Corporate Information versus Regulatory Information: Relevance of Accounting Information in the Brazilian Electric Sector

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Abstract

In 2010, the adoption of International Financial Reporting Standards Interpretations Committee (IFRIC) 12 and the Brazilian Electricity Regulatory Agency (ANEEL, in Portuguese) Resolution no. 396/2010 resulted in changes to the accounting model for concessionaires in the Brazilian electric sector. According to corporate regulation, the accounting model replaced granted fixed assets by operation rights, which are represented by a financial asset and/or intangible assets. According to electric sector regulation, the accounting model kept the record of the infrastructure as granted property, which was revaluated at a replacement cost for each tariff review. We identified whether there were significant differences between the return on equity and return on assets for Brazilian electric sector concessionaires and, if so, the degree of difference. We analyzed the corporate and regulatory accounting from 62 companies that adopted IFRIC 12 and published regulatory statements for the years 2009 and 2010. We also analyzed the returns of 20 of these companies from 2000 to 2010. The test results and regressions indicated that regulatory profit was less than corporate profit on average that corporate and regulatory shareholder equity and total assets were statistically equal on average, and that corporate regulation had more effect on returns.

Keywords: Return on equity; Return on assets; IFRIC 12; Brazilian utilities; Electricity sector.

1 Introduction

Minimizing state control of economic sectors received much attention in the last decades of the twentieth century. Proponents of minimization claim that the state should operate only typical state functions (e.g. justice, security, national defense) and that the private sector should operate other public services (e.g. gas, electricity, telecommunications, transportation, cargo services). In the 1990s, Brazilian law was amended to abolish state monopolies and privatize some public services. The legal procedures used to transfer operation of a public service to a private company include authorization, permission, and concession.

Authorization is a unilateral, discretionary, and temporary act that gives an individual the right to operate a public service, usually on an emergency basis. Permission is similar to authorization, except that there is no specified period, and it is preceded by bidding. Concession is a bilateral act, which is time-restricted and preceded by bidding. Operating a public service involves particular economic characteristics. In most cases, the state transfers responsibility of providing public service to the private sector and then acts as a regulator of economic activity. For example, the state may fix prices or limit access to potential users.

In November 2006, the International Accounting Standards Board (IASB) released the International Financial Reporting Interpretations Committee (IFRIC) 12 – Service Concession Arrangements. IFRIC 12 further defines the specific accounting procedures for private companies that operate public services. Under IFRIC 12, private companies are granted service concessions, in which the government delegates the right to operate a public service for a specified period. During that time, the state (or its legal representative) regulates and/or controls the price, the characteristics of eligible consumers, and the residual interest of the public service at the end of the concession.

The IFRIC 12 interpretation differs from the Brazilian legal view, however. In Brazil, the *Interpretação Técnica do Comitê de Pronunciamentos Contábeis* (ICPC) 01, introduced in 2009, is the Portuguese version of IFRIC 12. ICPC 01 was implemented in 2010 and applied to the public roads, gas, electricity, sanitation, and railroads. The impact of ICPC 01 was particularly evident in the Brazilian electricity sector, because the Brazilian Electricity Regulatory Agency, or *Agência Nacional de Energia Elétrica* (ANEEL) in Portuguese, used a different accounting model than that designated by corporate law. Because of the corporate accounting numbers in their service concession arrangements, ANEEL did not accept the corporate accounting model for regulatory purposes, specifically the exclusion of the monetary correction.

The corporate accounting model differed even more from the regulatory accounting model with the adoption of IFRIC 12.Considering the Brazilian scenario presented earlier, our research aimed to identify whether and to what degree the return on equity (ROE) and return on assets (ROA) of Brazilian electricity sector companies are affected by the changes implemented by IFRIC 12 (ICPC 01) and by ANEEL Resolution no. 396/2010. We also investigated differences between the corporate accounting that resulted from IFRIC 12 and the regulatory accounting of the Brazilian electricity sector companies. We tested the following hypothesis: The returns of Brazilian electricity sector companies are influenced more by regulatory accounting information than by corporate accounting information.

2 Accounting Models of Brazilian Electricity Sector Companies

2.1 **Relevance of Information and Accounting Choices**

In the literature examining the relevance of accounting information, the following question is of primary concern: to whom is accounting information relevant? (Hendriksen and Breda, 1999; Iudícibus, 2000; Lopes and Martins, 2007). To answer this question, we must identify the users of accounting information and the implications of its intended use. Among the potential users (e.g. investors, regulators, government, society in general), investors have received considerable attention from both regulatory and academic bodies, who have tried to analyses the investor perspective in relation to the relevance attributed to accounting information.

For example, the Financial Accounting Standards Board determined in 1978 that the relevance of accounting information is associated with the possibility that the user makes predictions about the results of past, present, and future expectations, as well as the possibility to confirm or correct previous expectations. The relevance of accounting information represents the level of influence that this information has on a user's decision-making process.

In a more restricted view, even from the perspective of investors, Barth et al. (2001) emphasize that accounting information is relevant if it is previously associated with the market value. In other words, accounting practices, which are used to determine the contained value in the accounting information, show economic events in a manner similar to that performed by the market. Considering this view, when organizations choose which accounting practices to employ, they choose accounting practices that are more aligned with market valuations, because they believe that market valuations are relevant.

The same reasoning applies to regulators, who define accounting rules based on similar accounting practices. Barth et al. (2001) explain that studies on the relevance of accounting information can help in the evaluation of accounting standards issued by the regulatory bodies and can identify problems related to the standards. For the authors, these studies provide the mechanisms to verify the qualitative characteristics of accounting information, such as relevance and reliability.

The investor's perception of relevance is not the only force that influences accounting choices of organizations. Watts and Zimmerman (1978) found that the greater the political costs of an entity, the more managers use accounting practices that defer recognition of current earnings to the future. They argue that society's political sector has the power to make transfers of wealth to various business groups. In turn, these transfers are vulnerable to political rules and societal pressures. In this context, the political costs are directly related to the size of organizations. Highly profitable organizations (usually large corporations) attract more attention. Thus, organizations can redistribute wealth, reflecting an increase in taxes and/or imposition of sanctions by the state through controlling the activities of the organizations in question.

We observe that organizations do not always opt for accounting practices that provide information that is relevant from the perspective of investors or other users. If a particular accounting practice results in increased political cost, then these organizations tend to select others to reduce or avoid such costs, even if others offer more relevant information to users. According to Watts and Zimmerman (1978), organizations incur costs to prevent unfavorable political actions, as well as the costs incurred for other social groups, such as unions and regulatory organizations.

Following the previous discussion of our research aim, we investigate Brazilian electric sector concessionaires in this context. First, most electric sector companies belong to the private sector and are set up as corporations. They may seek resources, directly or indirectly, in the stock market. They also submit public financial statements. Second, these organizations provide a public service, the provision of electricity. The price, or tariff, is regulated by the government in most cases. Additionally, these concessionaires act as a near total monopoly, which reduces the power of the general public to choose a supplier. Consequently, there is increasing social pressure for the government to stipulate the price of this public service, to prevent profiteering by the concessionaires.

In theory, concessionaires make their accounting choices in this context. On the one hand, concessionaires seek to demonstrate that they consider information that is relevant to investors to keep their current investors and attract new investors. Moreover, these organizations can be penalized for having excessive profits. When the social pressure costs become significant, this second force exerts important influence on the choices of companies. However, the regulators also exert influence on the companies' choices. In the next section, we discuss the role of regulatory bodies in the context of the Brazilian electric sector concessionaires.

2.2 Regulatory Influences In The Accounting Methods Of Brazilian Electricity Sector

As mentioned previously, the accounting choices of an organization are influenced not only by the aspirations of its owners and managers, but also of its regulatory bodies. According to Lopes and Martins (2007), the regulation of accounting practices is based on the premise that organizations do not freely offer appropriate accounting information. Thus, regulators ensure an adequate level of disclosure, so that other interested parties have access to such information. Accounting regulations balance the available informational level. Accordingly, Kothari et al. (2010) report that the justification and consequences of regulation can be explained from the perspective of three theories:

- Public interest theory of regulation: From a social point of view, regulation is a benevolent and efficient response to market failures, and the regulatory entity is incorruptible and infallible. This assumption excludes lobbying and its potential effects on regulations.
- Capture theory of regulation: Regulators seek to transfer wealth from society to political lobbies in exchange for favorable rules. Politicians, in turn, provide these favorable rules in exchange for re-election and the collateral requirements of future 'bribes'.

- Ideology theory of regulation: Like the public interest theory, this theory is also based on the premise of market failures. However, in contrary to the public interest theory, the ideology theory posits that lobbies can influence the actions of regulators. Unlike in the capture theory of regulation, the lobby is a mechanism by which the regulators are only informed about political issues. However, the existence of lobbies constitutes potential manipulators that can distort the rules so that regulators cannot maximize social welfare.

Kothari et al. (2010) emphasize, though, that the theories of capture regulation and ideology regulation are more likely to explain the behavior of the regulation and provide a starting point for studies of the political nature of accounting standards. In both theories, the mechanism of lobbying is an important influence on the decisions of regulatory bodies. For example, Watts and Zimmerman (1978) find that large corporations use political lobby groups, among other mechanisms, to minimize their political costs. These companies seek to influence the choices of regulatory organizations so that regulators adopt specific accounting practices that minimize companies' accounting profits and reduce the societal perceptions about the companies' high returns.

In the Brazilian electric sector scenario, these entities may have high political costs. Companies choose the accounting practices that show lower profits to avoid the imposition of sanctions or other penalties. To minimize these costs, these concessionaries attempt to influence the regulatory process and decision-making through lobbying. The Accounting Pronouncements Committee, or *Comitê de Pronunciamentos Contábeis* (CPC) in Portuguese, is responsible for the issue of corporate accounting standards. The application is submitted to the Brazilian Securities Commission, or *Comissão de Valores Mobiliários* (CVM), for those concessionaires incorporated as public companies and to the Federal Accounting Council, or *Conselho Federal de Contabilidade* (CFC), for other concessionaires. The CPC, whose accounting information users are investors and lenders, adopted the International Financial Reporting Standards (IFRS), with some adaptations.

The electricity sector companies are subject to the accounting rules issued by the CPC and ANEEL. ANEEL, which is the regulatory organization of the Brazilian electric energy market, regulates the generation, transmission, distribution, and sale of electricity in Brazil. Among other functions, ANEEL edits rules for concessionaries, especially those relating to tariffs. ANEEL focuses on maintaining the economic and financial balance among electric market players. Its main information user is society. In the context of Brazilian electricity sector companies, the accounting choices are influenced by these two regulators. In theory, each seeks information that is relevant to different users. While the CPC's rules are linked to investors' information needs, ANEEL's regulation is linked to accountability in the management of granted public assets and the fees associated with the supply of electricity.

Assuming the application described by Watts and Zimmerman (1978), we consider that these concessionaires lobby could influence regulatory decisions. From the investors' points of view, pressures may arise if investors realize that the accounting information does not fairly reflect the economic transactions. From society's point of view, the political costs may rise if the companies' profits are high, at society's expense, because the fixed fee is too high. More specifically, concessionaires could influence the regulatory organization to issue accounting standards that result in lower profits. Thus, the concessionaires minimize societal pressures and the associated political costs. If this occurs, the accounting numbers from the practices permitted by this regulatory organization tend to be smaller than the numbers of other accounting practices.

2.3 Accounting Standards of the Brazilian Electricity Sector

Before privatization occurred in the 1990s, the Brazilian electric sector concessionaires were managed by governmental entities. Because of this, the accounting information generated and used by such concessionaries (especially influential governmental concessionaires) were quite similar to those of typical governmental entities, with excessive emphasis on the budget. Those incorporated as governmental companies also observed corporate norms about financial and accounting practices. After privatization, a change occurred. As described by Longo (2009), the sector is currently composed of governmental and private entities.

There are investments to build infrastructure needed for the generation, transmission, and distribution of electricity. In 2000, the Brazilian federal government initiated a more stringent regulatory process for this sector, which is overseen by ANEEL.

The Brazilian electric sector concessionaires are regulated must follow the accounting standards issued by CPC and ANEEL. CPC uses the IFRIC 12 rules, and ANEEL, uses the Normative Resolution 396/2010 rules.The IFRIC 12, issued by the IASB, covers the accounting procedures related to financial records of service concession arrangements. According to IFRIC 12, the concession arrangement grants a governmental entity (or its representative) the right to operate a public-service infrastructure for a specified term. Service concession arrangements are observed if the governmental entity controls or regulates the services, users, and price, and also if the infrastructure, even if built by the concessionaire, belongs to and is controlled by the governmental entity.

In relation to old corporate rules, this standard changed the definition of concession. The concessionaires do not control the infrastructure used to provide service, so they cannot record these items in their consolidated balance sheets. However, they have the right to use the infrastructures. This involves three accounting models for demand-risk management: (a) if the risk is unique to the governmental entity, then the concessionaire's right is represented by a financial asset, (b) if the risk is exclusive to the concessionaire, then it is represented by intangible assets, and (c) if the risk is shared, then the concessionaire's right is allocated on a financial asset and other intangible assets. (Comitê de Pronunciamentos Contábeis, 2009).

IFRIC 12 addresses several additional points: (a) recognition and measurement of the value of the arrangement, (b) operating services, (c) borrowing costs, (d) subsequent accounting treatment of financial assets and/or intangible asset, and (e) the items supplied by the governmental entity to the concessionaire. The Orientação CPC (OCPC) 05, or CPC's Guidance, in English, further clarifies doubts about the application of IFRIC 12. OCPC 05 establishes the following for electric sector companies: (a) distribution concession arrangements use a bifurcated model (financial and intangible assets) or intangible model if the arrangement provides indemnity at the end of the concession, (b) in most existing contracts, transmission concession arrangements use the financial assets model, and (c) generation concession arrangements use the bifurcated model or intangible model, if there is any compensation prediction at the end of the concession. (Comitê de Pronunciamentos Contábeis, 2010).

In 2001, ANEEL established the Manual de Contabilidade do Setor Elétrico (MCSE), or Accounting Manual for Electric Sector (initially called the Accounting Manual for Public Service Electric) through Resolution no. 444/2001. The manual explains accounting procedures to be followed by electric sector concessionaires, in particular, for the disclosure of financial statements (Brasil, 2001). In light of the changes arising from the adoption of international accounting standards, particularly IFRIC 12, ANEEL issued Resolution no. 396/2010, which modified the MCSE. ANEEL justified the changes because the concessionaires needed to disclose information that adequately represented their financial situations. This included accounting information about composition of the assets related to the concession, permission, and authorization, according to the oversight and accountability of investments in entities (Brasil, 2010).

The main difference between the models adopted by IFRIC 12 and by the ANEEL resolution 396/2010 relates to granted infrastructure as fixed assets. Fixed assets in service, a term used by ANEEL for granted infrastructure, is an important element in the calculation of the tariff in the electricity sector (though there are segments in which the price is free). Additionally, changes in the MCSE (Brasil, 2010) stipulate that: (a) depreciation rates from fixed assets in service; (b) spending on new projects must be enabled in construction in progress and transferred for the fixed asset in service when in operation, and (c) the regulatory compulsory revaluation for fixed assets in service use the criterion of replacement cost for each tariff review.

3 Methodology

We verified the existence of significant differences between the accounting numbers calculated in accordance with Brazilian electric sector corporate and regulatory standards. We analyzed the series formed by the return on equity (ROE) and the return on assets (ROA), as shown in Table 1.

Table 1. Formula for calculating returns analyzed.

$ROE_t = NI_t/SE_{t-1}$		(1)
$ROA_t = (NI_t+IEL_t)/TA_{t-1}$, where:		(2)
ROE_t: Return on equity of period t.	IE_t: Interest expense net of tax of period t.	
ROA_t: Return on assets of period t.	SE_{t-1}: Shareholders' equity end of period $t-1$.	
NI_t: Net income of period t.	TA_{t-1}: Total assets end of period $t-1$.	

First, we identified the Brazilian electric sector concessionaires that published statements according to ANEEL's regulatory requirements and adopted IFRIC 12. We researched the internet and newspapers published up to October 2011, and we identified 62 companies, listed in the Table 2. With the exception of companies Eletrobras Distribuição Roraima (EDR), Centrais Elétricas do Norte do Brasil S/A (ELETRONORTE) and Empresa de Transmissão de Energia do Mato Grosso S.A. (ETEM), which published only regulatory financial information for the year 2010, all companies published information for the years 2009 and 2010.

Table 2. Brazilian electric sector companies initially analyzed in the research

Concessionaire	Acronym	Concessionaire	Acronym
AES Sul Distribuidora Gaúcha de Energia S.A.	AES SUL [a,b]	Copel Distribuição S.A.	COPEL-D [a]
Amazonas Distribuidora de Energia S.A.	AMAZONAS [a]	EDP – Energias do Brasil S.A.	EDPBR [a]
Ampla Energia e Serviços S.A.	AMPLA [a,b]	Elektro Eletricidade e Serviços S.A.	ELEKTRO [a,b]
Bandeirante Energia S.A.	BE [a,b]	Eletrobras Distribuição Roraima	EDR [a]
Caiuá – Distribuição de Energia S.A.	CAIUÁ [a]	Eletropaulo Metrop. Eletricidade de S. Paulo S.A.	EMESP [a,b]
Celesc Distribuição S.A.	CELESC-D [a]	Eletrosul Centrais Elétricas S.A.	ELETROSUL [a]
Celg Distribuição S.A.	CELG-D [a,b]	Emp. Amazonense de Transmissão de Energia S.A.	EATE [a]
Cemig Distribuição S.A.	CEMIG-D [a]	Emp. Brasileira de Transmissão de Energia S.A.	EBTE [a]
Centrais Elétricas de Rondônia S.A.	CERON [a]	Emp. de Distr. de Energia Vale Paranapanema S.A.	PARANAPANEMA [a]
Centrais Elétricas do Norte do Brasil S.A.	ELETRONORTE [a]	Empresa de Trans. de Energia do Mato Grosso S.A.	ETEM [a]
Centrais Elétricas do Pará S.A.	CELPA [a,b]	Empresa de Transmissão do Espírito Santo S.A.	ETES [a]
Centrais Elétricas Matogrossenses S.A.	CEMAT [a,b]	Empresa Energética de Mato Grosso do Sul S.A.	ENERSUL [a,b]
Companhia de Eletricidade do Estado da Bahia	COELBA [a,b]	Empresa Elétrica Bragantina S.A.	BRAGANTINA [a]
Companhia de Energia El. do Est. do Tocantins	CELTINS [a]	Empresa Luz e Força Santa Maria S.A.	ELFSM [a]
Companhia Energética de Pernambuco	CELPE [a,b]	Empresa Norte de Transmissão de Energia S.A.	ENTE [a]
Companhia Energética do Maranhão	CEMAR [a,b]	Empresa Paraense de Transmissão de Energia S.A.	ETEP [a]
Companhia Energética do Rio Grande do Norte	COSERN [a,b]	Empresa Regional de Transmissão de Energia S.A.	ERTE [a]
Comp. Est. de Ger. e Trans. de Energia Elétrica	CEEE-GT [a,b]	Empresa Santos Dumont de Energia S.A.	ESDE [a]
Companhia Est. de Distr. de Energia Elétrica	CEEE-D [a]	Energisa Borborema – Distrib. de Energia S.A.	ENERGISA-BO [a]
Companhia Força e Luz do Oeste	CFLO [a]	Energisa Minas Gerais – Distrib. de Energia S.A.	ENERGISA-MG [a,b]
Companhia Hidro Elétrica do São Francisco	CHESF [a,b]	Energisa Nova Friburgo – Distrib. de Energia S.A.	ENERGISA-NF [a]
Companhia Jaguari de Energia	CPFL-JG [a]	Energisa Paraíba – Distrib. de Energia S.A.	ENERGISA-PB [a]
Companhia Luz e Força de Mococa	CPFL-MC [a]	Energisa Sergipe – Distrib. de Energia S.A.	ENERGISA-SE [a]
Companhia Luz e Força Santa Cruz	CPFL-SZ [a]	Espírito Santo Centrais Elétricas S.A.	ESCELSA [a,b]
Companhia Nacional de Energia Elétrica	NACIONAL [a]	Evrecy Participações Ltda.	EVRECY [a]
Comp. Paulista de Força e Luz - Leste Paulista	CPFL-LP [a]	Light Serviços de Eletricidade S.A.	LIGHT-S [a,b]
Companhia Paulista de Força e Luz	CPFL-PA [a,b]	Lumitrans – Comp. Transm. de Energia Elétrica	LUMITRANS [a]
Companhia Piratininga de Força e Luz	CPFL-PG [a]	Rio Grande Energia S.A.	RGE [a,b]
Companhia Sul Paulista de Energia	CPFL-SP [a]	Santa Cruz Geração de Energia S.A.	SCRUZ [a]
Companhia Sul Sergipana de Eletricidade	SULGIPE [a]	Sistema de Transmissão Catarinense S.A.	STC [a]
Copel Geração e Transmissão S.A.	COPEL-GT [a]	Sistema de Transmissão Nordeste S.A.	STN [a]

Legend: (a) composes the first sample, (b) composes the second sample.

In the first step, we analyzed the financial statements of these companies to extract corporate and regulatory accounting information that included net income, shareholders' equity and total assets. We organized the information by individual company and grouped by company size and industry. We used the value of corporate equity in 2009 as our criterion, and we used the Levene test for the evaluation of each group. In the second step, we searched for information on the variables mentioned above, for the years 1999 to 2008, for such utilities. We performed the research with the CVM's database and only twenty concessionaries (second sample) had such information available.

We calculated ROAs and ROEs for the years 2000 to 2010. These values contain the following series:

- Corporate ROE: ROEs obtained from the accounting numbers calculated under the old Brazilian corporate accounting standards (from this point forward, BR-GAAP) from 2000 to 2008 that are under the new corporate rules (from this point forward, IFRS) for the years 2009 and 2010.
- Regulatory ROE: ROEs obtained from the accounting numbers calculated according to BR-GAAP from 2000–2008 and according to the ANEEL's standard for the years 2009 and 2010.
- Corporate and regulatory ROAs: ROAs calculated similarly to items "a" and "b", respectively.

In the third step, we applied a statistical technique for testing data averages in the first sample to evaluate the behavior and the differences of the net income, shareholders' equity, and total assets variables, for the years 2009 and 2010. To do this, we first preformed the Kolmogorov-Smirnov test for normality of the data. If the distribution analysis showed normal distribution, then we used it for the parametric test (Student's t test for paired samples); otherwise, we used a nonparametric test (Wilcoxon test).

In the fourth step, we applied regression analysis to ascertain the impact of the regulatory and corporate accounting numbers for 2009 and 2010. We used regressive models were based on prediction models of returns, the ROE model described in the work of Banker and Chen (2006). We adjusted the original model, including dummy variables for capturing the effects, if any, derived from changes caused by regulatory and corporate accounting numbers. The table below presents the regressive models used in the research.

Table 3. Regression models

$$ROE_t = \gamma_0 + \gamma_1\mu_i + \gamma_2 ROE_{t-1} + \gamma_3 D02 + \gamma_4 D09 + \gamma_5 D09 \cdot ROE_{t-1} + \gamma_6 D10 + \gamma_7 D10 \cdot ROE_{t-1} + \varepsilon_t \quad (3)$$

$$ROA_t = \delta_0 + \delta_1\tau_i + \delta_2 ROA_{t-1} + \delta_3 D02 + \delta_4 D09 + \delta_5 D09 \cdot ROA_{t-1} + \delta_6 D10 + \delta_7 D10 \cdot ROA_{t-1} + \eta_t, \text{ where:} \quad (4)$$

ROE_t: Return on equity of period t.

ROE_{t-1}: Return on equity of period t–1.

ROA_t: Return on assets of period t.

ROA_{t-1}: Return on assets of period t–1.

μ_i e τ_i: Averages of individual company.

γ_i e δ_i: Regression's coefficients.

D02, *D09* e *D10*: Dummies for the years 2002, 2009 e 2010.

$D00 \cdot ROE_{t-1}$ e $D00 \cdot ROA_{t-1}$: Multiplicative dummies relating to the change of accounting standards.

ε_t e η_t: Random terms.

D09 and D10 are dummy variables and assume zero value during the period between 2000 and 2008 and non-null value for the years 2009 and 2010. We used D02 as a dummy variable because of the Brazilian monetary crisis and/or the energy crisis ("blackout") that occurred in 2002 affected the companies' return in that year. The individual averages were included in the model to control the unique effects of each analyzed company. The regression model was applied to the series described above. The behavior of the series for the years between 2000 and 2008 was determined by analysis of linear correlation between the dependent and independent variables of the models. We found three types of behavior:

- Growth (significant positive correlation): companies whose one-year return tends to be higher than the previous year.
- Decreasing (significant negative correlation): companies whose one-year return tends to be lower than the previous year.
- No trend (correlation null or not significant): either a stable series (without significant variations from one year to another) or impossible to establish the relationship between the return of one year with the previous year

We identified the most appropriate regression method by performing the F, Breusch-Pagan, and Hausman tests to identify the best model: pooled regression model, panel with fixed-effects model, or panel with random effects model. We performed the linear regressions by using the ordinary least squares method, common or weighted in accordance with the pattern resulting from previous tests. We performed additional tests on the following: the normality of the regression residuals (Jarque-Bera), the heterogeneity of the residuals (LM Breusch-Pagan-Godfrey), the autocorrelation residuals (LM Breusch-Godfrey), and the model specification (Reset Ramsey). Also, we used Student's t test to compare the coefficients of the regressions.

4 Analyses

After summarizing and organizing data from Brazilian electricity sector companies, we calculated averages and standard deviations for the net income, shareholders' equity, and total assets variables, with corporate and regulatory accounting numbers for the years 2009 and 2010. We also performed the Kolmogorov-Smirnov normality test. The results are shown in Table 4 below.

Table 4. Basic statistics on net income, shareholder equity, and total assets for 2009 and 2010

Statistic	Variable					
	Net Income		Shareholders' Equity		Total Assets	
	Corporate	Regulatory	Corporate	Regulatory	Corporate	Regulatory
2009						
Mean[1]	256.963,37	217.313,10	991.934,25	976.362,05	2.551.897,05	2.533.988,73
K-S[2]	0,259	0,279	0,254	0,284	0,227	0,229
[Prob.][3]	[0,000]	[0,000]	[0,000]	[0,000]	[0,000]	[0,000]
2010						
Mean[1]	197.852,13	180.668,15	1.206.615,29	1.175.269,82	2.895.118,13	2.853.558,53
K-S[2]	0,258	0,272	0,295	0,295	0,241	0,243
[Prob.][3]	[0,000]	[0,000]	[0,000]	[0,000]	[0,000]	[0,000]
2009 e 2010						
Mean[1]	226.674,97	198.536,35	1.101.936,11	1.078.281,74	2.727.762,40	2.697.735,24
K-S[2]	0,248	0,267	0,276	0,292	0,235	0,237
[Prob.][3]	[0,000]	[0,000]	[0,000]	[0,000]	[0,000]	[0,000]

Legend: (a) Amounts in thousands of reais (Brazilian national currency). (b) Kolmogorov-Smirnov normality test. (c) Probability.

Means and standard deviations of 2009 include 59 observations. The year 2010 includes 62 observations and combined analysis for 2009 and 2010, the sum of both years. Given the diversity of the sampled companies, we grouped them according to the value of their shareholders' equity in four categories and divided the sample into quartiles: (a) less than 63 million reais; (b) between 63 million and 345 million reais; (c) between 345 million and 1.22 billion reais; and (d) up to 1.22 billion reais. The means and Levene's test results are shown in Table 5 below.

Table 5. Basic statistics on net income, shareholder equity, and total assets, grouped according to the size of the equity for 2009 and 2010.

Shareholders' equity size[1]	Variable/ Mean[2] / Levene's Test					
	Net Income		Shareholders' Equity		Total Assets	
	Corporate	Regulatory	Corporate	Regulatory	Corporate	Regulatory
2009						
< 63	-17.517,93	-4.912,73	-52.776,27	14.746,93	881.094,20	855.483,87
63 ├─ 345	50.399,80	37.674,20	152.873,07	130.337,47	427.191,93	424.914,27
345 ├─ 1.220	239.700,00	177.809,40	791.949,47	803.630,27	2.523.790,73	2.530.831,53
> 1.220	790.865,07	690.207,86	3.224.530,50	3.098.188,64	6.648.626,64	6.595.492,14
Levene[3]	6,647	8,838	3,677	3,490	4,698	4,004
[Prob.][4]	[0,001]	[0,000]	[0,017]	[0,022]	[0,005]	[0,012]
2010						
< 63	-39.800,50	-30.495,56	-28.654,56	-5.563,81	500.635,38	547.418,69
63 ├─ 345	189.020,29	192.292,00	154.844,29	143.536,93	673.392,21	655.894,64
345 ├─ 1.220	125.370,44	107.950,75	720.330,44	725.680,81	2.682.181,44	2.606.858,88
> 1.220	515.714,31	454.378,38	3.848.469,62	3.708.458,75	7.446.547,75	7.329.353,94
Levene [Prob.]	1,356	1,273	4,258	4,217	5,794	4,934
	[0,265]	[0,292]	[0,009]	[0,009]	[0,002]	[0,004]
2009 e 2010						
< 63	-29.018,61	-18.116,77	-40.326,35	4.263,97	684.728,35	696.482,48
63 ├─ 345	117.320,03	112.317,28	153.824,69	136.709,62	546.047,24	536.422,03
345 ├─ 1.220	180.691,19	141.753,32	754.984,81	763.398,29	2.605.540,77	2.570.071,45
> 1.220	644.118,00	564.432,13	3.557.298,03	3.423.666,03	7.074.184,57	6.986.885,10
Levene [Prob]	5,751	5,866	8,077	7,793	10,628	9,101
	[0,001]	[0,001]	[0,000]	[0,000]	[0,000]	[0,000]

Legend: (a) Shareholders' equity in millions of dollars. (b) Amounts in thousands of reais. (c) Levene's test for homogeneity of variances. (d) Probability.

All statistics normality tests (Table 4) resulted in probabilities lower than 0.001, which led us to reject the hypothesis that the variables are distributed normally. Consequently, we used the Wilcoxon test for the comparison between corporate and regulatory accounting numbers. In turn, with the exception of net income in 2010, the probabilities of the Levene's test were less than 0.03, which confirmed the heterogeneity of the sample and justified the inclusion of the average individual as a control variable in the regression models. Tables 6 and 7 show the results of the Wilcoxon test.

Table 6. Results of the Wilcoxon test for 2009 and 2010

Analyzed Group					
Corporate Net Income (CNI) x Regulatory Net Income (RNI)		Corporate Shareholders' Equity (CSE) x Regulatory Shareholders' Equity (RSE)		Corporate Total Assets (CTA) x Regulatory Total Assets (RTA)	
Statistic / [Probability]	Result	Statistic / [Probability]	Result	Statistic / [Probability]	Result
2009					
-4,323 [0,000]	CNI > RNI	-0,155 [0,439]	CSE = RSE	-1,321 [0,093]	CTA = RTA
2010					
-1,774 [0,038]	CNI > RNI	-1,502 [0,067]	CSE = RSE	-1,318 [0,094]	CTA = RTA
2009 e 2010					
-4,535 [0,000]	CNI > RNI	-4,535 [0,115]	CSE = RSE	-1,585 [0,057]	CTA = RTA

Table 7. Results of the Wilcoxon test, grouped according to the size of the equity, for 2009 and 2010.

Shareholders' equity size[1]	Analyzed Group / Statistic / [Probability] / Result					
	Corporate Net Income (CNI) x Regulatory Net Income (RNI)		Corporate Shareholders' Equity (CSE) x Regulatory Shareholders' Equity (RSE)		Corporate Total Assets (CTA) x Regulatory Total Assets (RTA)	
2009						
< 63	-0,314 [0,377]	CNI = RNI	-0,078 [0,469]	CSE = RSE	-0,941 [0,471]	CTA = RTA
63 ├─ 345	-3,296 [0,001]	CNI > RNI	-2,045 [0,021]	CSE > RSE	-0,852 [0,197]	CTA = RTA
345 ├─ 1.220	-3,181 [0,001]	CNI > RNI	-0,852 [0,197]	CSE = RSE	-1,023 [0,154]	CTA = RTA
> 1.220	-2,166 [0,015]	CNI > RNI	-0,094 [0,463]	CSE = RSE	-0,596 [0,276]	CTA = RTA
2010						
< 63	-0,282 [0,389]	CNI = RNI	-0,157 [0,438]	CSE = RSE	-0,031 [0,488]	CTA = RTA
63 ├─ 345	-0,534 [0,297]	CNI = RNI	-0,722 [0,235]	CSE = RSE	-0,408 [0,342]	CTA = RTA
345 ├─ 1.220	-2,069 [0,020]	CNI > RNI	-0,724 [0,235]	CSE = RSE	-1,086 [0,139]	CTA = RTA
> 1.220	-1,703 [0,044]	CNI >RNI	-1,241 [0,108]	CSE = RSE	-0,982 [0,163]	CTA = RTA
2009 e 2010						
< 63	-0,038 [0,485]	CNI = RNI	-0,165 [0,435]	CSE = RSE	-0,673 [0,251]	CTA = RTA
63 ├─ 345	-2,391 [0,008]	CNI > RNI	-1,957 [0,025]	CSE > RSE	-0,292 [0,385]	CTA = RTA
345 ├─ 1.220	-3,763 [0,000]	CNI > RNI	-0,059 [0,477]	CSE = RSE	-1,470 [0,071]	CTA = RTA
> 1.220	-2,890 [0,002]	CNI > RNI	-0,854 [0,197]	CSE= RSE	-1,100 [0,136]	CTA = RTA

Legend: (a) Shareholders' equity in millions of reais.

For companies without segregation analysis (Table 6), the Wilcoxon test indicated that in the years 2009 and 2010, corporate net income was higher than regulatory one.

In turn, with a probability greater than 0.05, the average corporate and regulatory total assets were statistically equal in both years. The same situation occurred in relation to average shareholders' equity. In reference to the average net income, the corporate one was higher than regulatory one in both years. When we separately analyzed the companies according to shareholders' equity size (Table 7), the results of the Wilcoxon test show that:

- There were no significant differences between corporate and regulatory average net income and shareholders' equity for companies that have up to 63 million dollars of shareholders' equity.
- Regardless of the size of shareholders' equity, corporate and regulatory total assets were statistically identical in both years.
- With the exception of 2009, for companies that have shareholders' equity between 63 and 345 million reais, there were no significant differences between the corporate and regulatory equity.
- Companies with shareholders' equity exceeding 345 million reais showed higher corporate net income higher than regulatory net income.

After analysis of the behavior of the variables net income, shareholders' equity, and total assets, we analyzed the behavior of returns on equity and on total assets. As explained in the Methodology section, only twenty companies had information available for the period between 2000 and 2010. Table 8 shows the correlations between the ROE_t and ROE_{t-1} variables and between the ROA_t and ROA_{t-1} variables.

Table 8. Correlation between returns in periods t and t–1, between 2000 and 2008.

ROE_t ´ ROE_{t-1}				ROA_t ´ ROA_{t-1}			
Company	**Correlation**	**Company**	**Correlation**	**Company**	**Correlation**	**Company**	**Correlation**
COELBA	0,924 [0,001][1]	BE	0,535 [0,172][3]	CPFL-PA	0,864 [0,006][1]	BE	0,502 [0,205][3]
CPFL-PA	0,903 [0,002][1]	CEMAT	0,280 [0,501][4]	RGE	0,863 [0,006][1]	AES-SUL	-0,707 [0,050][1]
RGE	0,816 [0,013][1]	CELG-D	0,278 [0,506][4]	CEEE-GT	0,653 [0,079][2]	CELPE	-0,596 [0,119][3]
COSERN	0,582 [0,130][3]	ELEKTRO	0,268 [0,521][4]	CHESF	0,574 [0,136][3]	CELPA	-0,550 [0,158][3]
CHESF	0,560 [0,149][3]	Others	[>0,537][4]	CEMAR	0,504 [0,203][3]	Others	[>0,281][4]

Legend: (a) Significant at 5%. (b) Significant at 10%. (c) Significant at 25%. (d) Not significant.

After analyzing the correlations previously reported, we found that:

- In relation to ROE, only six companies showed a tendency to increase, that is, the correlation was significant and positive. The other companies showed no significant correlation, precluding identification of the behavior of their returns.
- In relation to ROA, six companies showed positive and significant correlations, which means that their returns showed a growth trend. Three companies presented negative correlations, in that their returns showed a tendency to decrease. Similar to what occurred in relation to ROE, the other companies showed no significant correlation, so we were not able to determine the trend of the others.

We grouped the companies into six series (four with growth trends and two with decreasing trends). We identified the presence of outliers and eliminated the observations of standardized residuals that were higher, in module, by two standard deviations. Regarding the series of ROEs, the Companhia Paulista de Força e Luz was considered as an outlier and was thus removed from the series. Regarding the series of ROAs with trend growth, the Companhia Energética do Maranhão was considered an outlier and was thus removed from that series. No outliers were detected in the series of ROAs with decreasing trends.

Table 9. Tests for defining the regression model

Series	**Tests: Statistic / [Probability]**			**Model**
	F	**Breusch-Pagan**	**Hausman**	
Corporate ROE	0,233 [0,946]	2,063 [0,151]	1,320 [0,251]	Polled regression
Regulatory ROE	0,452 [0,810]	1,190 [0,275]	2,561 [0,110]	Polled regression
Corporate ROA – Growth	0,036 [0,999]	3,116 [0,078]	0,201 [0,654]	Polled regression
Regulatory ROA– Growth	0,031 [0,999]	3,143 [0,076]	0,175 [0,675]	Polled regression
Corporate ROA – Decreasing	0,009 [0,991]	1,643 [0,200]	Not performed	Polled regression
Regulatory ROA – Decreasing	0,007 [0,993]	1,649 [0,199]	Not performed	Polled regression

Table 9 shows the results of tests performed for determining the model that best fit the data. Considering a significance level of 5%, the test results led us to use pooled regression in all six series. Tables 10–12 display the results of the regressions performed. We did not conduct Hausman tests for the series of ROAs with decreasing trend, based on the number of observations.

Table 10. Results of regressions involving the ROE

Series	Variable: Coefficient / [Probability]				
	m_i	ROE_{t-1}	$D02$	$D10$	$D10 \times ROE_{t-1}$
Corporate ROE	0,367 [0,000][4]	0,744 [0,000][4]	-0,124 [0,001][4]	0,107 [0,000][4]	-0,311 [0,000][4]
Regulatory ROE	0,401 [0,000][4]	0,687 [0,000][4]	-0,123 [0,001][4]	0,104 [0,000][4]	-0,223 [0,001][4]

Series	Adjusted R^2	Test: Statistic / [Probability]			
		B-G[1]	B-P-G[2]	J-B[3]	Reset
Corporate ROE	0,865	0,360 [0,835]	4,862 [0,410]	5,060 [0,080]	3,384 [0,184]
Regulatory ROE	0,857	1,303 [0,521]	5,812 [0,325]	2,284 [0,319]	1,303 [0,282]

Legend: (a) LM test of Breusch-Godfrey. (b) LM test of Breusch-Pagan-Godfrey. (c) Jarque-Bera test. (d) Significant to 5%.

Table 11. Results of regressions involving ROA, with growth trend

Series	Variable: Coefficient / [Probability]				
	t_i	ROA_{t-1}	$D02$	$D09$	$D09 \times ROA_{t-1}$
Corporate ROA	0,404 [0,000][4]	0,699 [0,000][4]	-0,025 [0,030][4]	-0,078 [0,003][4]	0,629 [0,000][4]
Regulatory ROA	0,414 [0,000][4]	0,717 [0,000][4]	-0,025 [0,027][4]	0,004 [0,912]	-0,178 [0,406]

Series	Adjusted R^2	Test: Statistic / [Probability]			
		B-G[1]	B-P-G[2]	J-B[3]	Reset
Corporate ROA	0,757	2,140 [0,343]	1,477 [0,916]	0,225 [0,894]	0,106 [0,900]
Regulatory ROA	0,805	1,814 [0,175]	1,827 [0,872]	0,131 [0,937]	0,148 [0,863]

Legend: (a) LM test of Breusch-Godfrey. (b) LM test of Breusch-Pagan-Godfrey. (c) Jarque-Bera test. (d) Significant to 5%.

Table 12. Results of regressions involving ROA, with decreasing trend

Series	Variable: Coefficient / [Probability]				
	t_i	ROA_{t-1}	$D02$	$D09$	$D09 \times ROA_{t-1}$
Corporate ROA	1,377 [0,000][4]	-0,417 [0,020][4]	-0,097 [0,039][4]	-0,037 [0,667]	0,744 [0,286]
Regulatory ROA	1,402 [0,000][4]	-0,414 [0,022][4]	-0,098 [0,040][4]	-0,042 [0,633]	0,574 [0,413]

Series	Adjusted R^2	Test: Statistic / [Probability]			
		B-G[1]	B-P-G[2]	J-B[3]	Reset
Corporate ROA	0,469	1,043 [0,370]	5,411 [0,610]	2,704 [0,259]	0,019 [0,981]
Regulatory ROA	0,437	1,329 [0,286]	5,057 [0,653]	2,228 [0,328]	0,162 [0,852]

Legend: (a) LM test of Breusch-Godfrey. (b) LM test of Breusch-Pagan-Godfrey. (c) Jarque-Bera test. (d) Significant to 5%.

The following regressors were not significant and were removed from the model: the constant in all regressions, the variables D09 and D09 • ROE_{t-1}, in regressions with the series of ROEs, and the variables D10 and D10 • ROA_{t-1}, in regressions with the series of ROAs. Auxiliary tests reported that residues have normal distribution, that they are homoscedastic, and that they are not auto-correlated. Auxiliary tests also reported that there was no specification error in the regressive models. Thus, the results of the regressions are considered valid. The models' explanatory power was greater than 75% in the first four regressions and greater than 43% in the last two regressions.

In the corporate ROE series, considering a significance level of 5%, the independent variables that composed the regression model were considered significant. The variable D02 showed a coefficient of -0.124, which confirms the assumption that the companies' returns were affected in 2002, as previously explained. The variable D10 showed a coefficient of 0.107, which confirms that the new accounting standards, particularly IFRIC 12, caused a break in the behavior of the series in 2010. The variable D10 • ROE_{t-1} showed a coefficient of -0.311, which confirms a trend of slowing growth in the series as a result of new corporate norms. The equation of the final regression model was:

$$ROE_t = 0{,}367\mu_i + 0{,}744ROE_{t-1} - 0{,}124D02 + 0{,}107D10 - 0{,}311D10 \cdot ROE_{t-1} + \varepsilon_t \quad (5)$$

In the regulatory ROE regression series, all independent variables were also considered significant at a level of 5%. Similarly to the previous series, the variables D02 and D10, with coefficients equal to -0.123 and 0.104, respectively, demonstrated the existence of breaks in the series in 2002 and 2010. The 2010 result indicates that new regulatory standards changed the behavior of the series from that year. The variable ROE_{t-1} • D10 showed a coefficient of -0.223, which confirms that there is a trend of slowing growth in the series. The equation of the final regression model was:

$$ROE_t = 0{,}401\mu_i + 0{,}687ROE_{t-1} - 0{,}123D02 + 0{,}104D10 - 0{,}223D10 \cdot ROE_{t-1} + \varepsilon_t \quad (6)$$

In the corporate ROA series with trend growth, all independent variables were significant, considering a significance level of 5%. Again, the crises affected returns in 2002 (coefficient -0.025). However, the break in this series occurred in 2009 and not in 2010, as in the series of ROEs. Moreover, this change did not continue in 2010, for which the variables were not significant. The variable D09 • ROA_{t-1}, with a coefficient of 0.629, shows that there was accelerated growth in 2009. However the series returned to its default in 2010. The equation of the final regression model was:

$$ROA_t = 0{,}404\tau_i + 0{,}699ROA_{t-1} - 0{,}025D02 - 0{,}078D09 + 0{,}629D09 \cdot ROA_{t-1} + \eta_t \quad (7)$$

In the regulatory ROA growth trend series, variables D09 and D09 • ROA_{t-1} were not statistically significant at level of 5%. This implies that the regulatory standards did not impact the behavior of the series. As in the previous series, a break occurred in 2002. The equation of the final regression model was:

$$ROA_t = 0{,}414\tau_i + 0{,}717ROA_{t-1} - 0{,}025D02 + \eta_t \quad (8)$$

In the series of corporate and regulatory ROAs with decreasing trend, variables D09 and D09 • ROA_{t-1} were not statistically significant at a significance level of 5%. This implies that neither sets of standards impacted the behavior of the series. As happened in the previous series, a break occurred in 2002.

Table 13 shows the results of t tests for the comparison of regression coefficients of the corporate and regulatory series. As no changes were identified in equations 9 and 10, we excluded them from this test.

Table 13. Comparison of the regression coefficients of the series corporate and regulatory ROE and ROA

Equations	**Variable / Statistic t / [Probability]**				
5 e 6 – ROEs	m_i	ROE_{t-1}	$D02$	$D10$	$D10 \times ROE_{t-1}$
	-15,317 [0,000]	25,305 [0,000]	-0,652 [0,161]	16,073 [0,000]	-44,237 [0,000]
7 e 8 – ROAs	t_i	ROA_{t-1}	$D02$	$D09$	$D09 \times ROA_{t-1}$
	-4,100 [0,000]	-7,440 [0,000]	2,411 [0,011]	-101,09 [0,000]	155,08 [0,000]

Results of Student t tests show that:

- In relation to ROE: The corporate series' coefficients of the variables D10 and D10 • ROE_{t-1} were superior in modulus to the regulatory series ones. This implies different impacts in the series and a tendency for higher deceleration of the ROE in corporate series.
- In relation to ROA with growth trend: The corporate series' coefficients of variables were superior in modulus to the regulatory series' coefficients. This implies different impacts in the series and more rapid growth of the corporate series' ROA in 2009. This situation was not repeated in 2010, during which the series returned to the initial trend.

5 Conclusions

Corporate accounting standards and regulatory accounting standards in the electricity sector of Brazil changed in 2009 and 2010. These changes impacted the accounting choices of companies in the Brazilian electricity sector. In theory, these corporate changes sought to present more relevant information to investors. Regulatory changes made more transparent the process of tariff formation and its associated accounting numbers. The process regulation is not a hermetically sealed process, wherein the regulator chooses the best option while considering the collective wellbeing. The concessionaires, especially large corporations, seek to reduce their politic costs by influencing the regulators whose accounting practices allow lower profits. From the corporate point of view, the present concessionaires seek higher profits to attract or retain investors.

The results of our initial tests of 62 companies showed that the regulatory net income were lower than the corporate ones in the years 2009 and 2010. When we separately analyzed the size of the equity, the concessionaires with a net worth of more than 345 million reais continued to show this trend. This evidence supports the hypothesis of the political costs proposed by Watts and Zimmerman (1978) and initially supports the basic hypothesis of this research.

However, we found that corporate and regulatory shareholders' equity and total assets were statistically the same for the whole company in both analyzed years, especially for those whose net worth was in excess of 345 million real. This finding contradicts our basic hypothesis. We demonstrated that, in the early years of corporate accounting standards, IFRIC 12 did not significantly alter these items quantitatively, when compared with regulatory information, which is similar to the former Brazilian corporate accounting standards.

The results of the regressions showed that, from the year 2010, it was possible to identify changes in the behavior of the ROEs for these companies. The corporate accounting model caused greater impact on those returns, indicating a likely deceleration of growth of such returns from that year. Regarding the ROAs series with trend growth, it there were changes only in 2009 and no continuity in the following year, thus the corporate model caused more impact in those returns. These results lead us to reject our hypothesis and to conclude that the regulatory accounting practices did not intensely alter the returns of Brazilian electricity sector concessionaires, when compared to corporate practices. This conclusion is not in conflict with the hypothesis of the political costs. If the regulator chooses an accounting model that results in lower profits, then the model shows changes in returns. The reason for the choice is irrelevant, whether it is due to technical reasons (e.g. the corporate model is deemed economically unrealistic for non-restatement of fixed assets), to social pressures, or to lobbying. However, such changes are probably smaller than those induced by the new corporate accounting model and, in particular, by accounting models contained in IFRIC 12.

This research has major limitations. For changes that recently occurred, it is necessary to observe the behavior of the variables in the following years to confirm whether or not the trends occur. As a function of limiting access to the data of companies from the original sample, as well as the lack of identification of the trend of returns of companies that comprised the second sample, the results should be analyzed in the regressions and generalized carefully. No analyses used classifications by type of activity (i.e. generation, transmission, distribution). Finally, we used only one regression model for analysis of returns. We suggest, therefore, continuing this research when it is possible to increase the number of observations for longer and include more companies and other return regression models. It would be possible to use other segregation criteria for concessionaires besides the size of shareholders' equity, such as the type of activity.

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