempt to show the market discipline through private agents in the USA, Goyal (2004) considered the framework of subordinated debt contracts in the study. The analysis is made using panel data OLS method and the period under analysis was from 1974 to 1995 (sample 73 banks). The result indicates that there exists market discipline through contract

constraints. With the same objective and taking into account the data extracted from Fixed Income Securities Database (FISD) and accounting information, Krishnan, Ritchken, and Thomson (2005), made an analysis with the debentures spreads (period 1994 to 1999). The study employed the variation of risks in the estimation and the result denotes a weak relation between spread and variation risk of banks.

2. Data and methodology

Some special characteristics must be observed for analyzing market discipline in an emergent economy. In a general way, these economies have small secondary markets which are justified by high transaction costs and a great number of small firms. In short, volatilities in small markets are explained by macroeconomic and systemic risks. However, the market discipline can be hidden thus neglecting the institutional risks (Yeyati, Pería, Schmukler, 2004).

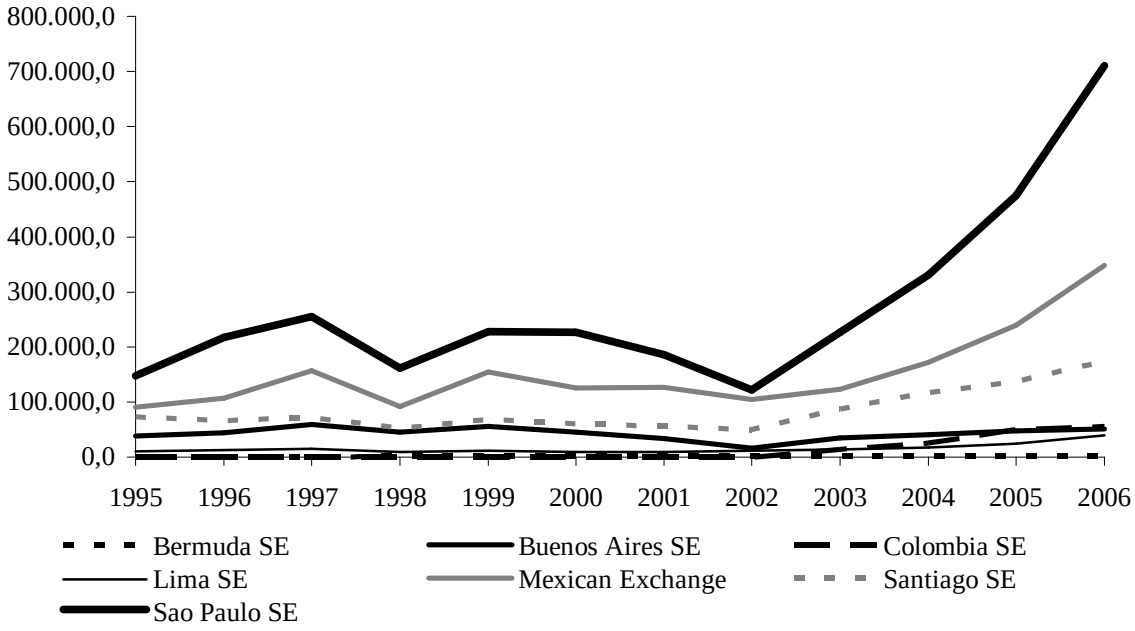
Although Brazil has the largest financial market in Latin America there is no empirical evidence, which reveals market discipline through subordinated debts holders. Figure 1 shows the relevance of the Brazilian financial market in Latin America. It is observed that in the period 1995 to 2006 the São Paulo stock market (BOVESPA) had the greatest amount of capitalization in the region. Furthermore, risk agencies (Moody's and Standard & Poor's) disclose credit ratings for most of the financial institutions in Brazil and the country has a secondary market of debentures. Hence, an empirical analysis taking into consideration this information can be made for evaluating the presence of auto-regulation.

It is important to note that under a stable macroeconomic environment the financial markets tend to grow. Brazil in June of 1999 adopted the inflation target which implied an increase in the transparency in the conduction of the monetary policy and a decrease in the volatility of the basic interest rate (see figure 2).

One consequence of an increase in the macroeconomic stability is an incentive to invest in assets with more risk (stocks, subordinated debts, etc.). Notwithstanding this effect cannot be observed immediately in the Brazilian financial market. A justification is due to the first election of President Luiz Inácio Lula da Silva because it generated a crisis of confidence regarding the conduction of the monetary policy implying a temporary increase in the basic interest rate. However, after the financial market perceived that the new president would not change the conduction of the economic policy, the political crisis was avoided. Moreover, it is

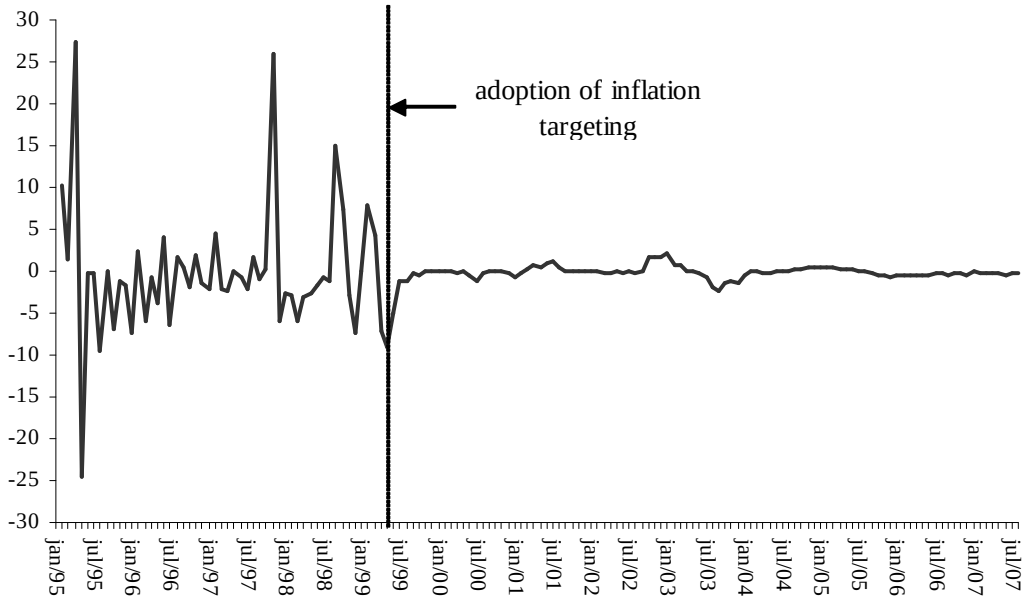
observed that in the middle of 2003 the amount of capitalization in BOVESPA increased considerably (see figure 1). With some lag, the negotiation of debentures, due to the presence of stickiness of such contracts, increased significantly from 2004 (see figure 3).

Figure1
Capitalization in stock markets 1995–2006 (US$ millions)



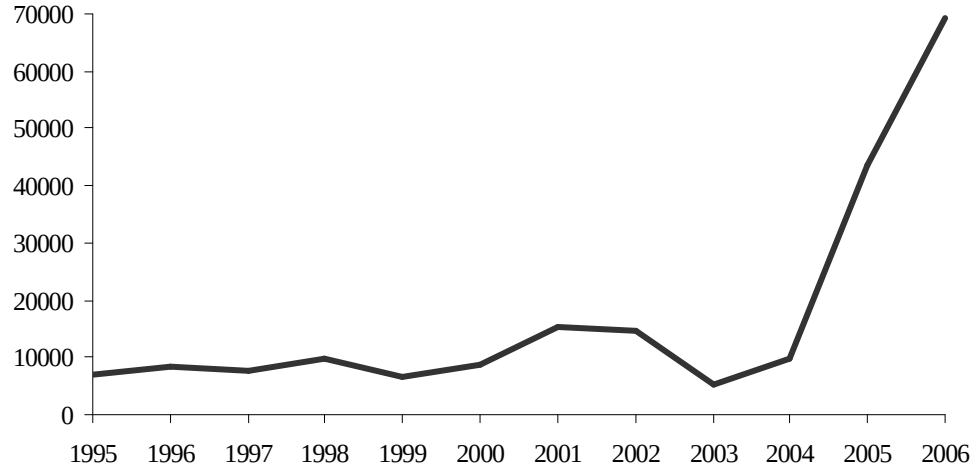
Source: World Federal Exchanges (2007).

Figure 2
Volatility – basic interest rate (first difference)



Source of data: Central Bank of Brazil (2007).

Figure 3
Negotiation of debentures in Brazil 1995-2006 (R$ thousands)



Source of data: Sistema Nacional de Debêntures (2007)

Based on empirical studies regarding this matter it is observed that the confirmation of the relation between the profitability of debenture funds and the risk of financial institutions is the key for proving the existence of market discipline. In short, three types of data are necessary for this analysis: the spread premium paid by debentures, the financial characteristics of banks, and the control variables in the model.

In Brazil the Debentures National System (DNS) reports daily the unitary price (UP) of the subordinated debts negotiated in the secondary market. For this study debentures regarding banks from third quarter of 2001 to third quarter of 2007 were identified. The sample takes into account 34 debentures of 11 different banks totaling 243 observations for data panel.[6] With the objective of calculating the spread premium (SP) paid by debentures in the quarter *t*, the UP of the assets in the last day of the quarter was divided by the UP of the same assets for the last day of the previous quarter, i.e.[7],

$$(1) \qquad SP_t = \frac{UP_t}{UP_{t-1}}.$$

As pointed out by Flannery and Sorescu (1996) the spread of debentures has a positive relation with the banking risk. In other words an increase in risk for institutions implies an increase in the return for private agents. Two different perspectives were implied for the

[6] The banks are: ABM Arom Bank, Banco Francês e Brasileiro, Itaú, Banco BMG, Bradesco, Banco Votorantin, Dibens, Banco da Indústria e Comércio, Mercantil, Panamericano, and Safra.
[7] It is important to note that the spread as the difference between return of debentures and the basic interest rate (main indexing factor of public debt) was not used in this analysis because the high basic interest rate practiced in Brazil implied negative spreads for some periods.

analysis of risk incurred by firms. The first takes into account the ratings of debentures. Under this perspective, the analysis considers 11 levels of risk based on ratings disclosed by Moody's, Standard & Poor's, Fitch, Atlantic, Austin, SR, and Fitch Atlantic.[8] The debenture ratings were extracted from DNS (2007). The second perspective takes into consideration indicators calculated through data from financial institutions' accountability reports. This study uses quarterly data from Securities and Exchange Commission of Brazil (CVM) and Central Bank of Brazil (CBB) for the banking conglomerate. It is important to highlight that the main objective of this article 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. Hence, four indices which represent the health of banks were selected: general liquidity, liabilities ratio, short-term financial liabilities *versus* circulating asset, and Basel index variation.

(i) General Liquidity (*GL*) – denotes the capacity of payment of long-term debts by institution. A lower index implies a lower firm's liquidity. Due to the association of low liquidity with high credit risks, the private agents demand a higher return. Thus, there is a negative relation between *GL* and the debentures spreads. The indicator is given by:

$$(2) \qquad GL = \frac{CA + LTA}{CL + LTL}, \qquad \text{where}$$

CA – Current assets; *LTA* –Long term assets; *CL* – Current liabilities; and *LTL* – Long term liabilities.

(ii) Liabilities ratio (*LR*) – represents the share of assets from borrowed capital. A higher indicator indicates a higher liability of the institution which in turn reveals a higher credit risk. In short, a positive relation of this indicator is expected with the debentures spreads.

$$(3) \qquad LR = \frac{CL + LTL}{LE},$$

LE – Liabilities and equity.

(iii) Short-term financial liabilities *versus* circulating asset (*FLCA*) – denotes the share of current assets which is financed by short-term resources. A higher indicator reveals a higher credit risk which in turn implies an increase in the debentures spreads. Therefore, there is a positive relation between this indicator and the debentures spreads.

$$(4) \qquad FLCA = \frac{CL}{CA}.$$

[8] 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.

(iv) Basel index variation (D*BI*) – capital over assets measured by risks. A higher indicator reveals a higher solvency of the bank, which in turn reveals a lower credit risk and thus a lower debentures spreads. In short, this indicator presents a negative relation with subordinated debts spreads. The indicator is calculated through,

$$BI = 11\% \left(\frac{Capital}{regulatory \quad capital} \right). \tag{5}$$

It is important to note that the Brazilian current capital obligation is 11% of exposures net of provision (Basel Committee defines 8%) and it obeys resolution 2682 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).

Due to the fact that the debentures return is not explained completely by risk of institutions, the use of control variables becomes necessary. For this purpose three control variables are considered:

(i) Basic interest rate (*BIR*) – Over/SELIC rate (data available from CBB) – is the main indexing factor of the Brazilian public debt and it represents the interest rate which is free of risk in the model. A higher *BIR* implies a higher spread for purchasing debentures. Therefore, a positive relation between *BIR* and debentures spreads is expected.

(ii) Variation of exchange rate (*DEX*) - data available from CBB – international investors lose (gain) return with a devaluation (appreciation) of currency. Therefore, due to the increase in investor's risk, a higher volatility in the exchange market provokes an increase in the rate of subordinated debts. Hence, there is a positive relation of this variable with debentures spreads.

(iii) Average country risk (*ACR*) – data available from www.portalbrasil.com.br - variations in risk premium may be explained by macroeconomic risk, especially in emergent economies. In periods under economic shocks the institutional risk becomes confused with macroeconomic risk. Therefore, a higher country risk demands a higher return (debentures spreads) by private agents.

According to Morgan and Stiroh (2001), contrary to most of the empirical studies which are made, an *ex post* analysis of variables is necessary for analyzing market discipline. These authors highlight the importance of the use of ratings and account information for this purpose. Moreover, the use of lagged variables is important as a way to capture, not only the

monitoring power, but also the influence of private agents on financial institutions (Bliss and Flannery, 2000).

This study uses panel data analysis. The justification for the use of this method is due to the lack of long historical series and due to the imbalance of data. With the objective of analyzing the relation between debentures spreads with credit risk series, 243 observations and three models were considered (see descriptive statistics in table 1). The first model uses the rating of debentures (*R*) as a proxy of credit risk of financial institutions, the second model applies the indices extracted from accounting information of financial conglomerates as a proxy of credit risk, and the third takes into consideration both proxies.

Unit root tests are necessary for selecting the correct specification before estimations. Based on Bond, Nauges, and Windmeijer (2005) several tests were created for testing unit roots in panel data. With this purpose, this analyzes considers the following tests: Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS), Fisher-ADF (ADF), and Fisher-PP (PP). The LLC test assumes the presence of only one unit root common to all cross-sections. For the other tests the existence of different unit roots in different cross-sections is assumed. The null hypothesis is the non-stationarity of series in all tests. Furthermore, the tests were applied for series in level, and the selection of lags was made through Schwarz and Akaike criteria.

Table 1
Descriptive statistics

	Mean	**Median**	**Maximum**	**Minimum**	**Standard deviation**	**Observations**
SP	1.039	1.038	1.063	1.028	0.009	246
R	3.464	3.000	10.000	0.000	3.061	246
GL	1.026	1.089	2.703	0.078	0.321	246
LR	0.877	0.899	0.944	0.274	0.088	246
FLCA	4.218	0.796	309.702	0.294	27.992	246
DBI	-0.0171	-0.0273	0.4591	-0.5091	0.138	211
BIR	1.037	1.036	1.058	1.021	0.009	246
DEX	-0.040	-0.087	1.051	-0.481	0.241	246
ACR	429.790	237.978	1877.719	149.222	419.065	246

The next step in the analysis is the definition of method: fixed effects model or random effects model. The main difference between the models is the fact that the random

effects model does not consider the presence of correlation between explicative variables and non-observed effect. However, the fixed effects permit this correlation and dummy variables are added for explaining changes in the intercept (Wooldrigge, 2001).

With the intention of correcting the heteroscedasticity problem in the estimations, the covariance matrices were estimated by the White method. Furthermore, the test of serial autocorrelation is made through an AR(1) model in the first difference. The null hypothesis is that there is not autocorrelation among series.[9] Moreover, the Wald test for serial autocorrelation is made. The normality of series is tested through residual graphs.

The presence of autocorrelation suggests that the estimation by Ordinary Least Squares (OLS) is inefficient and thus becomes F-statistics and t-statistics invalid. The Feasible Generalized Least Squares (FGLS) fixes the serial autocorrelation problem. Therefore, in the case where the serial autocorrelation is detected the method adopted is the FGLS.

For the definition of the model, the Hausman test (1978) is used. This test compares the random effects and fixed effects of the estimated coefficients. If the null hypothesis is accepted this implies that both methods can be used for estimation. However, the fixed effect estimators are considered inefficient. On the other hand, when the null hypothesis is rejected the use of fixed effects model is correct.

It is important to note that there is the possibility of simultaneity problem in the analysis due to the fact that financial wealth of banking firms may be influenced by debentures spreads. For avoiding this problem the Generalized Method of Moments (GMM) is employed. According to Bond, Hoeffler, and Temple (2001) the GMM has an important advantage in relation to the traditional regressions in cross-section and panel because GMM estimators are not inconsistent with omitted variables. Moreover, the use of instrument variables permits the estimation of consistent parameters even when in the presence of endogenous variables.

For the purpose of verifying the relevance of the instruments in the model, the test of overidentifying restrictions (Sargan test) is made as suggested by Arellano (2003). It is important to note that even with the premises of GMM that there is no correlation in the first difference of endogenous regressors, it is necessary to test the presence of unit root in the series. At last, as proposed by Arellano and Bond (1991), two tests of first-order (m1) and second-order (m2) serial correlation are used.

[9] Values close to -0.5 validate the null hypothesis.

3. Empirical evidence

The relation between banking firms' asset prices and its respective risks is the key to proving the presence of market discipline. This analysis tests the market discipline through of subordinated debts holders. With the objective of verifying the necessity of cointegration among the series, several unit root tests were performed (see table A.1 – appendix). The series *SP*, *DEX*, and *DBI* are stationary in all tests and models. The other series were stationary at least in two of the three models tested. In short, all series are I(0) which in turn avoids the necessity of cointegration among them. Moreover, the results taking into consideration the Schwarz criterion for the selection of lags is not significatively different from that presented by Akaike criterion.

The first method applied in this analysis is the estimation of an OLS panel. Besides the series mentioned in the previous section dummy variables were included (season dummies and political dummy - presidential election shock in 2002). It was observed that only the dummies for second and third quarters were statistically significant and thus the others were removed from the models. After the estimation, the AR(1) and Wald tests were performed and both results denote the presence of serial autocorrelation (see table A.2 – appendix). Hence, the estimation was made using FGLS method. Furthermore, the White's heteroscedasticity consistent covariance matrix was applied and the residual distribution is normal (see figure A.1 – appendix).

After the estimation of the models by FGLS, the Hausman test was made for the definition of the method: fixed effects model or random effects model taking into consideration three different specifications (see table A.3 – appendix). The Qui-square statistics accepts the null hypothesis for the three models which in turn reveals that the best method in this analysis is the random effects model. The results of the estimations are in table 2.

With the intention of making an ex post analysis of data, lagged variables were used in the models. Following Morgan and Stiroh (2001) and Bliss and Flannery's (2000) suggestion, the credit ratings were lagged four quarters. The justification is that the changes in the ratings occur with annual frequency. In relation to the accounting information of the financial institutions, the series *GL* and *FLCA* were lagged also one year. The *LR* was lagged six months while *DBI* was lagged three months. The idea behind this is that the economic agents update the information of the last series with more frequency than in the previous cases. It is

important to note that several lags for series were tested and the best specifications are given by:

$$(6)\quad SP_t = c + \beta_1 R_{t-4} + \beta_2 DEX + \beta_3 DEX_{t-1} + \beta_4 ACR_{t-1} + \beta_5 BIR + \beta_6 BIR_{t-1} + \beta_7 DUMMYQ2 + \beta_8 DUMMYQ3 + \varepsilon_t \quad \text{(sp. 1);}$$

$$(7)\quad SP_t = c + \beta_1 GL_{t-4} + \beta_2 DL_{t-2} + \beta_3 FD_{t-4} + \beta_4 DBI_{t-1} + \beta_5 DEX + \beta_6 DEX_{t-1} + \beta_7 ACR_{t-1} + \beta_8 BIR + \beta_9 BIR_{t-1} + \beta_{10} DUMMYQ2 + \beta_{11} DUMMYQ3 + \varepsilon_t \quad \text{(sp. 2);}$$

$$(8)\quad SP_t = c + \beta_1 R_{t-4} + \beta_2 GL_{t-4} + \beta_3 DL_{t-2} + \beta_4 FD_{t-4} + \beta_5 DBI_{t-1} + \beta_6 DEX + \beta_7 DEX_{t-1} + \beta_8 ACR_{t-1} + \beta_9 BIR + \beta_{10} BIR_{t-1} + \beta_{11} DUMMYQ2 + \beta_{12} DUMMYQ3 + \varepsilon_t \quad \text{(sp. 3).}$$

Table 2

Effect on debentures return – FGLS (Random effect)

Explanatory variable	Specification 1		Specification 2		Specification 3	
	Coef.	**t-Stat**	**Coef.**	**t-Stat.**	**Coef.**	**t-Stat.**
C	0.2357	9.3998***	0.2173	10.8372***	0.2201	10.7628***
R_{t-4}	0.0002	2.3835**	-	-	0.0001	0.7611
GL_{t-4}	-	-	-0.0033	-7.121032***	-0.0030	-4.7275***
LR_{t-2}	-	-	0.00881	7.170446***	0.0087	7.4497***
$FLCA_{t-4}$	-	-	8.4E-06	4.518561***	0.0000	4.4643***
DBI_{t-1}	-	-	-0.0022	-2.1863**	-0.0021	-2.0785**
DEX	-0.0047	-7.25329***	-0.0052	-7.5746***	-0.0052	-7.3447***
DEX_{t-1}	-0.0043	-8.159167***	-0.0042	-9.2954***	-0.0043	-7.7251***
ACR_{t-1}	5.5E-06	7.421722***	0.0000	7.5371***	0.0000	7.6938***
BIR	0.47518	9.597527***	0.4759	11.8372***	0.4704	11.1996***
BIR_{t-1}	0.2945	9.6897***	0.3078	11.8065***	0.3102	11.1394***
DUMMYQ2	0.0015	8.2188***	0.0013	5.1239***	0.0013	4.8509***
DUMMYQ3	0.0015	6.1164***	0.0013	4.7685***	0.0013	4.8050***
F-statistic		699.2917***		665.962***		601.7707***
Adjusted R^2	0.9773		0.9827		0.9824	

Notes: Marginal significance levels: (***) denotes 0.01, (**) denotes 0.05, and (*) denotes 0.1.

The first specification which considers the credit ratings as a proxy for the risk of banking firms indicates the presence of market discipline in Brazil. The t-statistics of the lagged rating is statistically significant at the 5% level. As expected, the positive signal of the coefficient denotes that the financial institutions with the largest ratings pay a higher return on their debentures. Notwithstanding the relative low magnitude of the coefficient (in comparison with other variables) reveals a weak discipline in the country. The variation of the exchange rate, the average country risk, and the season dummies have significant statistics. In relation to the basic interest rate there is statistical significance at the 1% level and the highest

coefficients of the regression which in turn shows the attention of the Brazilian financial market with this variable. One justification for this result is the high interest rate practiced in the economy.

The second specification takes into consideration the accounting information as a proxy for the risk of banking firms suggesting the presence of market discipline. The statistical significance of the variables confirms the theoretical perspective. However, such as in the first specification there is a relative low magnitude of the coefficients thus revealing weak market discipline. Moreover, the most important variable in the regression is the basic interest rate.

The third specification considers the ratings and accounting information as a proxy of risk in banking industry. Such as in the previous cases there exist indications of the presence of market discipline. Contrary to the first specification the coefficient of rating does not have statistical significance. On the other hand, the variables regarding accounting information present statistical significance at the 5% level and thus indicate the presence of market discipline. Due to the fact that the value of the coefficient of these variables is relatively low, there is an indication of the weak market discipline. It is important to note that with the exception of the variables *DEX and* DEX_{-1} which present a sign contrary to that in the previous section, the results in relation to the basic interest rate and the other variables are in agreement with the previous specifications.

It is important to highlight that the adjusted R^2 and the F-statistics denote that the three models are relevant for the analysis. Furthermore, omitted variables test was performed. In short, the relevance of the variables *R*, *GL*, *LR*, and *FLCA* in the first difference and with one lag for the regressions was tested. In addition, the relevance of the Basel index lagged one period is also tested. The results denotes that all the variables mentioned are not relevant for the specifications (see table A.4 – appendix).

Arellano and Bond (1991) proposed the estimation of a first difference GMM panel data as a way of eliminating the non-observed effects in the regressions. The use of endogenous variables justifies the estimation through GMM because the traditional models have as their hypothesis the non-endogeneity of the variables. Following Arellano and Bond methodology, before the estimation of the dynamic panel data the GMM panel data parameters were estimated with static specification. For this, the instruments (except dummy

variables) were transformed in the first difference.[10] Table 3 presents the results of the estimations taking into consideration the same set of instruments for the three specifications. The result of the Sargan test is satisfactory for the three models. The serial autocorrelation test of first order (m1) rejects the hypothesis of the presence of serial autocorrelation in the three specifications. The test of second order (m2) serial correlation denotes that there is no autocorrelation in the specifications 1 and 2. In relation to specification 3, it is not possible to declare the presence or not of autocorrelation.

Table 3

Effect on debentures return – static GMM

Explanatory variable	**Specification 1**		**Specification 2**		**Specification 3**	
	Coef.	**t-Stat**	**Coef.**	**t-Stat.**	**Coef.**	**t-Stat.**
R_{t-4}	0.00056	3.829252***	-	-	0.00042	0.63
GL_{t-4}	-	-	-0.01853	-1.576301	-0.02861	-1.364513
LR_{t-2}	-	-	0.02137	1.551182	0.01511	0.92
$FLCA_{t-4}$	-	-	-0.00003	-0.07	-0.00051	-0.97
DBI_{t-1}	-	-	-0.00401	-5.279626***	-0.00426	-7.275122***
DEX	-0.00559	-9.628881***	-0.00632	-8.398975***	-0.00671	-5.978211***
DEX_{t-1}	-0.00505	-9.376075***	-0.00370	-2.603953**	-0.00445	-3.131860***
ACR_{t-1}	0.00001	5.217213***	0.00001	3.081019***	0.00001	2.676775***
BIR	0.49008	6.563624***	0.37812	6.197788***	0.37816	2.685710***
BIR_{t-1}	0.32666	8.641600***	0.36777	12.16606***	0.37384	4.224972***
DUMMYQ2	0.00159	13.13694***	0.00132	8.302107***	0.00249	3.206231***
DUMMYQ3	0.00123	4.122727***	0.00155	3.412624***	0.00251	2.809814***
Number of instruments	30		30		30	
Sargan test	3.169448		5.204451		4.887334	
(p-value)	(0.96)		(0.52)		(0.30)	
m1	-5.700726		-3.464183		-3.125029	
(p-value)	(0.0000)		(0.0008)		(0.0025)	
m2	-0.576253		-0.913107		-3.173829	
(p-value)	(0.5665)		(0.3647)		(0.0023)	

Marginal significance levels: (***) denotes 0.01, (**) denotes 0.05, and (*) denotes 0.1.

The results in specification 1 denote the presence of the market discipline in Brazil. The rating lagged 1 year is statistically significant and the coefficient has a positive sign, which in turn is in accordance with the theoretical view. Notwithstanding the value of the coefficient is relatively low indicating a weak market discipline. Furthermore, such as the results observed in the estimation by FGLS, the basic interest rate is the main variable in the

[10] The instruments used on the estimations are: @DYN(SP,-1,-2), R(-1), R(-2), R(-3), R(-4), BIR(-1), BIR(-2), BIR(-3), BIR(-4), DEX(-1), ACR(-1), CL(-1), CL(-2), CL(-3), CL(-4), DL(-1), DL(-2), DL(-3), DL(-4), FD(-1), FD(-2), FD(-3), FD(-4), DBI(-1), DBI(-2), DBI(-3), DBI(-4), @LEV(DUMMYQ2) and @LEV(DUMMYQ3).

estimation and the other variables present in the analysis also have statistical significance in the explanation of the debentures spreads.

Specification 2 reveals that among the accounting information only the Basel index is relevant in the explanation of debentures spread and thus indicates the presence of market discipline. The behavior of the other variables in the estimation is similar to the previous.

Specification 3, which combines ratings and accounting information as a proxy of risk for financial institutions, once again, suggests the presence of weak market discipline. The justification is that although the variables *R*, *GL*, *LR*, and *FLCA* do not show statistical significance, the Basel index variation is relevant for the explanation of debentures return. In relation to other variables, statistical significance is observed for each. In the same way as the previous results, the basic interest rate represents the main variable in the model.

With the intention of applying the Arellano and Bond (1991) methodology the variable *SP* lagged 1 and 2 periods was used in the estimation. Moreover, the same set of instrument variables applied in the previous estimation was used. The Sargan test for the three specifications under consideration indicates the validity of instrumental variables (see table 4). In relation to the tests of first-order (m1) and second-order (m2) serial correlation, the first and second specifications do not indicate autocorrelation problem, but there exists the problem in the third specification which in turn implies that the t-statistics are not reliable.

The results from the first and third specifications suggest that there is no market discipline in the Brazilian economy. Regarding the second specification the result suggests the presence of a weak market discipline. Such as observed in the estimation presented in table 3, the coefficient concern of Basel index has statistical significance although its magnitude is low. The main variable for explanation of debentures return in the estimation for the three specifications is the basic interest rate.

It is important to note that the results from the dynamic GMM were not satisfactory. The variables SP lagged 1 and 2 periods do not present statistical significance in practically all specifications and thus indicate that the use of dynamic models is not adequate in this case. Therefore, for this analysis, the results from the static GMM are more reliable than from the dynamic GMM.

Table 4

Effect on debentures return – dynamic GMM

Explanatory variable	Specification 1		Specification 2		Specification 3	
	Coef.	**t-Stat**	**Coef.**	**t-Stat.**	**Coef.**	**t-Stat.**
SP_{t-1}	-0.13633	-0.68804	0.14092	0.73674	-0.06376	-0.19625
SP_{t-2}	-0.11769	-1.73425*	-0.10373	-0.37819	-0.21726	-1.57870
R_{t-4}	-0.00036	-0.41755	-	-	-0.00107	-0.72909
GL_{t-4}	-	-	-0.01580	-0.20082	-0.03187	-1.05578
LR_{t-2}	-	-	0.01748	0.53060	0.01370	0.93535
$FLCA_{t-4}$	-	-	0.00009	0.02591	-0.00041	-0.38082
DBI_{t-1}	-	-	-0.00495	-2.89585***	-0.00352	-1.51812
DEX	-0.00267	-1.62309	-0.00520	-1.94686*	-0.00289	-1.47022
DEX_{t-1}	-0.00330	-4.51094***	-0.00198	-0.60293	-0.00161	-1.15051
ACR_{t-1}	0.00000	0.25946	0.00001	0.76600	0.00001	1.24551
BIR	0.62353	3.90330***	0.35442	2.17810**	0.47235	3.12045***
BIR_{t-1}	0.43245	3.86059***	0.32125	2.06735**	0.46447	2.19553**
DUMMYQ2	0.00161	3.97444***	0.00087	0.13272	0.00230	1.94481*
DUMMYQ3	0.00126	2.68001***	0.00080	0.12260	0.00245	2.39965**
Number of instruments	30		30		30	
Sargan test	9.828902		4.083770		(3.016119)	
(p-value)	(0.13)		(0.25)		(0.22)	
m1	-4.666748		-4.203465		-1.578904	
(p-value)	(0)		(0.0001)		(0.1185)	
m2	-0.808814		1.319299		-2.399724	
(p-value)	(0.4217)		(0.1919)		(0.0194)	

Marginal significance levels: (***) denotes 0.01, (**) denotes 0.05, and (*) denotes 0.1.

4. Conclusion

According to Furlong and Kwan (2007) for the existence of market discipline, the presence of private sectors subject to financial risks related to the institutional decisions and that these sectors have the power of influence is needed. Hence the constant monitoring of the conduct of banks by private agents can create a powerful mechanism for banking regulation and supervision. The empirical results from subordinated debt holders in Brazil denote a weak market discipline. The main financial variable, the Basel index variation, has statistical significance in all models, which in turn reveals the relevance of this variable when the market takes into account the risk of banking institutions. Moreover, the credit rating is relevant to explain the debentures spreads in the large part of the specifications in the models.

It is important to note that although the variables as Basel index variation and credit rating are relevant in the models, the macroeconomic variables introduced in the models

cannot be neglected. This result indicates that the macroeconomic environment is an important determinant for debentures return in Brazil. A good example is the relevance of the basic interest rate in the models. One justification is that this variable is the main instrument of the CBB for reaching the inflation target, it represents the interest rate free of risk, and it is the main indexing factor of the Brazilian public debt. In short, the relevance of macroeconomic variables in the models suggests that the macroeconomic stability is an incentive for private agents to run a risk, which in turn contributes to an increase in the market discipline.

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Table A.1

Unit root tests

			Constant				Constant and Trend				Without Constant or Trend		
			LLC	IPS	ADF	PP	LLC	IPS	ADF	PP	LLC	ADF	PP
Schwarz*	*SP*	Stat.	-7.6822	-0.8760	73.7220	85.9096	-26.0194	-2.7559	80.0431	55.6873	-26.4780	234.3935	277.2540
		Prob.	0.0000	0.1905	0.0254	0.0021	0.0000	0.0029	0.0001	0.0319	0.0000	0.0000	0.0000
	R	Stat.	-1.9440	-2.2706	29.2038	23.9924	-1.5369	-0.8125	20.7655	5.59078	-2.8180	28.0193	30.5189
		Prob.	0.0259	0.0116	0.0098	0.0459	0.0622	0.2082	0.0539	0.9353	0.0024	0.1089	0.0619
	DEX	Stat.	-11.7540	-6.7720	165.4800	163.5014	-13.6063	-2.8362	121.2450	173.0510	-7.8565	154.9630	190.4476
		Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0023	0.0000	0.0000	0.0000	0.0000	0.0000
	ACR	Stat.	-7.5570	-1.9314	75.6943	104.9049	-4.8247	0.8114	36.4332	35.0012	-8.2090	120.1922	140.5684
		Prob.	0.0000	0.0267	0.0176	0.0000	0.0000	0.7914	0.5420	0.6089	0.0000	0.0000	0.0000
	BIR	Stat.	-1.0006	1.9959	37.6228	36.6366	-10.6919	-6.3813	165.9810	202.4050	-8.3222	174.0260	88.1247
		Prob.	0.1585	0.9770	0.9330	0.9474	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0040
	DBI	Stat.	-13.0028	-6.8157	141.7510	160.8310	-35.2072	-3.7984	118.9040	187.2000	-17.2889	257.5980	270.7310
		Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
	GL	Stat.	-143.7040	-73.4848	126.3560	113.8830	-14.1515	-1.7542	74.8760	62.1082	1.1258	48.2731	74.4645
		Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0397	0.0003	0.0081	0.8699	0.7589	0.0500
	LR	Stat.	-1.7793	-1.2603	78.0406	82.3502	-14.5182	-1.4714	67.4622	72.4096	0.4747	50.7725	53.0807
		Prob.	0.0376	0.1038	0.0112	0.0046	0.0000	0.0706	0.0023	0.0006	0.6825	0.6724	0.5861
	FLCA	Stat.	-29.7703	-9.2406	133.0050	144.8320	-8.6513	-1.3596	70.4144	160.2060	0.0557	50.4947	42.1507
		Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0870	0.0011	0.0000	0.5222	0.6825	0.9148
Akaike*	*SP*	Stat.	-7.4705	-0.7145	72.1738	85.9096	-26.0194	-2.7559	80.0431	55.6873	-26.5587	237.7240	277.2540
		Prob.	0.0000	0.2374	0.0335	0.0021	0.0000	0.0029	0.0001	0.0319	0.0000	0.0000	0.0000
	R	Stat.	-1.9440	-2.2706	29.2038	23.9924	-1.8160	-0.8895	20.8096	5.59078	-2.8180	28.0193	30.5189
		Prob.	0.0259	0.0116	0.0098	0.0459	0.0347	0.1869	0.0532	0.9353	0.0024	0.1089	0.0619
	DEX	Stat.	-10.0188	-5.9648	144.8190	163.5010	-12.4487	-2.5997	109.5080	173.0510	-7.8565	154.9630	190.4480
		Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0047	0.0000	0.0000	0.0000	0.0000	0.0000
	ACR	Stat.	-6.8957	-1.7245	72.5684	104.9050	-4.8247	0.8114	36.4332	0.5420	-8.8154	130.1460	140.5680
		Prob.	0.0000	0.0423	0.0312	0.0000	0.0000	0.7914	35.0012	0.6089	0.0000	0.0000	0.0000
	BIR	Stat.	-4.9544	-1.1808	67.0189	67.8330	-4.6261	-0.0578	38.0175	41.3756	-3.7838	66.6041	91.2743

	Prob.	0.0000	0.1188	0.0786	0.0692	0.0000	0.4769	0.4687	0.3255	0.0001	0.1570	0.0020
DBI	Stat.	-11.5914	-6.1589	125.0890	160.8310	-35.2072	-3.7984	118.9040	187.2000	-17.2889	257.5980	270.7310
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
GL	Stat.	-143.7040	-73.4848	126.3560	113.8830	-13.6342	-1.7968	75.5050	62.1082	1.1290	47.3061	74.4645
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0362	0.0003	0.0081	0.8705	0.7894	0.0500
LR	Stat.	-1.8666	-1.4159	79.2784	82.3502	-14.5182	-1.4714	67.4622	72.4096	0.4747	50.7725	53.0807
	Prob.	0.0310	0.0784	0.0088	0.0046	0.0000	0.0706	0.0023	0.0006	0.6825	0.6724	0.5861
FLCA	Stat.	-29.7703	-9.2406	133.0050	144.8320	-8.6513	-1.3596	70.4144	160.2060	0.0557	50.4947	42.1507
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0870	0.0011	0.0000	0.5222	0.6825	0.9148

Note: (*) The final choice of lag was made based on Schwarz and Akaike criteria.

LLC – Levin-Lin-Chu test – common root processes – H_0: $\alpha = 0$

IPS – Im-Pesaran-Shin test– individual root processes – H_0: $\alpha = 0$ (for each i)

ADF – Fisher-ADF test – individual root processes – H_0: $\alpha = 0$ (for each i)

PP – Fisher-PP test – individual root processes – H_0: $\alpha = 0$ (for each i)

Table A.2

AR(1) and Wald tests

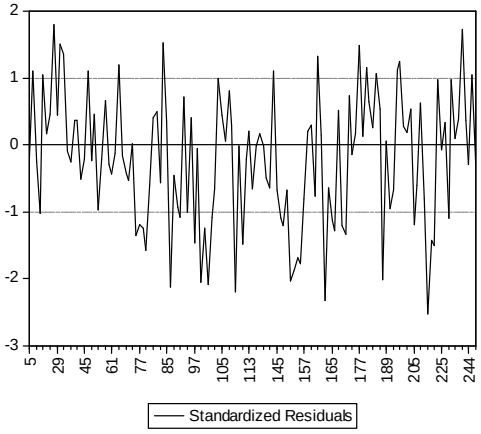
	Specification 1		Specification 2		Specification 3	
AR(1)	Coef.		Coef.		Coef.	
RESID01(-1)*	0.030749		0.013118		-0.008753	
Wald test	Stat.	Prob	Stat.	Prob	Estat.	Prob
F-statistic	3.53E+01	0	3.31E+01	0	3.13E+01	0
Chi-square	3.53E+01	0	3.31E+01	0	3.13E+01	0

Note: (*) Values close to –0.5 validate the null hypothesis (absence of serial autocorrelation).

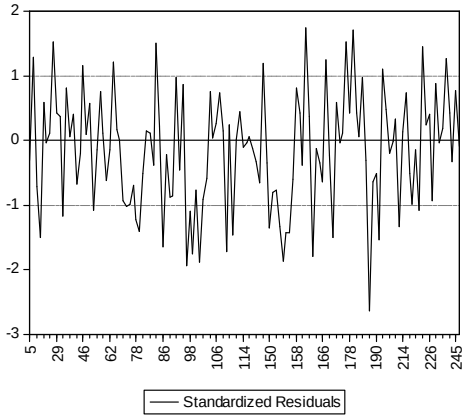
Figure A.1

Residual distribution

Specification 1



Specification 2



Specification 3

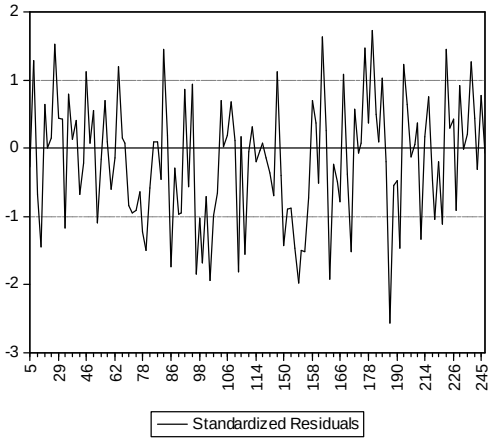


Table A.3

Hausman test

	Explanatory variable	Fixed effect	Random effect	Difference	Prob.
Specification 1	R_{t-4}	0.00057	0.00019	0.00000	0.01120
	DEX	-0.00529	-0.00475	0.00000	0.28030
	DEX_{t-1}	-0.00487	-0.00432	0.00000	0.13850
	ACR_{t-1}	0.00001	0.00001	0.00000	0.26090
	BIR	0.43700	0.47518	0.00092	0.20770
	BIR_{t-1}	0.32498	0.29455	0.00063	0.22520
	DUMMYQ2	0.00134	0.00146	0.00000	0.38600
	DUMMYQ3	0.00162	0.00149	0.00000	0.42990
	Qui-square statistic		0.00000		1.00000
Specification 2	GL_{t-4}	-0.00855	-0.00327	0.00000	0.00130
	LR_{t-2}	0.00840	0.00881	0.00000	0.84380
	$FLCA_{t-4}$	0.00001	0.00001	0.00000	0.13590
	DBI_{t-1}	-0.00221	-0.00217	0.00000	0.95090
	DEX	-0.00537	-0.00517	0.00000	NA
	DEX_{t-1}	-0.00437	-0.00415	0.00000	0.36520
	ACR_{t-1}	0.00001	0.00001	0.00000	0.34470
	BIR	0.44836	0.47593	0.00045	0.19580
	BIR_{t-1}	0.30361	0.30775	0.00008	0.64300
	DUMMYQ2	0.00135	0.00128	0.00000	NA
	DUMMYQ3	0.00147	0.00133	0.00000	0.05230
	Qui-square statistic		0.00000		1.00000
Specification 3	R_{t-4}	0.00071	0.00042	0.00000	0.12810
	GL_{t-4}	-0.00847	-0.00312	0.00000	0.00000
	LR_{t-2}	0.00060	0.00668	0.00001	0.06240
	$FLCA_{t-4}$	0.00001	0.00001	0.00000	0.66190
	DBI_{t-1}	-0.00213	-0.00192	0.00000	0.70520
	DEX	-0.00547	-0.00519	0.00000	0.24860
	DEX_{t-1}	-0.00445	-0.00432	0.00000	0.77600
	ACR_{t-1}	0.00001	0.00001	0.00000	0.51820
	BIR	0.43721	0.46022	0.00072	0.39090
	BIR_{t-1}	0.31926	0.32084	0.00030	0.92780
	DUMMYQ2	0.00130	0.00123	0.00000	NA
	DUMMYQ3	0.00149	0.00135	0.00000	0.23710
	Qui-square statistic		0.00000		1.00000

Table A.4

Omitted variables test

Omitted variable	Specification 1		Specification 2		Specification 3	
	Coef.	F- Stat.	Coef.	F-Stat.	Coef.	F-Stat.
D(R) D(R_{t-1})	0.0261	0.9742	-	-	1.9235	0.1508
BI BI $_{t-1}$	-	-	1.115759	0.3312	1.7225	0.1832
D(LR) D(LR $_{t-1}$)	-	-	0.581834	0.5605	0.7697	0.4655
D(GL) D(GL $_{t-1}$)	-	-	0.714802	0.4914	0.9740	0.3807
D(FLCA) D(FLCA $_{t-1}$)	-	-	1.2781	0.2825	1.4777	0.2325