

# The Role of Deferred Tax in the Regulatory Capital of Brazilian Financial Institutions\*

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## ABSTRACT

This study sought to provide evidence on the role of deferred tax assets and liabilities as an instrument for the attainment and arbitrage of regulatory capital levels by Brazilian financial institutions in the period from 2004 to 2009. Two hypotheses were developed: the managers of Brazilian financial institutions employ deferred taxes to a) comply with required regulatory capital limits and b) do so in a discretionary manner as a method for regulatory capital arbitrage. The present study collected evidence through the analysis of annual accounting information from Brazilian financial institutions. The hypotheses were tested using multiple linear regression and panel data regression data analysis techniques. The results show that Brazilian financial institutions have used deferred taxes to support or attain the minimum capital levels required by the Basel Accord; however, evidence that the volume of regulatory capital directly influences the volume of deferred taxes was also found, contradicting the international literature, which indicates discretion in the use of deferred taxes as a form of regulatory capital arbitrage.

**Keywords:** Deferred tax. Basel Accord. Financial Institution.

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## 1 INTRODUCTION

The Basel Accord, first drafted in 1988 in the International Convergence of Capital Measurement and Capital Standards (BIS, 1988) document, is one of many regulations that financial institutions are subject to. The Accord was first established by the G-10 countries (a group of eleven countries in which 85% of the world's economy is concentrated, namely Germany, Belgium, Canada, the United States, France, Italy, Japan, Holland, the United Kingdom, Sweden and Switzerland); however, it is not solely restricted to these countries. Its objective was to define uniform rules for all banks to provide the financial system with more reliability.

The basic instrument employed in this Accord was the so-called regulatory capital or Basel Index (BI), which indicates the minimum amount of capital that the financial institution must hold. According to the directives of the Bank for International Settlements (BIS), this minimum amount of capital is calculated as an institution's adjusted total equity, in accordance with the risk level of its asset structure. This index was set to 8% by the Accord, but the central bank of each country can establish a different required value through specific regulations.

In Brazil, the Accord was implemented by the National Monetary Council (Conselho Monetário Nacional - CMN) through Resolution no. 2,099, on August 17<sup>th</sup>, 1994. The CMN then altered the required minimum amount of capital to 10% through Resolution no. 2,399, on June 25<sup>th</sup>, 1997, and once more to 11% through Resolution no. 2,606, on May 27<sup>th</sup>, 1999, which is still the minimum required level. Therefore, the requirement in Brazil is that a financial institution must have a minimum amount capital corresponding to 11% (instead of 8%) of what it lends. For example, for a loan of BRL 1,000.00, the financial institution must hold a minimum of BRL 110.00.

Despite the regulations that they are subject to, financial institutions may make choices and select among alternatives when presenting their financial reports, a practice known in the literature as earnings management. The most well-known definition is that of Healy and Wahlen (1999, p. 368): Earnings management "occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers." Although this view may associate earnings management with fraudulent or reckless practices, it must be adopted with caution, especially when considering operating earnings management as part of the activities or economic context of the financial institution; - this is even more applicable during periods of crisis. This discussion, however, will not be included in the scope of this study.

Deferred taxes can therefore represent an opportunity for the earnings or regulatory capital of financial institutions to be managed. Regulatory capital arbitrage implies that managers of financial institutions can adjust their ca-

pital levels for regulatory purposes.

In Brazil, the CMN allowed deferred taxes to be included as part of the regulatory capital of financial institutions, whereas in other countries, deferred taxes are not recognized at all or have strict limitations imposed on them. When the moment for accounting recognition of the deferred tax arrives, the financial institution may try to improve its risk assessment and, thereby, the assessment of its risk-weighted assets and the net equity required to conform to the Basel Accord's requirements.

This may take place because a deferred tax asset consists basically of Corporate Income Taxes (Imposto de Renda das Pessoas Jurídicas - IRPJ) and Social Contributions on Profit (Contribuição Social sobre o Lucro - CSSL) over deductible temporary differences and fiscal losses. In analyzing this matter in greater detail, it can be seen that for a financial institution, allowances for doubtful accounts are the main sources of deferred taxes and should therefore be linked directly to the operational management of this type of economic activity. Distinguishing what constitutes intentional earnings management and what represents management aimed at operations control is a difficult task. Therefore, because the allowance for doubtful accounts can represent a significant figure, depending on the size of the institution (and especially during a period of crisis), the analysis of the evolution of deferred taxes among Brazilian financial institutions can be interesting because it could create uncertainty about effective asset recovery.

Two studies in the international literature are directly aligned with the focus on regulatory capital management in financial institutions: Gee and Mano (2006) addressed issues related to the importance of deferred taxes for the maintenance of regulatory capital in Japan in the period from 2002 to 2004 through a case study of the five largest Japanese bank groups; and Skinner (2008) supplied empirical evidence on the use of deferred taxes by Japanese banks as part of a strategy for regulatory capital attainment and the practice of regulatory capital arbitrage.

In this context, the present study seeks to answer the following question: Are deferred tax assets and liabilities used by Brazilian financial institutions as instruments for the attainment and arbitrage of regulatory capital levels?

Based on these previous works (Gee & Mano, 2006; Skinner, 2008), the justification for this study is the comparison of the Brazilian approach to compliance with international accounting standards and regulatory capital adequacy. Therefore, although there are international accounting and regulatory capital adequacy standards to which financial institutions are subject, because each country can specify its own implementation standards for these international standards (implementation which has been found to be different from the international standard in the previous studies performed in Japan), it seems to be of interest to empirically analyze the Brazilian approach in this context. The present study thus presents and discusses the

implementation of the international standard for regulatory capital adequacy.

This article contains five sections, including this introduction. Section 2 develops the hypotheses by reviewing the international and Brazilian literature referring to the role of deferred taxes as an instrument of earnings mana-

gement and regulatory capital adequacy; section 3 presents the study's methodology, including descriptions of the sample collection, variables and data analysis techniques; and section 4 presents the conducted tests and results of this study. Finally, section 5 presents conclusions and suggestions for future research.

## 2 HYPOTHESES DEVELOPMENT

In this section, the hypotheses are developed by reviewing both the international and Brazilian literature and illustrating aspects of the Basel Accords, regulatory capital and the role of deferred taxes as an instrument for earnings management and regulatory capital adequacy. The section closes by presenting the present study's hypotheses.

### 2.1 The Basel Accord and Regulatory Capital.

The Basel Accord (known as Basel I) was implemented by the CMN through Resolution no. 2,099, on August 17<sup>th</sup>, 1994. In Annex IV, article 1, this Resolution rules that financial institutions or institutions otherwise authorized to operate by the Brazilian Central Bank (Banco Central – Bacen), except credit cooperatives, must retain a level of adjusted total equity that is compatible with the risk levels of their asset structures. The required minimum equity value is calculated according to the following formula:

$$\text{RME} = 0.08 (\text{Rwa}) \quad \mathbf{1}$$

Where:

RME: Required Minimum Equity as a function of the risk of credit operations;

Rwa: Risk-weighted assets, equivalent to 0.08 (eight hundredths), composed by weighting the following risks: a) Weighting factor 0% (Null Risk); b) Weighting Factor 20% (Reduced Risk 1); c) Weighting factor 50% (Reduced Risk 2); d) Weighting Factor 100% (Normal Risk).

This is because financial institutions carry out different activities with diverging characteristics and associated risks, which reflect on different weighting factors.

According to Resolution no. 2,099, the following tax credits should be classified with a weighting factor of 20% (Reduced Risk 1):

- Tax credits resulting from expenditures that were accounted for in the financial period and that are deductible in subsequent financial years – lapse in four years; and
- 1.8.8.25.00-2 – Tax Credits – Income Taxes and Social Contributions.

Resolution no. 2,099 also notes, in article 2, that compliance with standards for net capital and equity is an essential condition for the operation of financial institutions and institutions otherwise authorized to operate by Bacen. Should it observe that this condition has not been met, Bacen will call on the institution's legal representati-

ves to inform them on the measures to be adopted to regularize the situation (paragraph 1). This Resolution, set December 31<sup>st</sup>, 1994, as the deadline for existing financial institutions to adapt their respective net equity values to the conditions set by it.

Resolutions no. 2,399, of June 25<sup>th</sup>, 1997, and no. 2,606, of May 27<sup>th</sup>, 1999, altered the minimum required capital level to 10% and 11%, respectively. According to the National Bank for Economic and Social Development (Banco Nacional de Desenvolvimento Econômico e Social – BNDES)<sup>1</sup> (2007 apud Sobreira & Martins, 2011, p. 352), the raising of this percentage to above 8% follows the Basel Committee's recommendation that developing countries, "where less developed banking systems operate, which are subject to shocks of higher intensity, should adopt higher coefficients – and risk-weighting factors for different asset classes." Resolution no. 2,606 further included other asset classes that could indicate the financial institution's exposure, such as swap and gold operations.

Until this point, the CMN had not provided an objective definition of net equity to be adopted to meet the Basel Accord's requirements. Resolution no. 2,543, of August 26<sup>th</sup>, 1998, introduced a new concept of a minimum amount of capital that is compatible with the risk level of credit operations. According to this Resolution, the Adjusted Total Equity (ATE) is now defined as the sum of Tiers I and II. The text underwent modifications, found in Resolution no. 2,802 of December 21<sup>st</sup>, 2000, which defined ATE as Reference Equity (RE) and culminated in Resolution no. 2,837 of May 30<sup>th</sup>, 2001, according to which Tiers I and II consist of the following:

- a) Tier I consists of net equity plus the accounts payable balance minus the accounts receivable balance, excluding revaluation, contingency reserves and special income reserves related to undistributed mandatory dividends, and minus values referring to cumulative and redeemable preferred shares;
- b) Tier II consists of reevaluation, contingency reserves and special income reserves related to undistributed mandatory dividends, cumulative and redeemable preferred shares, subordinated debts and hybrid instruments for capital and debt.

Resolution no. 3,444 of February 28<sup>th</sup>, 2007, defined RE, whereas Resolution no. 3,490 of August 29<sup>th</sup>, 2007, defined Required Reference Equity (RRE). From these,

<sup>1</sup> BNDES. Basileia e administração de riscos. O novo Acordo da Basileia e suas implicações para o BNDES. [Basel and risk management. The new Basel Accord and its implications for the BNDES] Relatório Parcial I, [Partial Report I] 2007. Mimeographed.



as will be detailed in section 3.2, the Basel Index (BI) was defined as:

$$BI = (RE \times 100) / (RRE / 0.11)$$

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Where:

RE: Reference Equity, composed by adding Tiers I and II and deductions (Tier I + Tier II – RE Deductions),

RRE: Required Reference Equity.

Next, Brazil formally adhered to the procedures suggested in the new Basel Accord (known as Basel II) by means of Communiqué no. 12,746 of December 9<sup>th</sup>, 2004, although the practical application of the new accord was enacted in Communiqué no. 16.137/2007. Because the implementation timeline extends from 2008 to 2012, its effects could not yet be properly verified. Because of this, the implications of the implementation process after this point will not be analyzed in the present study.

It can thus be ascertained that the Basel Accord has evolved to track changes in the context of financial institutions; adjustments were introduced according to assessments by regulatory bodies with the aim of preventing systemic crises brought about by the instability of individual financial system participants and to prevent financial institutions from being exposed to certain risks.

### 2.1.1 Tax Credits and Regulatory Capital Management

According to articles 2 and 4 of Resolution no. 3,059 of December 20<sup>th</sup>, 2002, which rules on accounting records for the tax credits of financial institutions and institutions otherwise authorized to operate by Bacen, until this Resolution came into power, tax credits recorded with an expected realization exceeding 5 years should be excluded from Tier I when calculating RE, in accordance with article 1 of Resolution no. 2,837. For the exclusion of tax credits realizable in periods longer than 5 years, the following timeline should be followed: a) after January 1<sup>st</sup>, 2004, exclusion of 20%; b) after January 1<sup>st</sup>, 2005, exclusion of 40%; c) after January 1<sup>st</sup>, 2006, exclusion of 60%; d) after January 1<sup>st</sup>, 2007, exclusion of 80%; e) after January 1<sup>st</sup>, 2008, exclusion of 100%.

Moreover, it was determined that the total tax credits (except those provided in articles 2 and 4 of Resolution no. 3,059) should correspond to no more than 40% of the RE's Tier I, after the previously mentioned exclusions. Resolution no. 3,355, from March 31<sup>st</sup>, 2006, in turn, altered paragraphs 1 and 5 of Resolution no. 3,059, although the standard's essence was maintained.

Resolution no. 3,444 of February 28<sup>th</sup>, 2007, ruled that tax credits defined in the terms of articles 2 and 4 of Resolution no. 3,059 should be excluded from the RE's Tier I, but Resolution no. 3,655 from December 17<sup>th</sup> 2008 determined that the total tax credits (except those subjected to adjustment) should correspond, at most, to the following percentages of the RE's Tier I, according to the following timeline: a) after January 1<sup>st</sup>, 2009, 30% of the RE's Tier I; b) after January 1<sup>st</sup>, 2010, 20% of the RE's Tier I; c) after January 1<sup>st</sup>, 2011, 10% of the RE's Tier I.

Therefore, starting with Resolution no. 3,059, objective standards for the recognition and maintenance of tax credits as components of required minimum capital were established. The concern of regulatory bodies is centered on the expectation of generating future taxable income that guarantees the realization of these assets.

## 2.2 Regulatory Capital Management.

As previously mentioned, financial institutions may make choices or select between alternatives when presenting their financial reports, a practice known in the literature as earnings management. In addition to the well-known definition of Healy and Wahlen (1999), other important references to this concept include Hepworth (1953), Gordon (1964), Ronen and Sadan (1975), Beneish (2001) and Fields, Lys and Vincent (2001).

The following studies stand out among those that have examined the relationship between allowances for doubtful accounts and earnings management in financial institutions: Scheiner (1981), Bhat (1996), Robb (1998) and Rivard, Bland and Morris (2003).

Of the studies that have examined the relationship between allowances for doubtful accounts and earnings management while also including regulatory capital management in financial institutions, the following are notable: Moyer (1990), Beatty, Chamberlain, and Magliolo (1995), Collins, Shackelford and Wahlen (1995), Kim and Kross (1998), Ahmed, Takeda and Shawn (1999), Shrieves and Dahl (2003), Anandarajan, Hasan and McCarthy (2005), Agarwal, Chomsisengphet, Liu and Rhee (2007) and Perez, Salas-Fumá and Saurina (2008).

Nevertheless, these studies found contradictory results in the context of financial institutions. The following studies have concluded that banks were actively involved in regulatory capital management: Moyer (1990), Beatty et al. (1995), Collins et al. (1995), Kim and Kross (1998), Ahmed et al. (1999), Shrieves and Dahl (2003) and Agarwal et al. (2007). In contrast, the studies of Anandarajan et al. (2005) and Perez et al. (2008) concluded no regulatory capital management took place.

Among the Brazilian studies that have examined the relationship between allowances for doubtful accounts and earnings management in financial institutions, those by Wasserman (2004) and Santos (2007) are of particular interest.

Wasserman (2004) proposed a model for the allocation of taxes among periods that could lead to a deferred tax asset founded on economic precepts while also meeting the regulatory capital requirements, based on information on all parties in the National Financial System (Sistema Financeiro Nacional - SFN) in the period from 1990 to 2003.

Santos (2007) investigated whether financial conglomerates made use of provisions for a) credit losses and b) unrealized losses on bonds and securities classified as "held-for-trading" to smooth reported earnings and control the regulatory capital. From a sample of 51 financial

conglomerates in the period from 2000 to 2005 and using the model proposed by Shrieves and Dahl (2003), the study found evidence that financial conglomerates did make use of the previously mentioned provisions (a) and (b) to smooth reported earnings, and only financial conglomerates with greater capital used provisions (b) to control regulatory capital as well.

However because the focus of the present study is on analyzing whether financial institutions used discretion over deferred taxes to manage regulatory capital, two studies in the international literature aligned with this proposition must be reviewed.

Gee and Mano (2006) addressed issues related to the importance of deferred taxes for the maintenance of regulatory capital in Japan. Through case studies of the five largest bank groups in Japan between 2002 and 2004, the authors concluded that these five groups would not have managed to operate internationally without deferred tax assets.

Skinner (2008) provides empirical evidence on the usage of deferred taxes by Japanese banks. This study was developed using a sample of 86 Japanese banks, obtained from Compustat, over the period from 1998 to 2003. The study can be divided into two hypotheses: the first is related to the usage of deferred taxes to support or attain the required amount of minimum capital determined by the Basel Accord. The study's conclusions show that, without including deferred taxes into Tier I of BI and without the government's capital injections in the beginning of 1999, 12 of the 15 banks would not have met the minimum regulatory capital requirements (of these 15, 14 were classified as major Japanese banks).

Deferred taxes provide significant power to managers because their realization depends on the manager's assessment of the company's capacity to generate sufficient levels of future taxable income (Miller and Skinner, 1998; Schrand and Wong, 2003; Dhaliwal, Gleason and Mills, 2004). Therefore, analyzing the evolution of deferred taxes in Brazilian financial institutions can be interesting because there is uncertainty about the effective

recoverability of assets. More specifically, it can be observed that the regulatory agent's (CMN) concern is not restricted to absolute asset values, but is mostly related to the issue of subjectivity, which is inherent to decisions on whether to register the deferred tax, and the expectation of credit realization, taking into account estimates of future taxable income.

Based on this referenced literature, the present study intends to test the following hypothesis (called the regulatory capital level hypothesis):

H1a: Managers of Brazilian financial institutions use deferred taxes to meet required regulatory capital levels.

Skinner (2008) has also provided empirical evidence on use of deferred taxes to practice regulatory capital arbitrage. According to the author, regulatory capital arbitrage occurs when managers "exploit the discretion available under banking regulations to report regulatory capital levels that satisfy the necessary thresholds" (Skinner, 2008, p. 226).

His tests were designed to assess whether decisions related to deferred taxes were guided by incentives to increase regulatory capital levels in light of the scarcity of other sources of capital. This leads to the supposition that the net deferred taxes would be inversely related to the regulatory capital levels, i.e., that financial institutions with weaker financial positions would register higher Net Deferred Taxes (NDT), when other factors remain unchanged.

Based on this second referenced research, the present study seeks to test the following hypothesis (called the regulatory capital arbitrage hypothesis):

H2a: Managers of Brazilian financial institutions use deferred taxes as an instrument for regulatory capital arbitrage.

This section has provided arguments and evidence that support the notion that deferred taxes might be used to reach the required regulatory capital levels and that managers of financial institutions might practice regulatory capital arbitrage. The following section describes the study's methodology so that tests can be conducted to verify the study's hypotheses.

### 3 STUDY METHODOLOGY

The study can be regarded as being empirical in nature and following a quantitative approach.

#### 3.1 Sample Collection.

Samples were collected by accessing Bacen's website (<http://www.bcb.gov.br>). Data were gathered according to the following procedure: a) Accessing the website's home page; b) choosing option "Sistema Financeiro Nacional" [National Financial System]; c) choosing option "Informações cadastrais e contábeis" [Registration and accounting information]; d) choosing option "Informações contábeis" [Accounting information]; e) choosing option "Informações Financeiras Trimestrais (IFT)" [Quarterly Financial Information]. On this last page, it is possible to search by

< NOME [NAME]>, < TRIMESTRE [QUARTER]> and < ANO [YEAR]>. Next, explanatory notes on each financial institution were accessed. If the required information was not available through this path, the websites of the financial institutions were consulted, based on the Financial-Economic Conglomerate (EC). If this information was unavailable, the search was extended based on the Financial Conglomerate (FC). If this information was unavailable, the search was extended based on the Financial Institution (FI) because it is understood that the institution in question is not part of any conglomerate.

After accessing the accounting information of each institution, 12 were excluded because the available information did not cover the entire period under study. As a re-

sult, the final sample was composed of 45 institutions. The period of analysis was 6 years (from 2004 to 2009), which corresponds to the available period (for which it was possible to obtain data using the procedure described above). A total of 1,080 data samples were obtained, i.e., 4 quarterly observations for each of the 45 financial institutions over a 6-year period. If a financial institution had been incorporated or closed, whether information on the consolidation was available for the entire period of study was considered. Analysis of the Total Assets of these Brazilian financial institutions shows that this is a concentrated sector because merely 10 institutions account for 90.37% of the market.

### 3.2 Description of the Study Variables.

The study used the following variables:

- 1) Net Equity (NE): net equity of the financial institution;
- 2) Total Assets (TA): total assets of the financial institution;
- 3) Deferred Tax Assets (DTA): deferred tax assets of the financial institution, referring to IRPJ and CSSL. Therefore, it does not include credits referring to other types of taxes;
- 4) Deferred Tax Liabilities (DTL): deferred tax liabilities of the financial institution;
- 5) Tax Credit Carry-forwards (TCC): tax credits that were not accounted for because they fail to meet the accounting requirements set by the accounting standard;
- 6) Tax Loss (TL): the proportion of deferred tax assets that can be attributed to tax losses and the negative tax base;
- 7) Loan Loss Provision (LLP): the proportion of deferred tax assets that can be attributed to the allowance for doubtful accounts;
- 8) Tier I: the Tier I as published by the financial institution as component of its BI. In the present study, this variable was used as a proxy for regulatory capital;
- 9) Tier II: the Tier II as published by the financial institution as component of its BI;
- 10) RE deductions: reference equity deductions stipulated in the standard that should be considered when calculating the BI;
- 11) Tier I and Tier II (RE): reference equity, the sum of Tiers I and II above;
- 12) RRE: Available only up to the third quarter of 2008 for most financial institutions, due to Circular no. 3,398 of July 23<sup>rd</sup>, 2008, which established procedures for the delivery of information related to the calculation of minimum regulatory standards and limits;
- 13) Basel Index (BI): given by  $BI = (RE \times 100) / (RRE / 0.11)$ . This formula was applied to all financial institutions in the period from 2004 to 2009. The obtained value can differ from that published by the financial institution; therefore, this formula's outcome was used for all financial institutions.
- 14) Return on Assets (ROA): the current quarter's ROA, calculated as Earnings Before Income Taxes (EBIT)/Total Assets (TA) at the end of the period;
- 15) ROA (M): the mean ROA of the last 3 quarters, i.e., the mean value of ROA for the 3 quarters prior to a given quarter;
- 16) TL (3): the number of losses in the last 3 quarters. For this purpose, a value of 0 was assumed in the case of profits and a value of 1 in the case of losses;
- 17) Future ROA: the mean ROA for the coming quarters, i.e., the mean value of ROA for the 3 quarters following a given quarter;
- 18) Size: the logarithm of TA, used to linearize the behavior of the variable Size;
- 19) Dummy: a binary variable used to represent the crisis of 2008. It takes a value of 1 for the year 2008, and 0 otherwise.

The variables collected directly from Bacen's website are not available in a public access database or through a license (as in the case, for example, of Economática), or even by means of a formal solicitation to Bacen. Therefore, these variables were collected manually, one at a time, through the website, following the procedure described above.

### 3.3 Data Analysis Techniques.

Next, for each of this study's hypotheses, the data analysis techniques that were found to be most appropriate for testing the study's objectives are detailed.

#### 3.3.1 Hypothesis: Regulatory Capital Level.

In the hypothesis that deferred taxes are used by managers as a discretionary instrument to meet the required regulatory capital level, the inclusion of deferred taxes into regulatory capital would be inappropriate because the assets resulting from the recording of deferred tax assets might have questionable economic value<sup>2</sup>. Section 4.1 will therefore present results related to the impact of recognizing deferred tax assets as components of Tier I, i.e., Tier I has been calculated before DTA inclusion.

#### 3.3.2 Hypothesis: Regulatory Capital Arbitrage.

Aiming to examine whether the decisions of managers concerning deferred taxes are related to the regulatory capital of their institutions, two techniques for data analysis were employed: multiple linear regression and panel data regression. The main reference for this section is Fávero, Belfiore, Silva and Chan (2009), along with the instructional manual for SPSS® software.

These two statistical dependence techniques are considered to be the most appropriate for the objective of this section, i.e., the identification of the variables that may influence deferred taxes in Brazilian financial institutions.

With regard to multiple linear regression, the objective was to ascertain which independent variables influence the dependent variables, i.e., which variables

<sup>2</sup> The discussion on the economic value of deferred taxes excludes the debate on the registration of these values at historical cost because it could be thought that, because tax benefits will occur only in the future, they could be discounted at an interest rate that represented this opportunity cost.

influence the deferred taxes of Brazilian financial institutions.

Multiple linear regression was applied using the SPSS® software application using a stepwise selection method. The dependent variables are DTA and TCC, and the independent variables are LLP, TL, Tier I, ROA (M), Size and Future ROA, described in section 3.2. The two dependent variables were used to assess how the independent variables explain the values that were or were not activated in connection to future tax benefits.

Due to the economic crisis of 2008, a dummy variable was included for this year to verify whether this phenomenon had any effect on the dependent variable, DTA. Such an effect would be verified by means of the coefficient of determination ( $r^2$ ): if this value were to change significantly, it would mean that the variable has some effect on the independent variables and should be applied to the remaining variables, and vice versa.

Another regression excluded LLP and TL as independent variables because they are significant components of DTA. The aim of this was to verify whether such exclusion

would have any effect on the dependent variable DTA. If any observable effect is identified in the regression results for the variable DTA, the exclusion should be applied to the remaining variable, and vice versa.

In the case of data panel regression, the objective was to assess which dependent variables had a greater influence on deferred taxes, considering time and the individual characteristics of Brazilian financial institutions.

Data panel regression was applied using the STATA® software application. The dependent variables are DTA and TCC, and the independent variables are LLP, TL, Tier I, ROA (M), Size, and Future ROA (the same that were used for multiple linear regression).

To understand the foundations of data panel regression, Fávero et al. (2009) stress that the main database formats related to the usage of cross-sections and time series must first be understood. To these authors, data panel analysis (also known as cross-sections across time) consists of a mix of these two approaches (cross-sections and time series) and arose from the need to analyze databases with these characteristics.

## 4 TESTS AND RESULTS

This section presents the tests employed in this study and their results. The hypotheses are analyzed, detailing the result of each regression applied to the variables, seeking to achieve the objectives set for them.

### 4.1 Hypothesis: Regulatory Capital Level.

To provide evidence on the effect of recognizing deferred taxes as regulatory capital among Brazilian financial institutions, Tier I was calculated before and after DTA was included. Table 1 displays the results. With regard to the number of quarters, 41 of the 240 quarters in the sample

would have had Tier I capital of below 11%; considering the number of institutions, 6 of the 10 largest ones would have had Tier I capital of below 11%.

The results provide evidence that deferred taxes were used by Brazilian financial institutions to support or attain the minimum capital levels required by the Basel Accord, thus confirming the hypothesis. The non-conformity of an institution to the minimum required capital level exposes it to rigorous supervision by the Bacen; thus, the use of deferred taxes to meet the regulatory requirements may be of interest.

**Table 1** Regulatory capital with and without deferred taxes

In number of quarters	Without DTA			In number of institutions	Without DTA		
	With DTA	Below 11.0%	Below 8.0%		With DTA	Below 11.0%	Below 8.0%
10 largest	0	41	1	10 largest	0	6	1
35 largest	0	77	18	35 largest	0	12	3

DTA = Differed Tax Assets

### 4.2 Hypothesis: Regulatory Capital Arbitrage.

This section provides evidence concerning the hypothesis of regulatory capital arbitrage by applying the multiple linear regression and data panel regression data analysis techniques.

#### 4.2.1 Application of Multiple Linear Regression.

The first regression shows that all explanatory variables (except Future ROA) are determinants of deferred tax assets, being responsible for an adjusted coefficient of determination ( $r^2$ ) of 0.965, which means that 96.5% of DTA variation is explained by variations in the independent variables contained in the model (LLP, TL, Tier I, ROA (M), Size).

The exclusion of the Future ROA variable was unexpect-

ted because, according to accounting standards, deferred tax assets can only be recognized if there is probable generation of a future taxable income that is sufficiently large so that the tax credit can be used within the period in which compensation is allowed by fiscal regulation. It may be the case that the way in which Future ROA was measured does not correspond to this reality (it may be interesting to try to use another measure as a proxy for future profitability).

The regression including the dummy variable had no impact on the sample (the adjusted coefficient of determination ( $r^2$ ) maintained its value). With the exclusion of LLP and TL, only the variables Tier I and Size were considered in the model. The adjusted coefficient of determination ( $r^2$ ) decreased in value from 0.965 to 0.735, although it was still a significant value; this result, however, seems to be more



realistic from the point of view of the standard.

The fourth regression did not perform as well as the previous ones: the adjusted coefficient of determination ( $r^2$ ) was 0.376. According to Skinner (2008), this result indicates that banks with relatively larger DTA due to allowances for doubtful accounts, larger past (and current) profitability and high expectation of future profitability tend to have lower TCC. These results are consistent with the idea that the higher the realization capacity of the DTA, the lower the TCC.

Table 2 summarizes the multiple linear regression results. With regard to the assumptions of multiple linear

regressions: a) the normal distribution of residues was violated because all the results obtained in the Kolmogorov-Smirnov test were different from zero, thus rejecting the null hypothesis; b) the absence of autocorrelation was violated because the residues are correlated to each other given that all regressions displayed negative autocorrelation, thus rejecting the null hypothesis; c) homoskedasticity was violated because all results obtained for Pesaran's test were inferior to the 5% significance level, i.e., the residues are heteroskedastic, thus rejecting the null hypotheses; d) the absence of collinearity was not violated because there is no collinearity between the study variables.

**Table 2** Summary of multiple linear regression results

DTA	Measure	Value	Assessment	Meets assumptions?
Fit of regression line	Adjusted ( $r^2$ )	0.965	Significant	Yes
Model significance (ANOVA)	F	5.975	Significant	Yes
	Sig.	0.000		
Parameter significance (Standardized coefficients)	LLP	72.873	Significant (Sig.=0.000)	Yes
	TL	37.867	Significant (Sig.=0.000)	
	Tier I	10.930	Significant (Sig.=0.000)	
	ROA (M)	2.604	Significant (Sig.=0.009)	
	Size	2.150	Significant (Sig.=0.032)	
Parameter significance (Equation with non-standardized coefficients)	DTA = -403,234 + 1.202*LLP + 3.622*TL + 0.045*Tier I + 3,242,333*ROA (M) + 57,538*Size			
Normality of residuals (K-S)	Sig.	0.000	Absent	No
Homoskedasticity of residuals (P-P)	Sig.	0.000	Absent	No
Absence of residual autocorrelation	Durbin-Watson	0.487	Negative Autocorrelation	No
	Smallest Tolerance	0.252	Absent	Yes
Multicollinearity of independent variables	Largest VIF	3.973	Absent	Yes
	Largest Conditional Index	4.298	Absent	Yes
TCC	Measure	Value	Assessment	Meets assumptions?
Fit of regression line	Adjusted ( $r^2$ )	0.376	Significant	Yes
Model significance (ANOVA)	F	218	Significant	Yes
	Sig.	0.000		
Parameter significance (Standardized coefficients)	TL	15.151	Significant (Sig.=0.000)	Yes
	Size	9.384	Significant (Sig.=0.000)	
	ROA (M)	2.675	Significant (Sig.=0.008)	
Parameter significance (Equation with non-standardized coefficients)	TCC = -654,282 + 0.623*TL + 103,552*Size + 1,615,524*ROA (M)			
Normality of residuals (K-S)	Sig.	0.000	Absent	No
Homoskedasticity of residuals (P-P)	Sig.	0.000	Absent	No
Absence of residual autocorrelation	Durbin-Watson	0.320	Negative Autocorrelation	No
	Smallest Tolerance	0.408	Absent	Yes
Multicollinearity of independent variables	Largest VIF	2.452	Absent	Yes
	Largest Conditional Index	2.240	Absent	Yes

TCC = Tax Credit Carry-forwards. Tier I = Tier I as published by the financial institution as a component of its BI (Basel Index). LLP = Loan Loss Provision. TF = Tax Loss. ROA (M) = mean Return on Assets of the last two quarters. Size = logarithm of Total Assets. DTA = Deferred Tax Assets.

According to the equations, the variable that most contributed to DTA was LLP, whereas TL was the one that most contributed to TCC.

The Tier I variable is positive and significant for DTA (value  $t = 10.93$ ), which means that financial institutions with strong financial positions tend to report

larger DTAs.

The results obtained in this study are different from those of Skinner (2008) because a) the LLP and TL variables were divided by TA; b) the dependent variable DTA was divided by TA, whereas TCC was divided by DTA; and c) his sample included 69 banks that were very different



from each other, he used a dummy variable to differentiate regional banks (1) from the rest (0).

Despite of these differences, he showed that ROA (M) was the most important explanatory variable for DTA (the adjusted coefficient of determination ( $r^2$ ) for the regression was 0.849, negatively related to DTA), which was expected because financial institutions with lower past profitability and greater provisions for loan losses would naturally recognize larger DTA.

The author also showed that the most important variable for TCC was ROA (M) (adjusted coefficient of determination ( $r^2$ ) for the regression of 0.630, negatively related to TCC), which was expected because less profitable financial institutions should have larger TCC.

The fact that the studies performed by Skinner (2008) were based on Japanese banks limits the generalizability of the results because the hypotheses are tested based on accounting data that employ different principles, which can obviously lead to different results.

#### 4.2.2 Application of Data Panel Regression.

The Hausman test was used to choose from the fixed and random effects models. The errors were not found to be significantly correlated to the independent variables, which makes the random effects model preferable. In this case, variations in each financial institution's individual characteristics are assumed to be random. The random effects model was chosen for the three explanatory variables.

The Wald statistic indicates that the model is significant (Sig. below 5%). The goodness-of-fit of the model, represented by the overall  $r^2$ , represents the percentage of the variance of Y that can be explained by the variance of X. Finally, the variables considered to be significant by the model were added to the summary in Table 3. All variables are positive.

The application of data panels changes little in how the parameters and the model are interpreted compared to the multiple regression, but it increases accuracy when studying several cross-sections (observations) over time. This explains why the values for the coefficient of determination ( $r^2$ ) obtained using data panel regression were lower than those obtained using multiple regressions.

The adjusted coefficient of determination ( $r^2$ ) for the variable DTA was 0.9591, meaning that 95.91% of the variance of variable Y can be explained by variations in X, adjusted by the number of cases and variables. The same variables as in the multiple linear regression model (LLP, TL and Tier I, represented in the equation) were found to be significant by this model.

The adjusted coefficient of determination ( $r^2$ ) for variable TCC was 0.2396, meaning that 23.96% of the variance of variable Y is explained by variations in X, adjusted by the number of cases and variables. The variable TL was found to be significant by both statistical dependence techniques. Data panel regression also found LLP to be significant, while variables Size and ROA (M) were also significant in the multiple linear regression.

**Table 3** Summary of panel data regression results

DTA		Interpretation	
Model choice	Hausman Test	Chi2 = -0.80	Random effects model choice
Model significance	Wald chi2	1115.93	Significant model
	Prob > chi2	0.0000	
Model fit	Adjusted $r^2$	95.91%	-
Significant variables' Coefficients	LLP	1.2621773 (Sig. 0.000)	Significant coefficient
	TL	2.1623085 (Sig. 0.000)	Significant coefficient
	TIER I	0.4961421 (Sig. 0,000)	Significant coefficient
Equation	DTA = 1.2621773*LLP + 2.1623085*TL + 0.4961421*TIER1		
TCC		Interpretation	
Model choice	Hausman Test	Chi2 = -1.34	Random effects model choice
Model significance	Wald chi2	44.12	Significant model
	Prob > chi2	0.0000	
Model fit	Adjusted $r^2$	23.96%	-
Significant variables' coefficients	LLP	0.5777731 (Sig. 0.000)	Significant coefficient
	TL	0.3850858 (Sig. 0.000)	Significant coefficient
Equation	TCC = 0.5777731*LLP + 0.3850858*TL		

TCC = Tax Credit Carry-forwards. Tier I = Tier I as published by the financial institution as a component of its BI (Basel Index). LLP = Loan Loss Provision. TF = Tax Loss. DTA = Deferred Tax Assets.

## 5 FINAL REMARKS

This study sought to provide evidence concerning the role of deferred tax assets and liabilities as instruments for Brazilian financial institutions to meet levels of regulatory capital and to arbitrage regulatory capital in the period from 2004 to 2009. To meet the objectives of this study, two hypotheses were developed: a) regulatory capital level hypothesis – managers of Brazilian financial institutions use deferred taxes to meet the required limits of regulatory capital, and b) capital arbitrage hypothesis – managers of Brazilian financial institutions use deferred tax discretionarily as instrument for regulatory capital arbitrage. The hypotheses were tested using the multiple linear regression and data panel regression data analysis techniques.

The regulatory capital level hypothesis was confirmed by means of tests that provided evidence that deferred taxes were used by Brazilian financial institutions to support or attain the minimum levels of capital required by the Basel Accord.

The regulatory capital arbitrage hypothesis was also tested by examining if deferred taxes are influenced not only by LLP values and tax losses but also by the levels of regulatory capital required by the Basel Accord. However, there was evidence that managers have been realistic in recognizing deferred taxes, meaning that they are therefore not practicing regulatory capital arbitrage. The results show that financial institutions with stronger financial positions (larger Tier I) tend to report higher deferred tax assets. This result contradicts the international literature, according to which more deferred taxes are reported by institutions with

weaker financial positions, thus configuring itself as regulatory capital arbitrage.

The usage of deferred taxes by financial institutions in the composition of their regulatory capital has been the subject of continuous scrutiny by Bacen. Therefore, although the analysis of the role of the regulatory agent was the focus of the present study, the function performed by Bacen of regulating and controlling the financial system must be stressed as an important variable within this context.

The study has limited itself to the chosen sample and period and, although the requirements to calculate the Basel Index may differ from country to country, comparisons among countries may still be of interest for the discussion about regulatory capital standards. Another limitation is related to the choice of variables used in the study because these could have been calculated differently or an entirely different set of variables might have been defined. The fact that the studies performed by Skinner (2008) were based on Japanese banks limits the generalizability of the results because the hypotheses are tested based on accounting data based on different principles, which can obviously lead to different results.

One suggestion for future studies is to focus on how deferred taxes were established by regulators, rather than by accounting regulators, and how the time and manner in which deferred taxes have been adopted by Brazilian financial institutions might be consistent with the concept of regulatory tolerance. Another suggestion would be to use different variables to test the hypotheses contained in this study.

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