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Editorial

Dear Readers,

On the last 26 of March we regretfully lost one of the members of the Scientific Editorial Body of the Journal of Education and Research in Accounting (REPeC), **Professor Dr. Lino Martins da Silva**. We will certainly miss his teachings each time we had a discussion regarding the articles that involved the area of Applied Accounting in the Public Sector. Considering that the Editorial Body is made up of professors of the Post-Grad Programs in Accounting Sciences in Brazil, we sought another professor of Masters in UERJ (course where Prof. Lino was linked to) and the name indicated to replenish the Scientific Editorial Body of REPeC was that of **Professor Dr. Waldir Jorge Ladeira dos Santos**, also of the area of Public Accounting.

In this Volume no. 7, Edition no. 2, of April to June of 2013, we have articles that involve different areas of Accounting, as seen as follows.

With the objective of verifying if there were significant statistical accounting indicators after the Law no. 11,638 (2007), the first article was published with the name **"Reflection of the Law no. 11,638/07 in the accounting indicators of textile companies listed in the BM&FBovespa",** of the authors *Paulo Roberto da Cunha, Vanderlei dos Santos, Nelson Hein* and *Ricardo Luiz Wust Correa de Lyra*.

The second article, written by Eliandro Schvirck, Rogério João Lunkes and Valdirene Gasparetto, entitled "Information Disclosure per Operator Segment: a Panorama of application of CPC 22", sought to trace a panorama of the disclosure of segments in the financial demonstrations of the open companies that operate in Brazil, published in 2010, the first year of the CPC 22.

The following work, of the authors *Magdalena Inglês da Costa, Luciana Silva Torres, Alessandra Carvalho de Vasconcelos* and *Márcia Martins Mendes De Luca*, entitled **"Classification of the Contents of Sustainability Reports in Companies Winners of Socioenvironmental Accountability Awards"**, aimed at analyzing the content of the disclosure of information on the dimension of corporate sustainability – economic, social and environmental – in the reports of companies rewarded for their practices of socio-environmental responsibility.

The fourth publication is about the **"Costs Systems: Relevance, Feasibility and Usefulness According to Public Officials in the State of Paraná (Brazil)"**, authored by *Luciane Maria Gonçalves Franco, Cristiano do Nascimento, Márcia Maria dos Santos Bortolocci Espejo* and *Simone Bernardes Voese*, that meant to identify the level of understanding and of adoption pertaining to the costs systems of the municipalities of Paraná.

The fifth article, with the title of **"Investment Strategy Based on Aviation Accidents: Are There Abnormal Returns?"**, of the authors *Marcos Rosa Costa, Fernando Caio Galdi* and *Silvania Neris Nossa*, investigated if a strategy of investments based on airplane accidents would generate abnormal returns through a study of events, considering all of the airplane accidents occurred between 1998 and 2009.

The last article of this edition, entitled **"Continuity and Inclusion of Actors in Scientific Production in Accounting between 1994 and 2009"**, authored by *Silvana Anita Walter, Tatiana Marceda Bach* and *Maria José Carvalho de Souza Domingues*, sought to verify, under a longitudinal perspective (1994-2009), the role played by the authors in the development of Brazilian scientific production in Accounting, through a bibliometric and sociometric research.

We emphasize that all of the articles were assessed in the double blind and review system, and always when necessary, one or another member of the Editorial Body are consulted for the final decision for publication. At last, I would like to thank everyone involved in this edition process, especially to the ad hoc reviewers and the authors for having trusted in this journal.

To all, good reading!

Prof. Dr. Valcemiro Nossa
General Editor

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Reflections Of Law 11.638/07 In The Accounting Indicators Of Textile Companies Listed On BM&FBovespa

Abstract

In December 2007, Law 11.638 (2007) was enacted in Brazil, which altered the Corporate Law. This law imposed significant changes, including the adoption of the Brazilian accounting standards in accordance with international standards, which implies different changes in the financial statements. According to this perception of changes in the financial statements, changes can also take place in the accounting indicators used for the purpose of financial statement analysis. In that context, in this paper, the aim is to verify whether Law 11.638 (2007) entailed statistically significant reflections in the accounting indicators. A descriptive study was undertaken with a quantitative approach. Data were collected from the Standardized Financial Statements (SFSs) for the period from 2000 till 2008, available on the website of the Brazilian Securities Commission (CVM). The convenience sample consisted of 16 companies listed on BM&FBovespa, classified in the cyclical consumption sector, in the subsector tissue, clothing and footwear, under the ply and tissue segment, with all SFSs in the period under study. Statistical linear regression techniques were applied based on the Koyck Model and the canonical correlation model. The results showed that a statistically significant canonical correlation exists between the accounting indicators in force before Law 11.638 (2007) and the accounting indicators after the same law came into force. In general, according to the companies analyzed, it is concluded that the accounting indicators underwent no statistically significant alterations as a result of the elaboration of the financial statements in compliance with the premises of Law 11.638 (2007).

Key words: Accounting indicators, Law 11.638 (2007); Canonical correlation; Koyck Model.

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1. Introduction

In December 2007, Law 11.638 (2007) was enacted in Brazil, which changed corporate law. The law imposed significant changes, including the adoption of the Brazilian accounting standards in compliance with the International Financial Reporting Standards (IFRS).

This new law creates conditions for Brazilian accounting standards and practices, applicable to the individual financial statements of joint-stock companies, to converge with international accounting practices (PriceWaterhouseCoopers [PWC], (2008). Law 11.638 (2007) contains several points of convergence with the IFRS, even if they mean neither their immediate adoption, nor complete convergence between Brazilian and international practices, but represent an important step towards the alignment of accounting practices.

In Brazil, with a view to the successful adoption of the IFRS as from 2010, some efforts and measures were taken and are ongoing. In 2005, through CFC Resolution 1.055 (2005), the Federal Accounting Council created the Accounting Pronouncements Committee (CPC). The mission of the CPC is to study, prepare and issue technical pronouncements about accounting issues in the intent to establish Brazilian accounting criteria that converge with international standards. In that sense, different pronouncements have been issued, as highlighted in Figure 1.

CPC	Description	CVM Deliberation	IFRS standard
01	Impairment of assets	611/09	IAS 36
02	The effects of changes in foreign exchange rates and the conversion of financial statements	534/08 and 624/10	IAS 21
03	Statement of cash flows	547/08 and 624/10	IAS 7
04	Intangible assets	553/08	IAS 38
05	Related party disclosures	560/08	IAS 24
06	Leases	554/08	IAS 17
07	Accounting for government grants and disclosure of government assistance	555/08	IAS 20
08	Transaction cost and premiums on the issuing of bonds and securities	556/08	Part 39
09	Statement of value added	557/08	No correspondence
10	Share-based payment	562/08	IFRS 2
11	Insurance contracts	563/08	IFRS 4
12	Adjustment at present value	564/08	Various
13	Initial adoption of law 11.638/07 and Provisional Measure 449/08	565/08	No correspondence
14	Financial instruments: recognition, measurement and disclosure	566/09	Revoked. Corresponds to OCPC 03
15	Business combinations	580/09 and 665/11	IFRS 3
16	Inventories	575/09 and 624/10	IAS 2
17	Construction contracts	576/09	IAS 11
18	Investments in associates	605/09	IAS 28
19	Investment in joint ventures	606/09 and 666/11	IAS 31
20	Borrowing costs	577/09 and 672/11	IAS 23
21	Interim financial reporting	581/09 and 673/11	IAS 34
22	Operating segments	582/09	IFRS 8
23	Accounting policies, changes in accounting estimates and errors	592/09	IAS 8
24	Events after the reporting period	593/09	IAS 10

CPC	Description	CVM Deliberation	IFRS standard
25	Provisions, contingent liabilities and contingent assets	594/09	IAS 37
26	Presentation of financial statements	595/09, 624/10 and 676/11	IAS 1
27	Property, plant and equipment	583/09	IAS 16
28	Investment property	584/09	IAS 40
29	Agriculture	596/09	IAS 41
30	Revenue	597/09	IAS 18
31	Non-current assets held for sale and discontinued operations	598/09	IFRS 5
32	Income taxes	599/09	IAS 12
33	Employee benefits	600/09	IAS 19
35	Separated financial statements	607/09 and 667/11	IAS 27
36	Consolidated financial statements	608/09, 624/10 and 668/11	IAS 27
37	Initial adoption of international accounting standards	609/09	IFRS 1
38	Financial instruments: recognition and measurement	604/09	IAS 39
39	Financial instruments: presentation	604/09	IAS 32
40	Financial instruments: disclosure	604/09	IFRS 7
41	Earnings per share	636/10	IAS 33
43	First-time adoption of CPC technical pronouncements 15 till 40	610/09	IFRS 1
	CPC PME – Accounting for small and medium-sized companies	No correspondence	No correspondence

Figure 1. CPC Pronouncements

Source: Accounting Pronouncements Committee (2010).

The pronouncements and other technical orientations by the CPC can be used either fully or partially, as described in Law 11.638 (2007), by the Brazilian Securities Commission (CVM), the Brazilian Central Bank (Bacen) and other regulatory entities and agencies. In view of previously sanctioned pronouncements towards the convergence with international standards, the financial statements will clearly undergo changes, due to new ways of recognizing, measuring and disclosing assets and liabilities.

One aspect inherent in the financial statements is the premise of comparability. Lage and Weffort (2009, p. 5) highlight that "users should be able to compare an entity's financial statements over time, with a view to identifying trends in its financial position and performance". Lage and Weffort (2009, p. 5) add that "as the users want to compare the financial position, performance and changes in financial position over time, it is important for the financial statements to include corresponding information from earlier periods".

In the same sense of changes in the financial statements, changes can also occur in the accounting indicators used in balance sheet analysis. The aim of balance sheet analysis is to establish an idea about the company's performance over a certain period and to extract information that helps to make projections about an entity's future, in addition to others (Martins, 2005).

For the purpose of balance sheet analysis, different indicators can be used, such as liquidity, indebtedness, profitability and activity (Matarazzo, 1998; Assaf Neto 2002; Gitman, 2005; Iudícibus, 2009; Marion, 2012). Different accounting indicators exist that permit the analysis of balance sheets. Lyra (2008) undertook a study to develop and analysis an instrument for the valuation and comparison of companies' economic-financial performance, based on the association between accounting indicators and analysts' expertise.

To reach the proposed objective, the author elaborated a list of the indicators scored in the yearbook *Melhores e Maiores*, in addition to the indicators resulting from the application of the statistical technique factor analysis and other indicators mentioned in the research bibliography, as important to assess corporate performance. Lyra (2008) selected indicators based on experts' replies through the application of three Delphi rounds, with a view to the establishment of a hierarchical structure among these indica-

tors. The result was the selection and ranking of seven indicators, with an acceptable degree of consensus among the experts' responses, which were: 1) Return on equity; 2) Return on assets; 3) Sales growth; 4) Current liquidity; 5) Indebtedness composition; 6) Net margin and 7) Asset turnover. For the sake of this research, the accounting indicators highlighted in Lyra's research will be used (2008).

In view of the changes in the financial statements as a result of Brazil's convergence with the international accounting standards and the fact that these changes can affect the accounting indicators and, consequently, the balance sheet analysis, the following problem is raised: *Did Law 11.638 (2007) entail statistically significant reflections in the accounting indicators?* Thus, the general objective is to verify whether Law 11.638 (2007) caused statistically significant influences in the accounting indicators.

The paper is structured in five topics, starting with this introduction. Next, a theoretical incursion is made, addressing the aims of financial statement analysis, followed by the explanation of the analysis through indicators and research on the theme. Then, the research method and procedures are described, followed by the description and analysis of the data. Finally, the conclusions of this research are presented.

2. Financial statement analysis

A literature overview reveals that several authors observe the importance of financial statement analysis, also called balance sheet analysis or financial analysis. Matarazzo (1998, p. 17) mentions that "the analysis of balance sheets is aimed at extracting information from the financial statements for the purpose of decision making".

By using the expression "balance sheet analysis", the author is referring to the analysis of the financial statements themselves, including the balance sheet, income statement, cash flow statement etc. The same author highlights that the aim of balance sheet analysis is to produce information. To give an example, the financial statements can disclose that a certain company has R$ Y thousand in debts. The financial analysis shows whether this debt is excessive or normal when compared to the sector, and also informs whether the company can pay it or not (Matarazzo, 1998).

Silva (2005) comments that, with a view to the financial analysis of a company, the information taken from its financial statements is used, as well as any available knowledge on the organization and the segment it is active in, so as to understand and assess aspects related to the company's payment capacity through its cash generation; ability to remunerate investors; making profit at levels that are compatible with their expectations; indebtedness level, reason and quality of indebtedness; operational policies and their impacts on the company's need for working capital and the impact of strategic decisions related to investments and funding.

The financial statement analysis technique is one way to assess the economic-financial performance, aiming to present the company managers with information that is of help in the decision-making process (Bortoluzzi, Lyrio & Ensslin, 2008).

Therefore, as observed, through financial statement analysis, information can be extracted that is relevant for organizational decision making, as it permits inferences about the companies' economic, financial and equity situation.

Martins (2005) provides invaluable instructions on what is necessary to develop a good analysis of the financial statements. First, one needs to know much more about accounting than one can image. Martins (2005) comments that "the number of mistaken conclusions due to lack of knowledge about the accounting foundations used in certain cases is truly noticeable".

Martins (2005) gives a step-by-step description of the procedures needed for an analysis. The first step is the analysis of the audit opinion, in view of the risk of reaching certain conclusions to discover, when reading the opinion at the end, the amount of nonsense concluded and the time lost.

The second step Martins (2005, p. 6) proposes is to "get to know the company's business and the accounting foundations it uses". The author highlights that, if one does not know how the business works

in a company and/or what accounting rules are applicable to this organization, one should not analyze its statements. Before analyzing a given company's statements, it is fundamental to know the business and the accounting criteria it uses.

The third step is that any analysis boils down to two main objectives: to know companies' liquidity and profitability. The aim of liquidity is to verify the company's ability to honor its financial commitments to all of its creditors. Liquidity can be analyzed in the short, medium, long term etc. Profitability analysis, on the other hand, is aimed at verifying whether the company effectively remunerates the capital it uses, mainly its own capital (Martins, 2005b).

Martins (2005b) alerts to the fact that both the inability to remunerate the company's own capital and to settle its obligations can put an end to an organization. The author highlights that other indicators are considered in the financial analysis, but that these are all secondary instruments that help to check liquidity and profitability. The fourth step proposed in financial analysis is to take special care with problems concerning the relations among magnitudes and certain "embellishing" operations".

To assess different company aspects, some forms of analysis instruments exist, including: horizontal analysis, vertical analysis, indicator-based analysis, dynamic analysis of working capital, bankruptcy forecasting models, among others. The literature review reveals authors who adopt the terminology balance-sheet or financial indices (Matarazzo, 1998; Gitman, 2005; Silva, 2007; Souza, 2007; Guth, Pinto, Fernandes & Rocha, 2008; Marion 2012), quotients (Souza, 2007; Iudícibus, 2009); Marion, 2012); economic-financial indicators (Assaf Neto, 2002) and accounting indicators (Lyra, 2008) when mentioning indicator-based balance sheet analysis.

In this study, the terminology accounting indicators is used. When citing different authors, however, the terminologies mentioned above can be used to maintain the original citation.

2.1 Analysis based on accounting indicators

The analysis based on accounting indicators includes the calculation of proportions that relate various amounts expressed in the financial statements. According to Silva (2005), the analysis based on indices is the best known, and is even mixed up with balance sheet analysis. That author states that indicators are relations between accounts or account groups in the financial statements, which are aimed at providing information that is not easy to observe directly in the statements.

Matarazzo (1998) mentions that the indices are the most used analysis technique in which, often, in practice or even in some books, balance sheet analysis is mixed up with the extraction of indices. The essential characteristic of indices is to provide a comprehensive view of the company's economic or financial situation.

According to Souza (2007, p. 56), "indices or quotients facilitate the analyst's work, making it easier and more relevant to value certain relations or percentages than amounts only".

Lyra (2008, p.34) mentions that "the aim of accounting indicators is to measure, compare and project economic, financial or equity performances. The indicators selected need to characterize the corporate situations under analysis though".

The basic aspects the indicators should contain are: objectivity, measurability, understandability and comparability. Objectivity permits their assessment. The measurability aspect means that the indicators need to be quantifiable on a certain scale. Concerning the understandability criterion, the indicators need to have an understandable meaning. In addition, comparisons should be possible over time as well as among companies (Lyra, 2008).

There is no exact or ideal quantity of indices to use in financial statement analysis. According to Matarazzo (1998) "what is important is not to calculate a large number of indices, but a set of indices that permits knowing the company's situation according to the desired level of depth in the analysis". The author also highlights that "the analysis of indices belongs to the kind that starts very will and gradually runs out of steam as new indices are added, that is, its output decreases".

Iudícibus (1998) agrees with Matarazzo, informing that it is much more useful to consistently calculate a certain quantity of indicators, from period to period, and to compare them with pre-established standards, and then verify what problems deserve further investigation, than to calculate tens and tens of indicators, without any mutual correlation, without comparisons, and to intend to attribute an absolute focus and meaning to those indicators.

Therefore, the adoption of different indicators does not mean a more sophisticated or better analysis. On the opposite, it can even be harmful. How many indices to use essentially depends on the information the analyst wants to obtain from the company.

As regards the group of financial indices, Guth, Pinto, Fernandes and Rocha (2008) undertook a literature review and found that, although the different authors share some points, it was verified that some differences exist in their groupings, as illustrated in Figure 2:

Groups of Financial Indicatores	Assaf Neto	Brigham e Houston	Gitman	Iudícibus	Marion	Matarazzo
Activity	X	X	X	X	X	X
Stock analysis	X		X			
Indebtedness/Capital structure	X	X	X	X	X	X
Liquidity	X	X	X	X	X	X
Profitability	X	X	X	X	X	X
Market value		X	X			

Figure 2. Group of financial indicators

Source: Guth, Pinto, Fernandes and Rocha (2008).

The liquidity indicators reveal the organization's degree of solvency as a result of the existence or not of financial solidity to guarantee the payment of the commitments assumed with third parties in the long, short or immediate term (Souza, 2007). Silva (2005) mentions that liquidity indices are aimed at strengthening the company's ability to pay its debts, based on the comparison between rights and liabilities. The following liquidity indicators are known in the literature: general liquidity, current liquidity, quick ratio and immediate liquidity. The main criticism against these indices is that they give a static picture of the company's situation, without any details on the settlement dates for receivables and payables. According to Assaf Neto (2002), the aim of the liquidity indicators is to get to know the organization's ability to comply with its liabilities on time. As the main constraint, however, the author highlights the fact that the organization is presented in a static position, which does not reflect the magnitude of the different currents inflows and outflows.

Concerning the indebtedness rates or capital structure, the proportion of own or third-party resources the organization maintains can be detected. Guth, Pinto, Fernandes and Rocha (2008) mention "it is through these indicators that the company's level of indebtedness is valued, that is, these indicators inform whether the company makes more use of resources from third parties or the owners. The indicators that belong to this group are: general indebtedness, interest of capital from third parties, indebtedness composition, index of immobilized equity, immobilized fixed assets, immobilized non-current resources and interest coverage index (Lyra, 2008).

The profitability indices serve to measure the company's economic capacity, that is, they disclose the degree of economic success the capital invested in the company obtains. They are calculated based on values taken from the income statement and balance sheet (Souza, 2007). These indices show the return on the capital invested. The main indicators used to verify company profitability are: return on equity, return on assets, gross margin, net margin and asset turnover.

The activity indices measure how efficiently the organization uses its assets, as they are directly related to the operating cycle by calculating the stock turnover and the trade notes receivable and payable (Sato, 2007).

It is highlighted that, in this research, the authors do not intend to detail each index, as they have already been explained more than appropriately in the literature. The authors emphasize, however, that they are studied in plenty of academic research, mainly using statistical tools or relating them with a new theme. In this study, statistically significant reflections were found in the accounting indicators after the enactment of Law 11.638 (2007).

2.2 Impact of the international accounting standards on the accounting indicators

On December 28th 2007, Law 11.638 was enacted, which altered, revoked and introduced new determinations into Corporate Law, mainly in chapter XV, about accounting matters, which came into force as from 01/01/2008. The main aim of this Law was to update Brazilian financial legislation to permit the convergence process of the accounting standards adopted in Brazil with the International Financial Reporting Standards (IFRS); and to allow the Brazilian Securities Commission (CVM0 to issue new accounting standards and procedures in accordance with the international accounting standards (Iudícibus, Martins & Gelbcke, 2008).

Law 11.638 (2007) entailed important changes in the accounting standards, including modifications in the following aspects: in the compulsory financial statements, in bookkeeping, in the equity account group and its valuation criteria, in the structure of the Income Statement (DRE), in the replacement of the Statement of Changes in Financial Position (DOAR) by the Cash-Flow Statement (DFC), in the inclusion of the Statement of Value Added (DVA), in the constitution and treatment of reserves, in transformations, incorporations, mergers and split-ups and their accounting registers, in the valuation of investments in associated and controlled companies and their accounting treatment (Sothe & Cunha, 2008).

In this study, a statistically significant impact is verified in a group of accounting indicators for 2008 (start of the alterations) when compared to the same group of indicators between 2000 and 2007. In Figure 3, the main legal changes introduced in 2008 are summarized, which can influence the accounting indicators:

Changed Accounting Practices		Effects In Consolidated Financial Statements	
		Balance Sheet	Income Statement
Adjustment at present value (CPC 12)	Relevant current and long-term assets are registered at their present value on the transaction date, using the contracted or implicit rate.	↓ Relevant current assets Relevant current liabilities Long-term assets Long-term liabilities	↑ Financial revenues Financial expenses ↓ Gross revenue Operational costs and expenses
Leases (CPC 06)	In the lessee, the leased good needs to be classified as a Fixed Asset at the present value of the minimum installments of the financial leasing, adjusted by the accumulated depreciation, and the obligation of its payment needs to be registered under liabilities at the present value of outstanding installments.	↑ Fixed assets Financial debt (Liability)	↑ Depreciation costs and expenses ↓ Rent costs and expenses
	In the lessor, the Fixed Asset cost of the leased good and the respective accumulated depreciation need to be written off and the right to receive needs to be registered as a Long-term Asset (Accounts receivable) at the present value of outstanding installments. The revenue has to be recognized on the transaction date and registered at its present value, while the interests need to be recognized during the contract term.	↑ Accounts receivable ↓ Fixed assets	↑ Gross revenue ↓ Depreciation costs and expenses
Transaction cost and premiums on the issuing of bonds and securities (CPC 08)	Transaction costs became registered in an account that reduces the account where the funding was registered (Liabilities or Equity) and the debt securities are accounted for at the net value of the transaction. The transaction costs, premiums and others start to be disclosed on an accrual basis.	↓ Financial debt (Liability) Equity	↓ Financial expenses
Accounting for government grants and disclosure of government assistance (CPC 07)	Government grants and assistance started to be disclosed directly in the income on an accrual basis, which used to be registered as a Capital Reserve. They can be excluded from the calculation base of compulsory dividends and destined to the Profit Reserves, in the Fiscal Incentive Reserve.	↑ Fiscal incentive reserves (Profit reserves) ↓ Capital reserves	↓ Deductions from gross revenue Cost of products or goods sold Income tax and social contribution
Asset revaluation	Law 11.638/07 prohibited the spontaneous revaluation of assets.	↓ Fixed assets Revaluation reserves	↓ Depreciation costs and expenses
Deferred Assets	Law 11.941/09 (MP 449/08) extinguished the Deferred Assets account.	↓ Deferred assets Accumulated profit	↓ Amortization expenses ↑ Operational costs and expenses
Intangible Assets (CPC 04)	Intangible Assets were created to classify identifiable non-monetary assets without physical substance, such as brands and patents, software, copyrights, internally created goodwill and goodwill paid upon expected future profitability.	↑ Intangible assets	↑ Amortization expenses

Legenda: ↑ Represents an increase in the respective account ↓ Represents a reduction in the respective account.

Figure 3. Summary of effects on the financial statements resulting from specific changes in Brazilian accounting practices

Source: Adapted from Carvalho (2010).

Figure 3 demonstrates how the new accounting practices adopted can affect accounting, in groups like assets, liabilities, revenues and expenses. For some changes, however, it cannot be determined whether their adoption will result in an increase or decrease, as this depends on the scenario the company is inserted in, as observed in Figure 4.

Changed Accounting Practices		Effects In Consolidated Financial Statements	
		Balance Sheet	Income Statement
Equity Accounting	Financial investments are valued based on equity accounting when the management of the controlling stockholder exerts significant influence in the investee's decisions, even without controlling it, or when it holds an interest of 20% or more in the voting capital of its associated or controlled companies or which are part of a same group or under common control.	△ Assets △ Liabilities △ Net equity	△ Net income
Effects of changes in foreign exchange rates and conversion of financial statements (CPC 02)	The functional currency of foreign subsidiaries of Brazilian companies is the Real, except when these subsidiaries essentially represent autonomous units. The balances of monetary equity accounts are still converted at the final rate of the period, while the balances of non-monetary equity accounts and transactions that affect the income are converted at the exchange rate on the transaction date.	△ Assets △ Liabilities △ Adjustments to equity valuation	△ Financial income △ Net income
Financial instruments (CPC 14)	New criteria were established for the valuation of financial statements, which are now classified under short and long-term assets and liabilities and distributed in three categories:: (i) held for trade, which should be valued at their fair value and registered in the income; (ii) held until maturity, which should be registered at their purchase cost or emission value plus yield adjusted at their probable realization value, plus effective interest rates; and (iii) available for sale, which should be valued at fair value, but the difference between the fair value and book value has to be registered in the adjustments to equity valuation account.	△ Assets △ Liabilities △ Adjustments to equity valuation	△ Financial income
Share-based payment (CPC 10)	Stock-based remuneration is recognized as an expense or interest when settled with equity instruments (e.g. stock or stock options) or in cash, measured at fair value, at the moment it is granted, against the Equity account Stock or Options Granted.	△ Stock or options granted (Capital reserve)	△ Other operational revenues and expenses

Legend: △ Represents an undefined variation in the respective account, which can be an increase or a reduction, depending on the context the company is inserted in.

Figure 4. Summary of probable effects in financial statements deriving from specific changes in Brazilian accounting practices

Source: Adapted from Carvalho (2010).

Figure 4 presents the Brazilian accounting practices that were altered, although their recognition and measurement influences in the balance sheet and income statement cannot be determined.

The changes in Brazilian accounting practices derive from the convergence process with international accounting standards, aiming to eliminate the divergences that cause a lack of comparability between the financial statements. In this search for convergence, existing differences in accounting practices can result in changes in accounting indicator values, as a result of changes in the recognition or valuation of assets, liabilities and income.

2.3 Earlier studies

Figure 5 displays studies about the impact of the adoption of international accounting standards on accounting indicators.

Authors	Theme addressed and results
Miranda (2008)	Identified possible impacts of the adoption of the IFRS (International Financial Reporting Standards) on the economic-financial indicators of banks in some countries in the European Union. The results showed that the IFRS affected half of the indicators tested for banks in the United Kingdom and Spain, and only one indicator calculated for banks in France. The main international standards that affected the indicators tested in the research were: IAS 27, IAS 32, IAS 39 and IFRS 4. The author concluded that the adoption of the IFRS was capable of provoking significant changes in the economic-financial indicators of banks in some countries in the European Union.
Beuren, Hein & Klann (2008)	Analyzed the impact of the differences between IFRS and the Generally Accepted Accounting Principles in the United States (US GAAP) on the economic-financial indicators of British companies. The study involved 37 British companies whose American Depositary Receipts (ADRs) are traded on the New York Stock Exchange (NYSE). The financial statements for 2005 were used which were sent to the London Stock Exchange and the NYSE. The research results identified percentage differences in the British companies' indicators, calculated based on the financial statements sent to LSE and NYSE. The regression and correlational analysis, however, indicated a significant correlation between these indicators' differences. Thus, it was concluded that the indicators are not significantly affected by the differences in accounting standards (IFRS and US GAAP).
Barbosa Neto, Dias & Pinheiro (2009)	Analyzed the impact of the presentation of financial statement according to the IFRS on the economic-financial indicators of Brazilian publicly traded companies. Through a descriptive research with a quantitative approach, the authors checked whether a correlation exists between the indicators calculated based on the financial statements elaborated according to the Brazilian standards and the IFRS. The results showed differences between the indicators calculated based on the financial statements elaborated according to each accounting standard. It was observed, however, that the influence of existing differences between the Brazilian and international standards on the economic-financial indicators is not statistically significant.
Carvalho; Ponte; Coelho & Luca, (2011)	Investigated whether the adopted of the accounting practices altered by the enactment of Law 11.638/2007 affected Brazilian companies' economic-financial indicators. Indicators were investigated related to the capital structure, working capital management, liquidity, profitability and market value. The results showed statistically significant changes in the interest of third parties in companies' capital, index of immobilized liquid assets and quick ratio. In a sectorial analysis, the authors observed changes in the behavior of indicators from companies in the construction and engineering, iron and steel, textile, electric and other sectors. They also found that no statistically significant alterations were observed in the indicators management of working capital, profitability and market value.
Braga; Araujo; Macedo & Corrar (2011)	Compared economic-financial indicators of Brazilian publicly-traded companies listed on Bovespa, considering statements for 2007 elaborated based on the "former" and "new" accounting practices adopted in Brazil. Thus, they verified whether statistically significant differences exist in the economic-financial indicators when the convergence with international standards was implemented. The study results showed significant changes (increases) in the indebtedness ratio only when the financial statements for 2007 were represented according to the new accounting practices adopted in Brazil.
Ribeiro (2011)	Investigated companies' adoption of the IFRS (International Financial Reporting Standards) and its possible impacts on the organizational and accounting context. This result was evidenced through the academic and professional perspective of faculty members at FAP and UFPI in Parnaíba/PI, using the BSC (financial and non-financial indicators) as a support and analysis model for the research. The study results showed that, according to the participants' perspective, the companies' (joint-stock companies) adoption of the IFRS strongly affects the corporate/accounting context and all financial and non-financial indicators addressed in the research.

Figure 5. Earlier studies on the impact of the adoption of the international accounting standards on accounting indicators

Source: elaborated by the authors.

As observed, these studies about the impact of the adoption of international accounting standards on the accounting indicators display conflicting results. While some showed statistically significant modifications, others did not. Therefore, the researchers hope this study will contribute to a better understanding about the theme.

3. Research method and techniques

A descriptive research with a quantitative approach was undertaken. Descriptive studies observe, register, analyze and correlate facts or phenomena (variables) without manipulating them. The intent is to discover, as precisely as possible, how frequently the phenomenon occurs, as well as its relation and connection with others and its nature and characteristics (Cervo & Bervian, 2003). In that sense, this research attempts to describe whether a statistically significant impact exists in a group of accounting indicators for 2008 when compared to the some group of indicators between 2000 and 2007.

The approach of the problem was quantitative, characterized by the use of quantification in information collection and treatment through statistical techniques, ranging from the most simple, such as percentages, means and standard deviations, to the most complex, such as correlation coefficients, regression analysis etc. (Richardson, 1989).

Concerning the data collection procedures used, a documentary research was chosen, based on the financial statements for the period from 2000 to 2008, available on the CVM website. Gil (2002) highlights that a documentary research is based on materials that were not subject to any previous analytic treatment or that can be re-elaborated in function of the research objectives.

The research population consists of the 20 companies listed on BM&FBovespa, classified in the cyclical consumption sector, in the subsector tissue, clothing and footwear, under the ply and tissue segment, consulted on May 20th 2009. A convenience sample was obtained, considering those companies whose Standardized Financial Statements (SFSs) for the period from 2000 to 2008 were available on the CVM website. Hence, the financial sample included 16 companies, described in Figure 6.

	Selected Companies
1	Buettner S.A. Ind. e Comércio
2	Cia. Ind. Schlosser S.A.
3	Dohler S.A.
4	Fábrica de Tecidos Carlos Renaux S.A.
5	Karsten S.A.
6	Teka Tecelagem Kuehnrich S.A.
7	Têxtil Renauxview S.A.
8	Cia. Fiação Tecidos Cedro Cachoeira
9	Cia. Tecidos Norte de Minas Coteminas
10	Empresa Nacional com Redito Participações S.A. Encorpar
11	Fiação Tec. São José S.A.
12	Cia. Industrial Cataguases
13	Cia. Tecidos Santanense
14	Tecblu Tecelagem Blumenau S.A.
15	Vicunha Têxtil S.A.
16	Wembley Sociedade Anônima

Figure 6. Selected Companies

Source: website BM&FBovespa (2009).

After establishing the sample, the companies' financial statements were downloaded in an Excel worksheet to calculate the accounting indicators defined by Lyra (2008), as demonstrated in Figure 7.

Indicator	Definition
Return on equity (ROE)	Result of dividing net profit by net equity.
Return on Assets (ROA)	Result of dividing operational profit before financial expenses by operational assets.
Sales growth (SG)	Evolution in gross revenues from sales.
Current liquidity (CL)	Current assets divided by current liabilities.
Indebtedness composition (IC)	Division of current liabilities by sum of current liabilities and long-term liabilities.
Net margin (NM)	Net profit divided by gross revenues from sales.
Asset turnover (AT)	Gross revenues from sales divided by total assets.

Figure 7. Definition of accounting indicators

Source: adapted from Lyra (2008).

Next, the seven indicators were calculated for the 16 sample companies, according to definitions displayed in Figure 7. After the calculations, it was verified whether any company possessed a negative equity. In these cases, to calculate the return on equity, total equity was replaced by the total subscribed capital stock.

After calculating the indicators, the bivariate linear equation from the Koyck model was applied to forecast the indicators, as described by Franses (2004), using the following equation (1).

$$\hat{Y}(t) = aX_{(t)} + b\Delta Y_{(t)} + c \quad (1)$$

In Koyck's model, the response of the dependent variable ($\hat{Y}$), which is the estimated accounting indicator for period t, occurs in function of the independent variables (X_t), i.e. the year and $\Delta Y_{(t)}$, which corresponds to the variation in the accounting indicator between period t and t-1. Through the Koyck model, the effect of these variables is distributed across different periods, considered the differentiation over time. Pineda (1999) describes the Koyck model as a bivariate linear regression that permits estimating economic results in a period based on the results reached in earlier periods and also considers the time period covered in the forecast. Thus, for each indicator described in Figure 7, equation 1 was calculated.

After calculating and processing the real indicators (obtained from the amounts taken from the financial statements) and those based on the Koyck model (through the application of equation 1), the null hypothesis (H_0) and an alternative (H_1) were established, tested through statistical analyses, as follows:

H_0: No statistically significant canonical correlation exists between the accounting indicators calculated before Law 11.638 (2007) and the accounting indicators calculated after Law 11.638 (2007) was enacted.

H_1: A statistically significant canonical correlation exists between the accounting indicators calculated before Law 11.638 (2007) and the accounting indicators calculated after Law 11.638 (2007) was enacted.

In case of evidence to accept H_0 (or lack of statistical evidence to reject H_0), it will be concluded that the accounting indicators underwent changes as a result of Law 11.638 (2007). If H_0 is rejected, one can infer that the accounting indicators did not change as a result of the elaboration of the financial statements in compliance with the premises of Law 11.638 (2007).

The analysis of canonical correlations was proposed by Hotelling (Mingoti, 2005) and its main aim is to "study existing linear relations between two sets of variables" (Mingoti, 2005, p. 143). The technique basically summarizes the information from each set of response variables in linear combinations. The choice of the coefficients in these combinations is based on the criterion of maximizing the correlation between the sets of response variables. These linear combinations built are called canonical variables, while the correlation between them is called canonical correlation. This correlation measures the degree of association that exists between two sets of variables, in this case the indicators mentioned for the textile companies. In mathematical terms, one might say that the regression is a generalization of the multiple linear regression, or a particular case of the first (Mingoti, 2005).

The two sets of variables are the seven real accounting indicators of the 16 companies for 2008 and the seven accounting indicators of the 16 companies for 2008 found through Koyck's model, both shown in Tables 2 and 3 in the data analysis topic.

Matrices $X_{16\times7}$ and $Y_{16\times7}$ illustrate the table of the 16 companies and their seven respective accounting indicators. The intent is to establish the relation:

$$a_1x_1 + a_2x_2 + a_3x_3 \ldots + a_7x_7 = b_1y_1 + b_2y_2 + b_3y_3 + \ldots + b_7y_7$$

Formally, the first pair of canonical variables is defined as the pair $U_1 = a_1x_1 + a_2x_2 + \ldots a_mx_m$ and $V_1 = b_1y_1 + b_2y_2 + \ldots + b_ny_n$ (in this case m = n = 7), in which a = [a_1, a_2, ..., a_m] and b = [b_1, b_2, ..., b_n] are vectors of constants, respectively chosen for a maximum correlation between variables U_1 and V_1 and a variance for these two variables equal to 1, that is: var(U_1) = Var(V_1) = 1. The same is true for U_2 and V_2, U_3 e V_3, ...V_k and U_k, k = 1,2,..., min(m,n).

To obtain vectors a_k and b_k, according to the literature (Seber, 1984), the following linear system should be solved:

$$\begin{cases} \left(\Sigma_{XY}\Sigma_{YY}^{-1}\Sigma_{YX} - \lambda_k\Sigma_{XX}\right)a_k = 0 \\ \left(\Sigma_{YX}\Sigma_{xx}^{-1}\Sigma_{xy} - \lambda_k\Sigma_{YY}\right)b_k = 0 \end{cases}$$

where Σ_{XX} is the variance matrix of X, Σ_{YY} the variance matrix of Y, Σ_{XY} and Σ_{YX} the covariance matrices and λ_k the k-eth highest eigenvalue of the matrix $\Sigma_{XX}^{-1}\Sigma_{XY}\Sigma_{YY}^{-1}\Sigma_{YX}$.

In this study, only U_1 and V_1 will be analyzed for each case, as these can also be interpreted as global performance indices. The other latencies will also be discussed.

The, the canonical correlations between the two sets were calculated, using Statgraphics software.

4. Description and data analysis

Initially, in Table 1, the calculation for the return on equity (ROE) indicator is demonstrated in the company Buettner. For the other indicators in the other companies, the same steps are followed. The first step was to calculate the indicator in view of a one-year time difference.

Table 1

Calculation of Buettner's ROE with one-year time difference

Ano	ROE	$\Delta ROE = ROE_t - ROE_{t-1}$
2000	0.06	–
2001	0.30	0.24
2002	(0.25)	(0.55)
2003	(2.91)	(2.66)
2004	(0.25)	2.66
2005	(1.09)	(0.84)
2006	(0.66)	0.43
2007	(0.45)	0.21
2008	(0.39)	0.06

Source: Research data.

The ROEp for the company Buettner in 2001 was calculated by discounting the ROE for 2000 (0.06) from the ROE for 2001 (0.30), resulting in an index of 0.24, and repeating the same step for the other years. After calculating this time difference, the year 2000 was removed from the database for the subsequent calculations.

After calculating the ΔROE in view of a one-year time difference, as proposed in equation 1, the regression was calculated using SPSS version 11.5. This resulted in the estimated indicator for 2008, in comparison with the real indicator that was calculated based on the SFSs, as demonstrated in Tables 2 and 3.

Table 2

Accounting indicators (ROE, ROA, SG and CL): real x expected according to Koyck's model

	ROE		ROA		SG		CL	
	Real	Koyck	Real	Koyck	Real	Koyck	Real	Koyck
Buettner	(0.39)	(0.82)	0.00	0.01	0.08	(0.01)	0.22	0.31
Dohler	0.03	0.01	–	(0.03)	0.06	0.00	5.11	5.01
Karsten	(0.85)	(0.79)	0.08	0.03	0.20	0.14	(1.53)	1.36
Renaux	(13.23)	(13.45)	(0.05)	(0.08)	0.23	0.12	0.29	0.32
Renauxview	(57.53)	(71.79)	–	(0.10)	0.15	(0.01)	0.22	0.13
Schlosser	(0.96)	(0.33)	(0.06)	(0.09)	0.45	0.37	0.13	0.12
Teka	(12.59)	(25.56)	(0.04)	(0.09)	0.03	(0.12)	0.11	(0.00)
Cedro	0.09	0.13	0.09	0.13	0.04	0.03	1.51	0.44
Coteminas	0.04	0.01	0.02	0.02	0.25	(0.21)	2.19	2.09
Encorpar	0.08	0.09	0.03	–	0.29	0.39	0.26	2.54
Fiação São José	(0.56)	(0.53)	(0.18)	(0.23)	0.32	(0.46)	0.17	0.16
Santanense	0.19	0.19	0.17	0.15	0.13	0.13	2.97	2.47
Tec. Blumenau	(1.21)	(0.61)	0.43	(0.44)	(0.57)	(0.84)	0.16	0.21
Vicunha	(0.59)	(0.53)	(0.01)	0.01	(0.08)	(0.07)	1.79	1.45
Wembley	0.06	0.06	0.02	0.02	0.24	(0.21)	2.12	2.08
Cataguases	0.1183	0.09	0.06	0.06	0.06	0.09	1.84	2.50

Source: Research data.

Table 3
Accounting indicators (IC, NM and AT): real x expected according to Koyck's model

	IC		NM		AT	
	Real	Koyck	Real	Koyck	Real	Koyck
Buettner	0.64	0.65	(0.07)	(0.08)	1.00	1.07
Dohler	0.62	0.68	0.03	0.01	0.77	0.82
Karsten	0.72	0.66	(0.11)	(0.10)	1.23	1.31
Renaux	0.45	0.34	(0.31)	(0.35)	0.79	0.55
Renauxview	0.66	0.54	(0.38)	(0.53)	1.20	1.22
Schlosser	0.56	0.58	(0.34)	(0.38)	2.66	2.64
Teka	0.63	0.62	0.47	0.31	0.86	0.65
Cedro	0.54	0.57	0.03	0.05	1.31	1.35
Coteminas	0.60	0.59	–	–	1.50	1.01
Encorpar	0.85	0.83	1.52	1.95	0.04	0.04
Fiação São José	0.98	0.98	(0.52)	(0.65)	0.43	0.52
Santanense	0.52	0.69	0.10	0.10	1.42	1.40
Tec. Blumenau	0.01	0.01	(229.79)	(229.98)	0.01	0.01
Vicunha	0.32	0.38	(0.17)	(0.14)	0.93	0.92
Wembley	0.27	0.26	0.00	0.01	0.90	0.96
Cataguases	0.56	0.45	0.07	0.05	0.89	0.84

Source: Research data.

By applying the statistical software Statgraphics for the two groups of variables used, seven linear combinations were found, as displayed in Table 4.

Table 4
Canonical correlation result

Number	Eigenvalue	Canonical Correlation	Wilks Lambda	Chi-Squared	D.F.	P-Value
1	1.0	1.0	1.15578E-14			
2	0.990107	0.995041	1.84845E-7	116.278	36	0.0000
3	0.987701	0.993831	0.0000186844	81.6587	25	0.0000
4	0.955005	0.977243	0.00151917	48.6719	16	0.0000
5	0.88463	0.940548	0.0337629	25.4129	9	0.0025
6	0.660035	0.812426	0.29265	9.21583	4	0.0559
7	0.139175	0.373061	0.860825	1.12398	1	0.2891

Source: Research data.

As verified in Table 4, the two sets of variables used resulted in seven linear combinations, the first six of which showed high mutual correlations. Until the fifth combination, the degrees of correlation exceeded 94%, with the first combination showing 100% of correlation, and the second and third 99% of correlation. In combination 6, the correlation dropped to 81%, although this is still considered high. Combination 7 showed a low correlation, corresponding to 37%.

Table 5 presents the canonical correlation equations for the seven combinations found.

Table 5
Canonical correlation equations

Number	Equations	Canonical Correlation
1	**Real** = 0.000534536*ROE - 0.0134607*ROA + 0.00263673*CV - 0.00285912*LC - 0.00434953*CE + 0.990478*ML - 0.000508811*GA **Expected** = 0.00316623*ROEp - 0.0138509*ROAp - 0.00158045*CVp - 0.00322264*LCp - 0.00463157*CEp + 1.01508*MLp + 0.00100769*GAp	100.0%
2	**Real** = 0.876291*ROE – 0.705932*ROA + 0.194671*CV – 0.0206343*LC + 0.105737*CE - 0.633973*ML – 0.226424*GA **Expected** = 1.02054*ROEp – 0.740113*ROAp - 0.0159493*CVp - 0.0939046*LCp + 0.0921921*CEp + 0.716697*MLp – 0.226222*GAp	99.5%
3	**Real** = 0.275715*ROE + 1.40486*ROA -0.07169*CV + 0.324349*LC + 0.38908*CE - 0.983306*ML – 0.153947*GA **Expected** = -0.0365652*ROEp + 1.311106*ROAp - 0.0311832*CVp + 0.354098*LCp + 0.437661*CEp -1.26999*MLp – 0.118435*GAp	99.3%
4	**Real** = 0.39444*ROE - 0.0273634*ROA + 0.0280766*CV – 0.252504*LC – 0.808002*CE + 0.282416*ML + 0.628568*GA **Expected** = 0.494305*ROEp + 0.0776642*ROAp + 0.00266285*CVp – 0.195509*LCp – 0.701772*CEp + 0.204449*MLp + 0.649727*GAp	97.7%
5	**Real** = -0.0330649*ROE – 0.121089*ROA + 0.131269*CV – 0.202248*LC – 1.28723*CE + 1.06514*ML – 0.968699*GA **Expected** = 0.131253*ROEp + 0.0169383*ROAp -0.0157069*CVp – 0.0931283*LCp – 1.05364*CEp + 1.03279*MLp – 0.824392*GAp	94.0%
6	**Real** = -0.250934*ROE – 0.72374*ROA + 0.368217*CV + 1.08224*LC – 0.059177*CE – 1.0982*ML + 0.144382*GA **Expected** = -0.165919*ROEp – 0.855319*ROAp – 0.64835*CVp + 1.10423*LCp – 0.32753*CEp + 0.821595*MLp + 0.588453*GAp	81.2%
7	**Real** = -0.233753*ROE + 0.873877*ROA + 2.1623*CV + 0.0654132*LC – 0.476342*CE – 0.52188*ML – 0.581134*GA **Expected** = 0.0645212*ROEp – 0.94969*ROAp + 1.45794*CVp + 0.36869*LCp – 0.29261*CEp – 0.147669*MLp – 0.153494*GAp	37.3%

Source: Research data.

The analysis of Tables 4 and 5 reveals that a statistically significant canonical correlation exists between the accounting indicators calculated before and after the enactment of law 11.638/07. Thus, the null hypothesis is rejected and it is inferred that hypothesis H_1 is accepted, which indicates that the accounting indicators were not altered by the fact that the financial statements were elaborated in compliance with the premises of law 11.638/07.

5. Conclusion

This paper was aimed at verifying whether Law 11.638 (2007) entailed statistically significant influences for accounting indicators. The 20 Brazilian companies were selected that are listed on BM&F-Bovespa and classified in the cyclical consumption sector, in the subsector tissue, clothing and footwear, under the ply and tissue segment, consulted on May 20th 2009. Sixteen of these companies presented the financial statements needed for this study. The data were collected from the balance sheet and the income statement the companies forwarded to CVM, for the period from 2000 to 2008.

The accounting indicators used for the study were those considered by Lyra (2008), resulting from a research that involved Brazilian and international specialists: 1) Return on Equity; 2) Return on Assets; 3) Sales Growth; 4) Current Liquidity; 5) Indebtedness Composition; 6) Net Margin and 7) Asset Turnover.

After defining the indicators, they were calculated for the 16 companies, considering the period from 2001 till 2008. Then, the linear regression of Koyck's model was applied to find the indicators forecasted for 2008, in view of a one-year time difference. This resulted in two sets of variables to apply the canonical correction: the seven accounting indicators of the 16 companies for 2008 were calculated based on the financial statements published, and the same seven accounting indicators found through the application of the linear equation in Koyck's model.

Finally, the canonical correlations between the two sets of variables were analysis. The research results showed that the sets of variables found seven linear combinations, the first six of which showed high mutual correlations, corresponding to 100.0%; 99.3%; 97.7%, 94.0% and 81.2%, respectively.

Therefore, in view of the research hypothesis, based on the statistical analysis, the null hypothesis (H_0) is rejected and the alternative hypothesis is accepted (H_1). The alternative hypothesis H_1 presupposed that a statistically significant canonical correlation exists between the accounting indicators before and after the enactment of law 11.638 (2007).

In general, it is concluded that, in the companies under analysis, the enactment of law 11.638 (2007) entailed no statistically significant influence on the accounting indicators. The results are in line with the findings by Beuren, Hein & Klann (2008); Barbosa Neto, Dias & Pinheiro (2009) and Carvalho *et al.* (2011), revealing no statistically significant alterations in economic-financial indicators as a result of the adoption of international accounting standards.

Further research is recommended to verify the same aspects in other economic segments, including the possible use of other statistical tools to support or refute the present study.

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Information Disclosure per Operating Segment: a Panorama of the Application of CPC 22

Abstract

The aim in this research was to outline a panorama of segment disclosure in the financial statements of publicly traded companies active in Brazil, which were published in 2010, the first year in force of CPC 22. Therefore, the researchers attempted to identify how the segments were defined and how many were published, besides analyzing these results with regard to the company's corporate characteristics: size, activity sector and listing status according to corporate governance levels. A bibliographic and descriptive study with a descriptive focus was undertaken. The data were surveyed in the notes to the financial statements of 81 publicly traded companies, selected among the largest companies in the 2010 edition of *Revista Melhores e Maiores*. Data analysis was based on descriptive statistics and correlation analysis. The research results showed that some companies did not refer in any way to segment information. The definition of the segments mainly followed the criterion of the business line, and 27% of the companies grouped the activities in a single segment. The correlation analysis showed that only the asset size showed a significant and positive relation with the characteristics of the definition and the number of segments published. Great heterogeneity was found in the structure of the segment reports published.

Key words: Accounting disclosure, Segment reporting, CPC 22, IFRS 8.

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1. Introduction

The Brazilian capital market has expanded as a result of different companies going public, new investors who entered the market, the search for training to be active in the market, among other factors. According to Lélis, Colauto, Pinheiro and Jordão (2008), as a result of the strong development of the capital market in economically developed and emerging countries, the market increasingly demands compulsory or voluntary information disclosure in financial terms, with a view to permitting greater transparency to investors.

The improvement in the information disclosure level to the market frequently involves the standardization of procedures; in line with that premise and as a part of Brazilian companies' adoption of the International Financial Reporting Standards – IFRS, CPC 22 – Segment Information was issued. According to this pronouncement, as from the year 2010, Brazilian publicly traded companies need to publish segment information as a part of their annual financial statements.

Iudícibus, Martins, Gelbcke and Santos (2010, p. 628) explain that

> The harmonization process of accounting standards in the international context provides accountants and managers with a new posture, whose judgment, relevance and economic influence are prioritized, to the detriment of the previously established regulatory standards.

Thus, in line with the premises of the international standards, now adopted in Brazil through the pronouncements of the Accounting Pronouncements Committee (CPC), managers and accountants will prioritize the economic essence of the fact over the rules and standards in their decisions.

At the same time, segment reporting needs to be elaborated based on the data used for internal decision making, that is, adopting a management approach, independently of fiscal or tax standards, thus providing managers with discretionary power. In accordance with Iudícibus *et al.* (2010, p. 628), "the main idea is to provide users with management information [...] the company managers use in their daily decisions".

In its transcription of IFRS 8, CPC 22 does not define a standardized format and contents for the data organizations need to disclose, departing from the premise that each company has an internal structure for decision making that specifically depends on its management model, which should guide this disclosure.

This lack of standardized disclosure is demonstrated in the study by Talha and Salim (2010), involving a sample of 374 companies in Malaysia. The authors found that 15.8% of the companies under analysis defined the operating segments within a geographic perspective, while 84.2% defined them per business line. In the research by Nichols and Street (2007), focused on the segment disclosure characteristics in 160 companies from different countries, the results show that managers use the flexibility of the standard to define the segments, disclosing between one and more than ten segments.

In view of this context, this study was based on the following guiding question: what are the characteristics of the segment disclosure by publicly traded companies active in Brazil, in 2010, particularly because that was the first year of compulsory disclosure?

The aim in this study was to outline a panorama of segment disclosure in publicly traded companies active in Brazil, based on the analysis of the financial statements published in 2010, identifying how they were defined and how many segments were published, as well as to analyze these results in view of corporate characteristics like size, activity sector and listing status of the company according to the corporate governance levels.

The research is due and contributes to the development of the theme in Brazil, showing what practices companies address in the disclosure of their operating segments, the number of segments presented, how the companies are segmented and whether a segmentation pattern can be determined according to the companies' specific characteristics. It is highlighted that the results for 2010, published in 2011, represent companies' first experience in the compulsory disclosure of segment information.

Earlier studies in Brazil (Vasconselos & Szuster, 2003; Cruz, Machado, Pereira & Carvalho, 2011 and Schvirck & Gasparetto, 2011) addressed the theme based on voluntary data disclosure and found few segment data in the companies they investigated. Therefore, it is considered relevant to find out, when disclosure becomes compulsory, how publicly traded companies are making data available to their stakeholders.

2. Theoretical framework

2.1 Accounting information disclosure

The main goal of the reports accounting produced based on the recording of the facts that occurred in the companies is to provide stakeholders with information about the economic and financial situations, as well as the risks and returns related to the investment. Different authors have discussed accounting information users. Among them, Iudícibus (2004, p. 23) presents Figure 1, in which he lists the main clients and their aspirations with regard to the information accounting produces.

Accounting information user	Target for maximization or most important information type
Minority stockholder	Regular dividend flow.
Majority stockholder or with large interest	Dividend flow, market value of shares, earnings per share.
Preferential stockholder	Minimum or fixed divided flow.
Lenders in general	Future cash flow generation, sufficient to safely receive back the capital plus interests.
Governmental entities	Value added, productivity, taxable profit.
Employees in general, as wage earners	Future cash flow capable of safely guaranteeing good salary raises or maintenance; liquidity.
Middle and high management	Return on assets, return on equity; comfortable liquidity and indebtedness situation.

Figure 1. Accounting information users

Source: Iudícibus (2004)

Lopes (2002, p. 7) adds that the financial market "is one of the main accounting information users through analysts, brokers, institutional and individual investors, investment banks, etc." No matter the users' interests in the companies, the decisions they have to make need information about financial, economic or operational corporate data. In this context, information disclosure is fundamental for the users to know the company.

Accounting information disclosure, according to Iudícibus (2004, p. 121) "is linked to the objectives of accounting, by guaranteeing different information to various types of users". In line with Hendriksen and Van Breda (1999, p. 515), on the other hand, the aim of disclosure is to "provide users with important and relevant information [...] to help them make decisions in the best possible manner." The authors argue that "the amount of information received partially depends on the sophistication of who receives it". In this sense, Iudícibus (2004, p. 21) defends that the objective of accounting is to build "a basic accounting information file", in which each type of user can flexibly obtain the information (s)he finds convenient.

The dynamic nature of corporate facts, however, does not allow accounting to evidence everything that occurs in the companies. Thus, Lopes and Martins (2005, p. 55) argue that the managers use accounting to selectively inform about the company's most interesting aspects. This communication is selective because the managers do not provide all information they have at their disposal, but select what is most relevant according to their own interest.

The choices as to what information to publish are particularly made to comply with legal requirements and, according to Paulo (2007, p. 30), they are based on a broad set of factors that affect the figures. Some of these choices exert immediate and/or long-term effects on the income, while others only affect the year income.

Concerning disclosure based on discretion, Verrecchia (2001, p. 99) argues that this is an endogenous event, considering the incentives managers and/or companies receive to disseminate the information they know. This decision is typically taken in the capital market context, a significant consumer of published information. In other words, the companies tend to disclose information according to the benefits they can obtain from them.

Market regulators as well as investors and funders aim to improve companies' information disclosure. Investors and funders do this by offering more resources to companies with more transparent actions, and entities through standards and laws. In that sense, the harmonization of the Brazilian accounting standards with the international accounting standards motivated different changes in companies accounting and information disclosure practices.

As from 2010, disclosed at the start of 2011, publicly traded companies were obliged to disclose, together with already existing financial statements, segment information, in compliance with the pronouncement CPC 22. The intent is for companies to disclose information that allows the financial statement users to assess the nature and financial effects of the business activities it is involved in and the economic environments it operates in.

The validity of this pronouncement tends to provide the company's stakeholders with a more detailed view of the company's business. According to Torres (2011), the stockholders and analysts now have information at their disposal which most companies did not usually publish: the profit obtained in each operating segment.

2.2 Segment reports

Company mergers, internationalization movements and the expansion of activity markets led to the establishment of corporate groups that are active in different geographical areas and distinct businesses. Holdings of publicly traded companies normally manage the activities of these clusters in a consolidated manner, that is, all businesses are grouped in a sole controlling company. Thus, information that can be relevant to the agent interested in the company are grouped together with different other data and presented to the market in a consolidated form.

With a view to the availability of more detailed information, the application of CPC 22, based on IFRS 8, aims to show to the market how the companies act in each of the segments, allowing the stakeholders to know the risks and possibilities inherent in each activity branch.

According to Iudícibus *et al.* (2010, p. 628),

> The basic principle is that the information presented per segment, together with the accounting information, allow users to correctly assess the nature of the business activities and their respective financial effects, providing true knowledge of the economic environment the company is inserted in.

Garrison, Noreen and Brewer (2007, p. 446) define a segment as a part or activity of the organization about which the managers would like to have cost, income or profit data. According to CPC 22, item 5, an operating segment is a component of the entity that develops business activities, through which it can gain revenues and incur expenses, whose income is regularly reconsidered in the decision making and performance assessment process, also permitting the individualization of available financial information.

Iudícibus *et al.* (2010, p. 628) defend that the separation per segment is important to understand the company's history and trends and the regional context of a product or service, to assess the influence of political aspects and to measure the contribution of a relevant client to company revenues, among other possibilities created through segment reporting.

In that sense, Vasconselos and Szuster (2003, p. 72) comment that

Segment information gains increasing importance in the economic-financial analysis of Brazilian and international companies, improving their disclosure and, from a management viewpoint, it is very helpful in decision making. From the perspective of external users, it enhances companies' transparency, as it provides the market with information about the strategy adopted in their activities.

Before the application of CPC 22, little encouragement towards segment reporting was provided in Brazil, in accordance with Iudícibus *et al.* (2010, p. 627), although some companies did provide this disclosure, either voluntarily or because it was required for them to be active in international markets, but in a timid and incipient form.

The theme segment reporting is recent in Brazil. International standards have been prescribing these procedures for some time though. In November 2006, the International Accounting Standards Board – (IASB) issued IFRS 8, which replaced International Accounting Standard 14 (IAS 14), issued in 1981 and updated until its recent replacement in 2006. In the environment the Financial Accounting Standards Board (FASB) regulated in June 1997, the most recent version of the standard on this theme was issued, the Statement Financial Accounting Standard 131 (SFAS 131), substituting SFAS 14 from 1976.

In Brazilian legislation, segment reporting has been and, in accordance with the research by Vasconselos and Szuster (2003, p.86), before the enactment of CPC 22, the lack of an explicit standard about the presentation of this information in the Brazilian market made the companies publish it abroad, according to IASB or FASB standards, and not in the internal market.

In 2002, Vasconselos and Szuster (2003) undertook a study in 30 companies listed on Bovespa, based on data published in 2001, to assess the quality of voluntary accounting information disclosure per segment in Brazil, involving companies traded on the international market, obliged to publish segment information in accordance with IAS 14. In the group studied, 57% published segment reporting in the management report and 17% in notes to the financial statements. The authors also highlight that 26% of the companies did not present any kind of segment information in the Brazilian market.

Vasconselos and Szuster (2003, p. 85) concluded that it cannot be confirmed that companies traded abroad present better information in the Brazilian market, that is, that the lack of legislation on the compulsory publication of this information made companies publish the information in the external market and not in Brazil.

Voluntary segment reporting in Brazil was focused on in a study by Cruz *et al.* (2011), aimed at verifying how companies published segment information for 2009. The research was undertaken in 106 companies listed on BM&FBovespa (2012) and found that only 13.2% of the companies studied voluntarily presented segment information. Cruz *et al.* (2011, p.16) conclude that, in general lines, segment reporting remains incipient in the Brazilian context.

In line with these results, in the study by Schvirck and Gasparetto (2011), involving 49 companies listed on BM&FBovespa (2012), the relation between voluntary segment reporting in 2009 and corporate governance levels was investigated. The results indicated that companies that adhere to the highest governance level are more prone to voluntary segment reporting, although all companies demonstrated low levels of adherence to the requirements of CPC 22.

Possible reasons for this lack of voluntary disclosure, besides the lack of a standard, include fear related to this disclosure. Talha, Sallehhuddin and Mohammad (2006, p. 266) explain that one of the main arguments is that the high cost of information preparation exceeds the potential benefit. In addition, the authors present the benefit strategic company information provides to potential competitors as the most serious argument against the publication of segment information.

In this context, Talha *et al.* (2006) developed a study of 116 companies listed on the Malaysian Stock Exchange between 2000 and 2002, with a view to empirically assessing the change in companies' competitive advantage patterns after the publication of segment information. The results indicate that companies' competitiveness or financial performance level increases when the quality of segment disclosure drops, that is, when the companies publish higher-quality information, its competitiveness level tends to decrease, as

measured by their financial performance. When considering company size, the study indicates that, given the same quality level of the disclosure, large companies present worse competitiveness levels than smaller companies, that is, larger companies are more exposed to competitive disadvantage than smaller companies.

Edwards and Smith (1996) assessed the existence of competitive disadvantage based on segment reporting in British companies. The study evidenced greater competitive disadvantage for companies that publish segment reports per geographical region when compared to those that publish per business segment.

In Malaysia, Talha and Salim (2010) developed a study of 374 companies listed on the local stock exchange, aimed at investigating the factors that make companies choose between business line or geographic region as the primary segment. The research was based on data for 2006 and found evidence that size, financial performance and industrial sector significantly affect the choice of the primary segment according to the business line, to the detriment of the geographic information.

In another study, Jahmani (2003) found that business segment and geographical segment disclosure affect the company's risk perception. The companies' consolidated financial statements do not provide investors with sufficient information for appropriate decision making, and the data per business line or geographical region are valuable information to complement the consolidated statements.

Ettredge, Kwon and Smith (2002) assessed the effects associated with the use of SFAS 131 in the United States capital market and found that the adopted of this standard significantly affected the companies that used to be more encouraged to combine information per segment. As a result of the management approach, companies started to disclose information in a form less aggregated per product line, which according to the authors improved corporate disclosure.

In Brazil, in 2011, Ernst Young Terco, together with Fipecafi, developed a study of 56 companies to assess the application of CPC 22 as from the statements for 2010. The results showed that the companies disclosed between one and nine segments, highlighting the large number of companies (23%) that published information for only one segment. As regards the segment definition, 61% were based on the product line, 7% on the geographical area and 32% on both.

Garrison *et al.* (2007, p. 446) explain that segments can be company divisions, sales territory, individual stores, service centers, factories, marketing departments, individual clients and product lines. A company's operations can be segmented in many ways.

In the light of SFAS 131, Pahler (2003, p. 458) argues that, conceptually, segment information can be presented in different forms, for example: per product and service, per geographic area, per legal institution, per client type, or according to how the company organizes the segments internally (per subsidiary, division, department or other internal units), to report the form management uses for decision making. The author highlights that the latter form, the management approach, is required in SFAS 131 as well as in IFRS 8.

Established based on IFRS 8, according to CPC 22, information needs to be reported based on the management approach, that is, reports need to be provided on the same base used internally to assess the performance of operating segments and make decisions on resource allocation. As described under item 25 of the pronouncement,

> the amount of each item in the segments disclosed should correspond to the value the main operation manager reports for the sake of decision making on segment resource allocation and performance assessment.

The management approach proposed in the standard was a source of criticism in some studies, like Crawford, Helliar and Power (2010) for example, who mention that investors are concerned with IFRS 8, considering the possibility of data manipulation, due to the freedom in the segment reporting process, as the standard requires the disclosure of information prepared and measured for the sake of internal management decisions, without clear discussion about who manages the operations, i.e. an important agent in the definition of the company's segments. The pronouncement determines on the disclosure of geographical segments, but permits non-disclosure of this information if the company does not prepare them for internal purposes, attribution the form and contents of disclosure to the managers' discretion.

In the definition of segments for disclosure, factors can be identified that permit the aggregation of amounts, according to CPC 22 item 12,

> Two or more operating segments can be combined into a sole operating segment [...] if they share similar economic characteristics or if they are similar with regard to each of the following aspects:
> - nature of the products or services;
> - nature of the production processes;
> - type or category of clients for their products and services;
> - methods used to distribute their products or deliver the services; and
> - if applicable, the nature of the regulatory environment, e.g. banks, insurances or public services.

The accounting standard established that, after identifying the segments, they should be submitted to quantitative tests in order to decide whether they can be disclosed or not. Thus, according to CPC 22 item 13, segments can be disclosed when they comply with any of the following criteria:

a) when the revenues the segment provides is equal or superior to 10% of the revenues in all operating segments;
b) when the profits or losses are equal or superior to 10% of the highest between the following amounts:
   i. profit in all segments that did not make any losses; and
   ii. losses in all operating segments that revealed losses.
c) when the segment assets represent 10% or more of the combined assets in all segments.

According to CPC 22 item 19, if the number of segments for disclosure "[...] is higher than 10, the entity should weigh whether the practical limit has not been reached already". Based on this determination, it is observed that, even if the management approach is used to elaborate segment reporting, decision makers internal to the company have access to different other pieces of information for support, that is, segment reporting tends to contain more information than consolidated reports, but nevertheless do not contain the same level of detail as internally used information.

In this context, the disclosure of income information per segment can take different forms and structures as, when using the management approach, the information structure of disclosure can strongly differ among companies.

3. Methodological Procedures

The research departs from a descriptive focus, as it presents the publication characteristics of the sample companies' segment reporting; Gil (2002, p. 43) explains that the primary aim of descriptive studies is to describe the characteristics of a given population or phenomenon, or to establish relations among variables.

Concerning the technical procedures, this research is a bibliographic study, developed based on existing material, mainly including books and scientific papers, as defined by Gil (2002, p. 44); and also as a documentary study, in view of Martins and Theóphilo's (2007, p. 55) explanation about the use of documents as a source of data, information and evidences.

The sample used to develop the research was defined based on the access to the data needed. Among the 300 largest companies listed in the 2010 edition of *Revista Exame Melhores e Maiores*, publicly traded companies were chosen whose statements had been published on the BM&FBovespa (2012) website, resulting in a group of 81 companies for analysis.

Considering this group, the notes to the financial statements were verified to examine how the segments were disclosed. The study data relate to the year 2010. After characterizing the segment reporting, it was tested whether the variables related to the company's corporate characteristics, size, listing status on the stock exchange and activity sector were somehow correlated with the number of segments disclosed.

The results were analyzed by means of descriptive statistics, which Martins (2002, p. 19) defined as the organization, summary and description of a set of data. Thus, the research data were grouped and ranked to characterize the analysis elements and the correlation between the study variables was assessed to understand existing relations between them. The data were statistically treated with the help of SPSS 13.0.

4. Presentation and Analysis of Results

This study was aimed at presenting a panorama of segment reporting as required in CPC 22 for the financial statements published as from 2010, without any intent to assess the quality of the information disclosed, but focusing on how the companies defined the segments and how many they disclosed. The researchers consider, however, that a more detailed presentation enhances the quality of the information. Hence, it is expected that companies that disclose more segments further their users' understanding about their activity context.

To put the research in practice, financial statements were analyzed for 81 publicly traded companies that are active in the Brazilian market. In that group, 13.5% of the companies did not make any reference to segments in their notes to the financial statements, contravening CPC 22. These companies were excluded from subsequent analyses as they did not present data for use in the study. Therefore, the final segment information sample consists of 70 companies.

The adoption of the management approach for segment reporting, according to the standards, permits choices that can cause structural differences in the statements disclosed as, in line with Talha *et al.* (2006, p. 272), managers make discretionary judgments when determining how to define the segments, what items are disclosed and the level of materiality.

In this context, the initial assessment was focused on how the companies defined their segments. Among the companies that disclosed segments, 11% used the geographical region as the criterion for their definition; 86% used the product or service line, that is, the business line; and 3% used both, as shown in Figure 1.

This research is in accordance with the study by Ernst Young Terco and Fipecafi (2011), considering the predominant definition of segments per business line. Due to the difference in the groups of companies studied, however, the percentages found did not coincide.

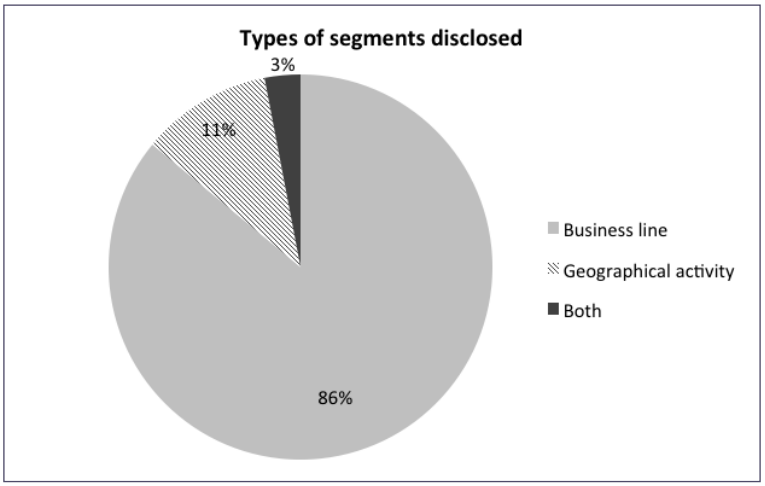

Figure 1. Types of segments disclosed by the companies

In some studies, it is reported that the use of SFAS 131 and IFRS 8, substituting the earlier standards, improved the companies' information disclosure by breaking down product lines and increasing the number of segments disclosed (Berger & Hann, 2003; Street, Nichols & Gray, 2000; Ettredge, Kwon, Smith & Stone, 2006; Nichols & Street, 2007; Mardini, Crawford & Power, 2012). In the Brazilian market, the companies disclosed between one and eight segments. In Table 1, the research findings on the number of segments published are summarized.

Table 1
Number of segments disclosed

Number of segments	% of companies in the sample
One segment	27.1%
Two segments	22.9%
Three segments	20.0%
Four segments	17.1%
Five segments	5.7%
Six segments	4.3%
Seven segments	1.4%
Eight segments	1.4%

The data in Table 1 reveal low levels of segmentation in the companies analyzed. In 27.1%, information is presented in a consolidated form, arguing that that was how the decision maker received the information, or that company activities are centralized in one identifiable line of business.

In the study sample, 42.9% of the companies belong to the groups with two and three segments, one of which tends to be the corporate segment, that, not an operating segment but an administrative structure.

The results demonstrated in Table 1 are related to the findings in the study by Ernst Young Terco and Fipecafi (2010), especially regarding the concentration of companies that published between two and four segments, as well as the considerable number of companies that presented data in a single segment.

The company's activity area can influence the disclosure format. Talha and Salim (2010, p.22) argue that the disclosure level differs according to the sector, that is, each sector has its own characteristics and regulations. In that sense, Table 2 demonstrates the disclosure characteristics of the segment reports according to the sample companies' activity sector. The small number of companies in each sector did not permit any further discussion on this item.

Table 2
Segment definition form segregated per sector

Sector	Segment definition			Number of segments
	Geographic	Business line	Both	
Wholesale		1		1
Car industry		3		2 to 5
Capital goods	1			2
Consumption goods	3	3	1	2 to 4
Energy		20		1 to 8
Construction industry	1	1		2 and 4
Digital industry		2		2 and 4
Mining		1		5
Paper and pulp		3		2 and 3
Agricultural production			1	2
Chemical and petrochemical		3		2 and 6
Services		6		1 and 4
Iron and steel	1	2		4 and 5
Telecommunication	1	6		1 and 3
Textile	1	1		1 and 3
Transportation		3		1 and 2
Retail		5		1 and 4
TOTAL	**8**	**60**	**2**	

In Table 2, the sector of consumption goods stands out, which showed higher levels of segment definition per geographical sector, in 43% of the companies. It can be inferred that, as this sector tends to work with a wide range of products, information per geographical area is more relevant than information per business line.

In the energy sector, all companies under analysis defined their segments per business line. The difference in the number of segments can be highlighted as, while some companies published only one segment, others published eight, showing that no pattern can be established in this sense.

According to Talha and Salim (2010, p. 21), the listing status of the company can also influence its disclosure practices. In the Brazilian market, companies can be listed in four different segments, according to the stock exchange standard. The New Market is the highest level, followed by Level 2, Level 1 and companies that did not adhere to any of the levels, the so-called Traditional Market. Companies at higher governance levels tend to be more prone towards disclosure and, hence, will disclose more segments and define segments based on different criteria. According to the research results by Murcia and Santos (2009, p. 12), corporate governance is one of the factors to explain the disclosure level.

Then, the segment reporting characteristics were observed, aiming to identify the companies' behavior according to their market level. Table 3 displays the summary of this analysis.

Table 3
Segment definition form segregated per corporate governance level on Bovespa

Sector	Segment definition			Number of segments
	Geographical	Business line	Both	
New Market	12.5%	79.2%	8.3%	1 to 5
Level 2		100%		1 to 4
Level 1	15.4%	84.6%		1 to 6
Traditional Market	10.3%	89.7%		1 to 8

The research data show that the listing level was not relevant in the definition of the reporting characteristics. It should be highlighted, however, that only New Market companies published segments per business line as well as per geographical region. In the New Market, 41.7% of the companies published two operating segments, 25% only one and 20.8% four segments. Concerning companies in the Traditional Market, 34.5% published only one segment and 31% three operating segment.

The evaluation of company size is cited in different studies as a relevant sector for accounting disclosure. In Brazil, Cunha and Ribeiro (2008), Salotti and Yamamoto (2006) and Murcia and Santos (2009) found a significant relation between company size and disclosure.

In the same sense, Silva (2008, p. 54) presents different accounting measures used as a proxy for company size. In the research by Silva (2008) about disclosure studies, revenues and total assets were used as a measure of company size.

In this study, total assets were used as a criterion for company size. The sample was stratified based on the definition of quartiles according to the sample companies' total asset value. Thus, the first quartile grouped the smallest companies and the last the companies with the largest total asset value. Data on segment reporting characteristics according to the company size are displayed in Table 4.

Table 4
Segment definition form according to company size

Sector	Segment definition			Number of segments
	Geographical	Business line	Both	
Up to R$ 3.336	11.1%	88.9%		1 to 7
Between R$ 3,336 and R$ 7,753	11.8%	88.2%		1 to 8
Between R$ 7,753 and R$ 22,625		94.1%	5.9%	1 to 5
Higher than R$ 22,625	22.2%	72.2%	5.6%	1 to 6

Table 4 reveals that, in all groups, the definition of segments per business line is predominant. The disclosure of both segment types is only present in groups 3 and 4, which contain the largest companies.

In the first group, involving the smallest companies, reports were published with between one and seven segments. It is highlighted that 38.8% presented one segment, that is, the companies identified a single business line and, therefore, there is no need to present a partial report about segments. In 27.8% of the companies, two segments were presented, 16.7% three, 11.1% four and 5.6% seven different segments.

In the second quartile, 35.2% of the companies published only one segment, 29.4% two segments, 11.8% three and four segments and 5.9% six and eight segments.

The third group also included the largest companies: 29.4% with only one segment, 17.7% two and four, 23.5% three and 11.7% five operating segments.

The largest companies also revealed the highest segmentation level. Only 5.5% published only one segment, 16.7% two, 27.8% three and four and 11.1% segmented their business in five and six segments.

In summary, considering company size, the largest companies tend to publish more segmented reports for the sake of decision making as, in the group with the highest total assets, 77.8% disclosed between three and six segments while, in the group with the smallest asset size, about 65% of the companies published one or up to two operating segments.

The analysis of correlations between the variables supports the data assessed based on the proportions described earlier. Table 5 shows that only the size of companies' assets was significantly related with segment, type and quantity characteristics. Hence, the larger the company, the more segments it tends to disclose and the more it tends to use more than one criterion to define what segments can be disclosed.

Table 5
Correlation between the variables

		Number of segments	Type of segment	Activity sector	Corporate	Total Assets
Number of segments	Pearson Correlation Sig. (2-tailed)	1	0.074 0.544	-0.160 0.186	-0.111 0.362	**0.295*** **0.013**
Type of segment	Pearson Correlation Sig. (2-tailed)	0.074 0.544	1	-0.096 0.431	-0.181 0.133	**0.263*** **0.028**
Activity sector	Pearson Correlation Sig. (2-tailed)	-0.160 0.186	-0.096 0.431	1	0.049 0.688	0.077 0.526
Corporate Governance Level	Pearson Correlation Sig. (2-tailed)	-0.111 0.362	-0.181 0.133	0.049 0.688	1	-0.075 0.535
Total Assets	Pearson Correlation Sig. (2-tailed)	**0.295*** **0.013**	**0.263*** **0.028**	0.077 0.526	-0.075 0.535	1

* Correlation significant at 0.05

5. Final Considerations

Information availability is important for decision makers, whether these are managers, investors, funders or any other agent interested in a company, and whether they are internal or external to the organizations.

In 2010, CPC pronouncement 22 came into force in Brazil, which sets rules for the publication of segment information. Hence, publicly traded companies need to comply with this standard, disclosing income information to users external to the company in the segmented form, that is, in further details than in the consolidated statements.

In view of the regulatory innovation established in CPC 22 and the expected expansion of the data the companies disclose to the stakeholders based on the segments, this research was aimed at outlining a panorama of segment disclosure in the first year this pronouncement came into force, with a view to answering the question about the publication characteristics of segment information by publicly traded companies active in Brazil in 2010. Therefore, considering a group of 81 companies listed on BM&FBovespa (2012), it was analyzed how they defined their segments, how many segments they disclosed and whether this disclosure was somehow related with the companies' corporate characteristics.

The study results demonstrated that the segment information is published in a very heterogeneous manner, and that no type of pattern can be established, neither according to activity sector, corporate governance level or corporate asset size. Nevertheless, when considering the latter, a positive and significant correlation was found between size and number of segments, in view of the greater administrative complexity of larger companies.

Considering the possibility of defining segments for disclosure according to the company's management structure, the companies predominantly chose segment disclosure according to the business line. As regards the number of segments in the companies, this ranged between one and eight.

The research demonstrated that no quantitative pattern can be established, independently of the corporate characteristics as, in 2010, 27.1% of the companies under analysis did not publish segmented activities, that is, they disclosed only one segment, while 60% published between two and four operating segments and 12.9% between five and eight segments.

The company size was the only study variable with statistically relevant results. Large companies tend to define the segments based on more than one criterion, possibly because they are active in larger markets; in addition, in this group, fewer companies did not publish segment information according to the criteria of the CPC 22. Also, these were the companies with the highest segmentation level, which can be explained by the fact that they are active in more branches and consumer markets.

As regards the listing status in terms of corporate governance levels, the New Market group reveals a trend towards a more significant disclosure level, as companies in this group published both geographical and business line segments. On the other hand, in the Traditional Market group, more companies did not publish segment information, confirming the expectation of greater willingness towards disclosure among companies with better corporate governance practices.

The research results revealed how the companies are structured in terms of operating segments, based on the compulsory publication required in CPC 22, during its first year in force. This standard contributes to the improvement of market information disclosure by requiring that publicly traded companies provide their external agents with information about the composition of the company income, considering the share of each of its operating segments.

On the other hand, by granting freedom for the company to define what can be published, based on the quantitative criteria presented earlier, and by using the management approach, room is created for the companies to discretionarily assume that all of its activities are aggregated in a sole segment, so that they do not disclose any information further than that published in their statements before CPC 22 came into force. It should be highlighted, however, that the companies under analysis significantly adhered to the pronouncement, as only 13.5% of the 81 companies in the sample did not publish segment information.

The present study results are limited to the group of companies under investigation. As the selected group figures among the largest Brazilian companies, they may not picture the characteristics of less relevant companies in the economic context.

This research was focused on the analysis of the criteria used to define what segments to disclose and how many. Therefore, for the sake of future research, the information disclosure level required by CPC 22 should be investigated, also attempting to understand the possible determinants of a higher or lower disclosure level in the segments disclosed.

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Classification Of The Contents Of Sustainability Reports In Companies Winners Of Socioenvironmental Accountability Awards

Abstract

In view of the importance of sustainability reports – an instrument for management and information disclosure about the company's interaction with the environment it is active in –, the aim in this study is to analyze the contents of information disclosure about the dimensions of corporate sustainability – economic, social and environmental – in the reports of companies who received awards for their socio-environmental accountability practices. A descriptive and qualitative study was carried out, using documentary research and Content Analysis. The results indicate the preponderance of the social dimension, especially in the external context, and of quantitative non-monetary disclosure. They also suggest that the effect of company activities on the environment and the capital structure serve as indicators of the disclosure levels in the analyzed companies' sustainability reports, among the winners of socio-environmental accountability awards.

Key words: Voluntary disclosure; Sustainability report; Sustainability dimensions; Legitimacy.

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1. Introduction

Governmental incentives and countless Corporate Social Responsibility (CSR) awards encourage the transformation of companies' traditional management model, with a more internal and monetary result oriented view, into corporate management, which adopts the premises of sustainability, observing the impact of its activities on society, considering the economic, social and environmental approaches.

The congruence among these three approaches gave rise to the triple bottom line (TBL0 concept, also known as the tripod of corporate sustainability, which considers that a company's performance should comprise the economic, social and environmental aspects. In other words, Vellani and Ribeiro (2009) inform that the TBL concept reflects on the need for companies to consider the economic bottom line, the social bottom line and the environmental bottom line in their strategic decisions. Thus, the TBL, like other guidelines or indices – Global Reporting Initiative – GRI, Sustainability Measures of the Institution of Chemical Engineers - IChemE and Dow Jones Sustainability Index – DJSI (Delai & Takahashi, 2008) – with a focus on the corporate sustainable environment adopts, according to Wang (2005), the following triple bottom line approach: the improve the financial growth while reducing the negative environmental impacts and attending to society's expectations. According to the GRI (2009), the triple bottom line concept proposes a balance in the complex relations among economic, environmental and social needs that does not compromise future development.

Based on the considerations of the TBL, in this study, it is considered that the corporate sustainability concept is aimed at integrating business, society and ecosystems in the search for sustainable development, a concept shared with different authors, including Almeida (2002) and Vellani and Ribeiro (2009). According to a similar perspective, Ferreira (2011) clarifies that corporate sustainability should reflect a set of values, principles and processes an entity should pursue to create value in the economic, social and environmental dimensions, minimizing any damage resulting from its activities in the market.

Concerning the corporate sustainability dimensions, Almeida (2002) alerts that the economic dimension includes not only the formal economy, but also the informal activities that provide services to individuals and thus increase their monetary income and standard of living. It should be reminded, in line with Delai and Takahashi (2008, p. 35), that the economic dimension "is related to the organization's short and long-term financial health" and with the relationship it maintains with its stockholders and investors. As regards the environmental (or ecological) dimension, the authors opine that it stimulates organizations to take into account the impact of their activities on the environment and contributes to the integration of environmental management into the work routine. Like in Prescott-Allen (1997, p. 7), in this research, it is considered that the environmental dimension of corporate sustainability deals with the "condition in which the ecosystem maintains its diversity and quality, its ability to support life and its potential to adapt to changes, providing future options." What the social dimension is concerned, Almeida (2002) explains that it is related to human beings' qualities, covering the company's internal and external environments. In accordance with the study by Delai and Takahashi (2008), the social dimension in this study takes into account the company's relationship with all of its stakeholders: employees, society, government, consumers, suppliers, among others.

Besides factors of – positive and negative – pressure related to the economic, social and environmental approaches, some agents' demand is fundamental in the incentives companies receive to voluntarily disclose socio-environmental information (Ribeiro & Van Bellen, 2008) with a view to gaining social acknowledgement. According to Gray and Bebbington (2001), the following influential agents stand out in terms of voluntary social-environmental disclosure initiatives in companies: United Nations Organization (UN), GRI, developmental committees, industrial associations, eco-labelling (protection whose effects are similar to that of technical trade barriers) and socio-environmental awards (factor considered in this research).

Socio-environmental awards represent society's acknowledgement of social and environmentally responsible companies. This acknowledgement is related to the Legitimacy Theory, according to which

companies seek mechanisms to legitimize themselves in society (Nascimento, Santos, Salotti, & Múrcia, 2009). In this case, companies make efforts for society to perceive them as responsible and, thus, are stimulated to continue operating efficiently in the context they are inserted in. According to Deegan (2005), legitimacy theory is widely applied in different corporate strategies, particularly in those that involve organizational information disclosure.

Thus, for companies to achieve legitimate social and environmental responsibility practices, it is fundamental to publish information through effective and high-quality instruments. In line with Vanstraelen, Zazerski and Robb (2003), the decision process should rest on a set of information that pictures the company's true situation. Thus, the discussion about the extent of voluntary information, mainly socio-environmental, raises doubts as to what and how much should be disclosed, due to the lack of parameters.

In view of the above, in this study, the researchers attempt to investigate the association between two themes – voluntary disclosure and corporate sustainability – from the perspective of Legitimacy Theory, with a view to answering the following question: What is the content of information about the corporate sustainability dimensions – economic, social and environmental – in the sustainability reports of companies that have won awards for their socio-environmental responsibility practices? To answer this question, the general aim is to analyze the contents of information published about the corporate sustainability dimensions – economic, social and environmental – in the sustainability reports of companies that received awards for their socio-environmental sustainability practices. With a view to reaching that objective, the following specific objectives were outlined: 1) to examine the level of disclosure about the sustainability dimensions and types of disclosure adopted in the companies under analysis; and 2) to identify possible factors that indicate the levels of disclosure about the sustainability dimensions in the research companies' sustainability reports.

The sample companies' sustainability reports for 2007, 2008 and 2009 were submitted to content analysis, considering the number of phrases as the analysis unit. Two foci were adopted in the observation: (i) the corporate sustainability dimensions – economic, social (divided between internal and external) and environmental; and (ii) the type of disclosure – type 1: declarative phrase; type 2: non-monetary quantitative phrase; type 3: monetary quantitative phrase.

The sample included the companies that won the awards of Editora Abril's *Guia Exame de Sustentabilidade* (2009) and the ECO Award, granted by *AMCHAM and the journal Valor Econômico* (2007, 2008 and 2009). These two awards consider the main references of corporate sustainability indicators in Brazil and globally as assessment criteria.

The authors believe that the present research findings, related to the contents of information disclosure about the sustainability dimensions in the reports of socially responsible companies that won the awards can serve as a parameter for companies that are not part of this universe, but also seek social approval.

Despite countless studies on voluntary disclosure and corporate sustainability, gaps remain in empirical research that intends to link both themes with companies that have won socio-environmental responsibility awards. This justifies the choice of the sample, comprising companies that received public acknowledgement for the maturity, development and integration of their corporate sustainability, which permits a more complete assessment of the present study objectives.

In that context, the theme of this study gains relevance exactly because of the observed gaps, attempting to provide a view on the classification of the contents of sustainability reports by companies that received socio-environmental responsibility awards, independently of their capital structure, an aspect that also represents a differential in this research.

By analyzing companies awarded by the *Guia Exame de Sustentabilidade* and the ECO Award, the researchers attempted to eliminate the possibility of inappropriate information contents about the corporate sustainability dimensions in view of the proposed study objectives. Therefore, it should be reaffirmed that the fact that the companies won awards, which presupposes a successful strategy or action, qualified them for this research.

2. Socioenvironmental information disclosure – theoretical approach and earlier studies

Legitimacy theory is considered one of the dominant theories in socio-environmental information disclosure research (Deegan, 2002). Legitimacy is the perception or supposition that an entity's actions are desirable, appropriate or adequate in a socially constructed system of standards, values and beliefs (Suchman, 1995). Deegan (2005) affirms that the defenders of legitimacy theory address the need for organizations to respond to society's expectations. Therefore, they need to disseminate their projects and the respective results.

According to Guthrie and Parker (1989), financial reports represent a tool for the construction, maintenance and legitimacy of (explicit or implicit) agreements between organizations and society and contribute to the achievement of both party's interests. That is, legitimacy is influenced by information disclosure about the organization's performance, and not simply by its accomplishments. The need to increase the quality level of the information disclosed is highlighted though (Adams, Hill & Roberts, 1998).

In this perspective, Cho and Patten (2007) indicate important points for environmental reports, including: information and concerns with environmental policy, debates about pollution control, environmental regulations, disclosure about capital, investments in pollution or emission reduction control and projected controls for future investments. Adams (2004) comments that, in the mid-1980's, there was a significant increase in companies' socio-environmental disclosure, giving rise to an academic research line focused on studying what and how companies practice this type of disclosure.

Gray, Kouhy and Lavers (1995) consider that legitimacy theory provides the best interpretation of the fundamentals to understand how and why managers use disclosure to benefit the organization, especially considering the sustainability elements.

Authors like Brown and Deegan (1998) and Deegan, Rankin and Tobin (2002) emphasize that emphasis is due on what legitimacy theory shows in terms of companies' motivation and incentives towards socio-environmental disclosure. Mattila (2009) complements these authors' assertion, informing that what drew greater attention on socio-environmental responsibility in recent years was a better understanding about its potential benefits for companies' competitiveness, mainly through the promotion of the corporate image.

Different authors have contributed to the increase in research that analyzes companies' information disclosure, considering that their main motivation is the concern with legitimizing their activities (Gray, Kouhy & Lavers, 1995; Guthrie & Parker, 1989; Branco, Eugênio & Ribeiro, 2008; Aerts & Cormier, 2009). Branco, Eugénio and Ribeiro (2008) investigated the changes in two companies' voluntary environmental disclosure levels in Portugal, in response to society's manifestations against their polluting activities. The authors suggest that one of the companies used disclosure to minimize the controversy, "managing" its legitimacy, while the other directly addressed the issue by presenting details about the problem in its report. Aerts and Cormier (2009) reported that the results companies from the United States and Canada disseminated in their sustainability reports directly influence the research companies' institutional image.

According to Anderson and Frankle (1980), the public disclosure of a set of information about the company's involvement with the community, employees, environment and benefits of the products offered is known as social disclosure.

Among international studies about the problem related to this research, the following stand out: Gray, Kouhy and Lavers (1995), Al-Tuwaijri, Christensen and Hughes II (2004), Kuasirikun and Sherer (2004), Cho and Patten (2007) and Clarkson, Jacobsen and Batcheller (2007), which explored the theme using different approaches and in different contexts, but without a distinguished approach to the eminently socio-environmental aspects. In addition, the analysis proposed in the present research should be underlined, aimed at identifying possible indicators of the disclosure levels about the sustainability dimensions in the research companies' reports. Even without the use of inferential statistical techniques, this raises important points for future academic discussions with a quantitative approach.

The research by Gray, Kouhy and Lavers (1995) was focused on describing the disclosure practices in

environmental and social reports by companies in the United Kingdom, between 1979 and 1991, and revealed a significant change in the social and environmental disclosure behavior during the period under analysis.

In the study by Al-Tuwaijri, Christensen and Hughes II (2004), the existing interrelation among environmental disclosure, environmental performance and economic performance is analyzed, using a simultaneous equation approach. The authors found a significant association between good environmental performance and good economic performance, and also with a quantitatively more extensive environmental disclosure of specific pollution measures and events.

More specifically related to environmental disclosure characteristics, the study by Kuasirikun and Sherer (2004) analyzed companies in Thailand and demonstrated that most information about the environment is disclosure in the Managament Report, in the declarative form and through positive news.

The results of the research by Cho and Patten (2007) – aimed at proving the role of legitimacy theory in environmental information disclosure – indicate a variation in the use of disclosure in different corporate groups. The generalized results provide additional support for the argument that companies use environmental disclosure as a tool to achieve legitimacy.

Clarkson et al. (2007) aimed to review the relation between disclosure and environmental performance, using the premises of the economic and socio-political theories of voluntary disclosure, based on a sample of 191 companies from the five most polluting sectors in the United States, and found a positive association between environmental performance and the level of discretionary environmental disclosure.

In view of the importance of the theme, Brazilian companies' voluntary information disclosure about socio-environmental responsibility practices led to a series of studies in recent years, many of which presented contradictory and sometimes inconsistent results.

Among Brazilian studies about the theme, Milani Filho (2008), Cunha and Ribeiro (2008), Rezende, Junqueira and Medeiros (2008), Rover and Murcia (2010), Teixeira and Nossa (2010) and Moura, Nascimento and De Luca (2010) are highlighted.

Milani Filho (2008) investigated whether companies that self-declared socially responsible publish specific financial information about the resources spent to the benefit of the public (private social investment) and whether a significant difference exists between spending in companies whose products are associated with negative externalities and those of organizations that participate in the BM&FBovespa Corporate Sustainability Index (CSI). The results indicated that not all organizations that declare making social investments disclose this fact. It was verified that 11.8% of the companies in the CSI portfolio and 72.2% of the companies linked with negative externalities do not publish information on social spending, creating doubts in the community about the accomplishment or dimension of these investments.

After investigating the incentives of companies traded on BM&Bovespa to voluntarily disclose social information in the period from 2004 to 2006, Cunha and Ribeiro (2008) concluded that the degree of spontaneity depends on the level of corporate governance, company performance and size, as well as on preliminary experiences.

Rezende, Junqueira and Medeiros (2008) analyzed the social responsibility practices of Brazilian companies awarded in the 2007 *Guia Exame de Sustentabilidade* and found that, in all of them, social responsibility is oriented from the internal to the external environment, which takes form in the concern with developing a culture focused on voluntary and environmental activities among their employees.

Rover and Murcia (2010) investigated whether the voluntary economic and socio-environmental disclosure level influences Brazilian companies' cost of own capital. The research results indicate that the voluntary disclosure level influences the companies' cost of capital; on the other hand, the hypothesis that, the greater the voluntary disclosure, the lesser the cost of capital, was not accepted.

The study by Teixeira and Nossa (2010), which investigated whether the companies' funding is affected by their participation in the corporate sustainability index (CSI) and whether a relation exists between the CSI and the (systematic) market risk, revealed that companies that indicated corporate social responsibility (CSR) showed a negative relation with indebtedness and risk, differently from the other companies.

Moura, Nascimento and De Luca (2010) investigated the voluntary social information disclosure of companies in the North, Northeast, Central-West and Southeast, according to the CSR indicators in the UN

Guide, and found that the most disclosed indicators are those required in the country's legislation in force – going against the idea of voluntary social disclosure – while the least disclosed indicators are non-financial.

Becchetti, Di Giacomo and Pinnacchio (2005) emphasize that the differences found in studies about this theme do not necessarily reflect errors, but imply different perspectives (observation periods, selected companies, performance measures and methodological approaches). Although some studies support the view that companies disclosure some information to enhance their legitimacy, this research is justified to the extent that it attempts to analyze the contents of information disclosure about the corporate sustainability dimensions (economic, social and environmental) in the sustainability reports, from the perspective of companies who won awards for their socio-environmental responsibility practices, considered as benchmarks in this study.

The choice of awarded companies is also highlighted in the context of legitimacy theory, which considers society's perception of the companies as very important. This distinction by society can take the form of awards that, according to Voss, Pfitscher and Cruz (2010, p. 4), commonly intend to acknowledge companies with "greater transparency and community and environmental participation, with a view to finding a situation that is better for everyone: government, society, businessmen, citizens, nature and the future".

3. Methodological procedures

In view of its objective, descriptive research with a qualitative approach adopts bibliographic and documentary procedures.

To answer the research question, the sample companies were selected based on the population of companies awarded in Editora Abril's 2009 *Guia Exame de Sustentabilidade* and companies that won the ECO Award, granted by *AMCHAM and Valor Econômico, in* 2007, 2008 and 2009 – awards that consider the main references of corporate sustainability indicators in Brazil and globally in their assessment -, as shown in Figure 1.

Guia Exame de Sustentabilidade (Editora Abril)	
Winners (2009)	**Analysis criteria**
AES Tietê S.A., Alcoa Alumínio S.A., Amanco Serviços e Participações Ltda, Anglo American Brasil Ltda., Banco Bradesco S.A., BRF – Brasil Foods S.A., Bunge Alimentos S.A., Companhia Energética do Ceará – Coelce, CPFL Energia S.A., EDP – Energias do Brasil S.A., Fibria Celulose S.A., Itaú Unibanco S.A., Masisa do Brasil Ltda., Natura Cosméticos S.A., Philips do Brasil Ltda., Promon S.A., Serasa S.A., Suzano Papel e Celulose S.A., Tetra Pak Ltda. and Walmart Brasil Ltda.	• Environmental criteria used for all production process phases • Companies developing projects with water consumption reduction targets • Publication of sustainability reports • Establishment of performance improvement targets and accountability for commitments assumed the previous year • Investments in sustainability to deal with most recent global crisis

ECO Award (AMCHAM and Valor Econômico)	
Winners (2007, 2008 and 2009)	**Award categories and analysis criteria**
ABN AMRO Real S.A., Banco Santander Brasil S.A., Bradesco Capitalização S.A., BrasilPrev Seguros e Previdência S.A., Carbocloro S.A. Indústrias Químicas, Companhia de Desenvolvimento dos Vales do São Francisco e do Parnaíba – CODEVASF, Eco Negócios Sustentáveis Ltda., E-TAB Tecnologia e Gestão Ltda., Intelcav Cartões Ltda., Itaipu Binacional, Microsoft Brasil and Multiplus Comercial de Alimentos Ltda.	• Categories: ◦ Sustainability in business model ◦ Sustainability in new projects ◦ Sustainability in processes ◦ Sustainability in products • Analysis criteria: ◦ Relevance for the business ◦ Contributions to improve corporate performance ◦ Social and environmental results obtained through innovation ◦ Related innovation management ◦ Possibility of dissemination or replication ◦ Quality of information disclosure ◦ Degree of innovation

Figure 1. Research population

Source: Research data.

According to Figure 1, the research population consists of 32 companies, 20 of which received awards in Editora Abril's *Guia Exame de Sustentabilidade* (2009), and 12 winners of the ECO Award by AMCHAM and Valor Econômico (2007, 2008 or 2009).

In Figure 2, the research sample is delimited, based on the criterion of sustainability reports published on the sample companies' websites, related to the years 2007, 2008 and/or 2009.

Company	Sustainability Report (SR) Year/Model			
	2007	2008	2009	Model
ABN AMRO Real S.A.	No	No	No	–
AES Tietê S.A.	Yes	Yes	Yes	GRI
Alcoa Alumínio S.A.	No	Yes	Yes	GRI
Amanco Serviços e Participações Ltda.	No	Yes	Yes	GRI
Anglo American Brasil Ltda.	Yes	Yes	Yes	GRI
Banco Santander Brasil S.A.	Yes	Yes	Yes	GRI
Banco Bradesco S.A.	Yes	Yes	Yes	GRI
Bradesco Capitalização S.A.	No	No	No	–
BrasilPrev Seguros e Previdência S.A.	No	Yes	Yes	Own
BRF – Brasil Foods S.A.	Yes	Yes	Yes	GRI
Bunge Alimentos S.A.	Yes	Yes	Yes	GRI
Carbocloro S.A. Indústrias Químicas	No	Yes	No	GRI
Companhia Energética do Ceará – Coelce	Yes	Yes	Yes	GRI
Companhia de Desenvolvimento dos Vales do São Francisco e do Parnaíba – Codevasf	No	No	No	–
CPFL Energia S.A.	Yes	Yes	Yes	GRI
Eco Negócios Sustentáveis Ltda.	No	No	No	–
EDP – Energias do Brasil S.A.	Yes	Yes	Yes	GRI
E-TAB Tecnologia e Gestão Ltda.	No	No	No	–
Fibria Celulose S.A.	Yes	Yes	Yes	GRI
Intelcav Cartões Ltda.	No	No	No	–
Itaipu Binacional	Yes	Yes	Yes	GRI
Itaú Unibanco S.A.	Yes	Yes	Yes	GRI
Masisa do Brasil Ltda.	Yes	Yes	Yes	Own
Microsoft Brasil	Yes	Yes	Yes	Own
Multiplus Comércio de Alimentos Ltda.	No	No	No	–
Natura Cosméticos S.A.	No	Yes	Yes	GRI
Philips do Brasil Ltda.	No	Yes	Yes	GRI
Promon S.A.	Yes	Yes	Yes	Own
Serasa S.A.	Yes	No	Yes	GRI
Suzano Papel e Celulose S.A.	Yes	Yes	Yes	GRI
Tetra Pak Ltda.	Yes	Yes	No	GRI
Walmart Brasil Ltda.	Yes	Yes	Yes	GRI

Figure 2. Research sample: companies that published sustainability reports between 2007 and 2009

Source: Research data.

Figure 2 shows that 25 companies (or 78.1% of the population) elaborated and published their sustainability reports for at least one of the three years under study: 19 in 2007, 24 in 2008 and 23 in 2009. Most of the

companies adopted the Global Reporting Initiative (GRI) model – an international organization that joints representatives from governments, companies and civil entities – in the elaboration of sustainability reports.

After defining the sampling universe, the sustainability reports of the companies for 2007, 2008 and 2009 were subject to content analysis. The three phases of the method were observed, according to Bardin (2004): (1) pre-analysis; (2) exploration of the material, in this case the sustainability reports; and (3) treatment of the results, inference and interpretation.

In this sense, the phrases were used as analysis units to code and quantify the disclosure. For the sake of content analysis, the number of phrases related to the observation fields – corporate sustainability dimensions – were counted: economic, internal social, external social and environmental: and to the types of disclosure: type 1 – declarative phrase, type 2 – non-monetary quantitative phrase and type 3 – monetary quantitative phrase – in the sustainability reports for the period from 2007 to 2009, of companies awarded in Editora Abril's 2009 *Guia Exame de Sustentabilidade* and companies that won the ECO Award, granted by *AMCHAM and Valor Econômico (*2007, 2008 and 2009).

The content analysis applied starts with the qualitative part, through the reading and interpretation of the text messages, and continues with the quantitative part, based on the coding and quantification (frequency counts) of each disclosure element observed. The disclosure types considered for this study, in accordance with Nossa (2002), are: type 1) declarative disclosure – when the qualitative information is described and expressed in exclusively descriptive terms; type 2) non-monetary quantitative disclosure – when the quantitative information is described and expressed in non-financial figures; and type 3) monetary quantitative disclosure – when the quantitative information is described and expressed in financial figures.

Figure 3 provides some examples of phrases in the sustainability reports (SR) under analysis, according to the sustainability dimension and disclosure type.

Sustainability dimension	Type of disclosure	Phrase
Economic	1	It is the leading institution among financial and economic-financial conglomerates registered in the Central Bank (Santander, RS 2008)
	2	Includes 60 industrial units in Brazil and three abroad (Argentina, England and the Netherlands), exports to more than 110 countries and its portfolio includes more than 3,000 items (BRF – Brasil Foods, RS 2009)
	3	Regional sales reached a record US$ 2.9 billion, resulting in a net income of US$ 475 million (Alcoa, RS 2008)
Internal Social	1	Ranks among the best companies to work at in the ranking organized by the magazines Exame and Você S/A (Coelce, RS 2009)
	2	Registered 1,502 participations in courses among its collaborators, totaling 20,428 man-hours of training (AES Tietê, RS 2007)
	3	Distributed about R$ 35.5 million together with its collaborators, through three programs (Bunge Alimentos, RS 2007)
External Social	1	Its activities move a large production chain, which levers the socioeconomic development in the regions it is active in (Fibria, RS 2007)
	2	CPFL Leste Paulista donates 143 high-energy efficiency refrigerators and 4,950 lights, while CPFL Mococa donates 120 refrigerators and replaced 3,180 lights (CPFL, RS 2007)
	3	Sociocultural programs supported and promoted by the company, focused on educational and local development initiatives, received R$ 8.5 million in investments (EDP, RS 2009)
Environmental	1	The established structure allows the institutional commitment to go beyond legal environmental measures, promoting ways to expand its participation in the maintenance and preservation of local biodiversity (Anglo American, RS 2008)
	2	Reduction of water (8.9%) and energy consumption (16.9%) in industrial operations per billing unit (Natura, RS 2008)
	3	More than R$ 2.5 million invested in forest units (Suzano, RS 2008)

Figure 3. Examples of phases published in research companies' SR

Source: Research data.

Thus, the types of mutually exclusive and exhaustive disclosure considered for the sake of this study are: declarative, quantitative monetary and quantitative non-monetary, related to the corporate sustainability dimensions found in the research companies' sustainability reports.

It should be highlighted that one of the study limitations relates to the analysis of the information disclosure levels, based on an instrument that only assesses the quantity of information, but not its quality.

4. Research results

4.1. Company characteristics

Figure 4 presents the distribution of the 25 companies that participated in the sample– awarded in Editora Abril's 2009 *Guia Exame de Sustentabilidade* and winners of the ECO Award, granted by *AMCHAM and Valor Econômico (*2007, 2008 or 2009) – per activity sector, effect of the activities on the environment, size, capital structure and listing segment on BM&FBovespa. To define the companies' sector and the nature of their activities, Attachment VIII to Law 10.165/2000 was used, about the National Environmental Policy. As regards the company size, based on the companies' gross revenues during the year ended on 12/31/2009, the classification in the same law was considered, whose article 17-D informs that a medium-sized company is considered as a legal entity with gross annual revenues superior to R$ 1,200.000.00 and not superior to R$ 12,000,000.00, and large-sized companies as legal entities with a gross annual income superior to R$ 12,000,000.00.

Company	Activity sector	Effect of activity on the environment	Size	Capital structure	Listing segment on BM&FBovespa
BM&FBovespa	Energy	Polluting	Large	Open	–
Alcoa Alumínio S.A.	Iron/steel	Polluting	Large	Closed	–
Amanco Serviços e Participações Ltda.	Construction industry	Polluting	Large	Closed	–
Anglo American Brasil Ltda.	Mining	Polluting	Large	Closed	–
Banco Santander Brasil S.A.	Finance	Non-polluting	Large	Open	Level 2
Banco Bradesco S.A.	Finances	Non-polluting	Large	Open	Level 1
BrasilPrev Seguros e Previdência S.A.	Insurance/social security	Non-polluting	Medium	Closed	–
BRF – Brasil Foods S.A.	Consumption goods	Polluting	Large	Open	New Market
Bunge Alimentos S.A.	Consumption goods	Polluting	Large	Closed	–
Carbocloro S.A. Indústrias Químicas	Petrochemicals	Polluting	Medium	Closed	–
Companhia Energética do Ceará – Coelce	Energy	Polluting	Large	Open	–
CPFL Energia S.A.	Energy	Polluting	Large	Open	New Market
EDP – Energias do Brasil S.A.	Energy	Polluting	Large	Open	New Market
Fibria Celulose S.A.	Paper and pulp	Polluting	Large	Open	New Market
Itaipu Binacional	Energy	Polluting	Large	Closed	–
Itaú Unibanco S.A.	Finance	Non-polluting	Large	Open	Level 1
Masisa do Brasil Ltda.	Wood	Polluting	Large	Closed	–
Microsoft Brasil	Informatics	Non-polluting	Large	Closed	–
Natura Cosméticos S.A.	Consumption goods	Polluting	Large	Open	New Market
Philips do Brasil Ltda.	Electro-electronics	Polluting	Large	Closed	–
Promon S.A.	Services	Non-polluting	Large	Closed	–
Serasa S.A.	Services	Non-polluting	Large	Closed	–
Suzano Papel e Celulose S.A.	Paper and pulp	Polluting	Large	Open	Level 1
Tetra Pak Ltda.	Packaging	Polluting	Large	Closed	–
Walmart Brasil Ltda.	Retailing	Non-polluting	Large	Closed	–

Figure 4. Characterization of companies in the research sample

Source: Research data.

Based on the data in Figure 4, the predominance of companies from the energy (5), finance (3) and consumption goods (3) sectors is verified. As regards the effect on the environment, 17 companies (68%) are considered as polluting. In addition, although almost all companies are large-sized (23), only 11 of them are publicly traded, nine of which are listed in BM&FBovespa Corporate Governance levels (Level 1, Level 2 or New Market). Despite the small proportion of publicly traded companies in the sampling universe, the data reveal that not only companies traded on the stock exchange – to attract investors, among other objectives – but also closed companies are assuming the accomplishment, control and disclosure of socio-environmental responsibility practices.

4.2. Disclosure levels about corporate sustainability levels and types of disclosure adopted in the research companies

Table 1 displays the number of phrases about the corporate sustainability dimensions in the research companies' reports for 2007, 2008 and 2009.

Table 1
Disclosure about corporate sustainability dimensions in sustainability reports – 2007/2008/2009

Corporate sustainability dimension	2007 (19 companies)		2008 (24 companies)		2009 (23 companies)	
	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)
Economic	2,193	20.8	2,995	21.5	2,901	24.8
Internal Social	2,530	23.9	3,452	24.7	2,863	24.4
External Social	2,976	28.2	3,766	27.0	3,209	27.4
Environmental	2,867	27.1	3,744	26.8	2,744	23.4
Total	**10,566**	**100.0**	**13,957**	**100.0**	**11,717**	**100.0**
Mean per company	556		581		509	

Source: Research data.

Although the number of phrases about the sustainability dimensions published in 2008 and 2009 increased by 32.1% and 10.9%, respectively, in comparison with 2007, in fact, the volume for 2009 corresponded to a drop by 16% in relation to 2008, so that no assertions can be made about and evolution in the information quantity published in the reports during that three-year period (Table 1).

As regards the corporate sustainability dimensions, the external social dimension was the most evidenced in the three years under analysis, followed by the environmental dimension in 2007 and 2008 and the economic dimension in 2009. On the whole, the (internal and external) social dimension represents 52.1%, 51.7% and 51.8% of disclosure about the corporate sustainability dimensions in 2007, 2008 and 2009, respectively. The economic dimension is the least expressive in the first two years under analysis, revealing that the sustainability report was essentially used as a disclosure instrument of socio-environmental responsibility practices.

Figure 5 illustrates the disclosure behavior about the research companies' corporate sustainability dimensions in the reports for 2007, 2008 and 2009.

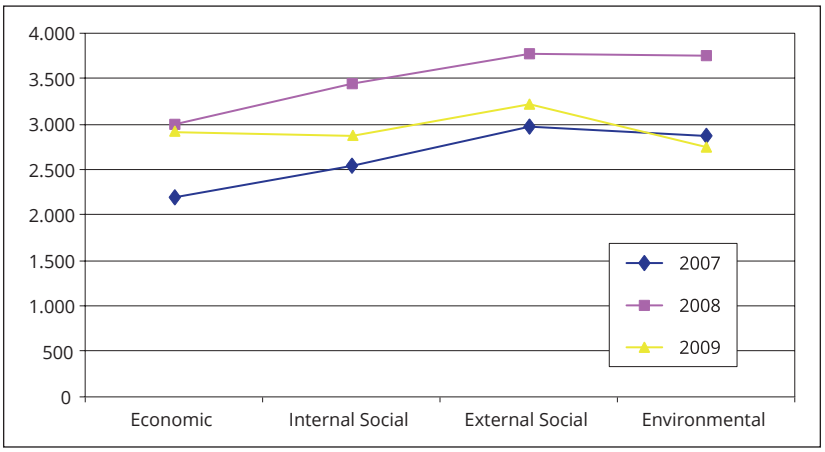

Figure 5. Behavior of disclosure on sustainability dimensions in sustainability reports

Source: Research data.

According to Figure 5, the environmental dimension showed the strongest drop in the number of phrases published in the companies' sustainability reports, a fact that influenced the decline in the general disclosure about the sustainability dimensions across the triennium under analysis.

In general, regarding the preponderance of the social dimension in the sustainability reports analyzed, these research results are in line with the findings by Rezende, Junqueira and Medeiros (2008) who, in an analysis of social responsibility practices among companies awarded in the 2007 *Guia Exame de Sustentabilidade*, identified that social responsibility was oriented from the internal to the external context.

Table 2 demonstrates the quantitative distribution of phrases on the corporate sustainability dimensions evidenced in the research companies' sustainability reports per type of disclosure in the reports for 2007, 2008 and 2009.

Table 2

Quantitative and proportional distribution of phrases on corporate sustainability dimensions evidenced in the research companies' sustainability reports per type of disclosure – 2007/2008/2009

Corporate sustainability dimension	2007 (19 companies)		2008 (24 companies)		2009 (23 companies)	
	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)
1	4,205	39.8	5,353	38.3	4,339	37.0
2	3,870	36.6	5,648	40.5	4,797	41.0
3	2,491	23.6	2,956	21.2	2,581	22.0
Total	**10,566**	**100.0**	**13,957**	**100.0**	**11,717**	**100.0**
Mean per company	556		581		509	

Source: Research data.

In Table 2, it is observed that, in 2007, type 1 disclosure – declarative disclosure was predominant. In 2008 and 2009, on the other hand, type 2 – non-monetary quantitative disclosure predominated. In the three years under analysis, type 3 – monetary quantitative disclosure was the least used. On the whole, (monetary and non-monetary) quantitative disclosure corresponds to 60.2%, 61.7% and 63% of the disclosure types used in the companies' sustainability reports on the corporate sustainability dimensions in 2007, 2008 and 2009, respectively, revealing a quantitative growth in the information volume across the triennium.

Figure 6 illustrates the behavior of the three disclosure types about the corporate sustainability dimensions in the companies' reports for 2007, 2008 and 2009.

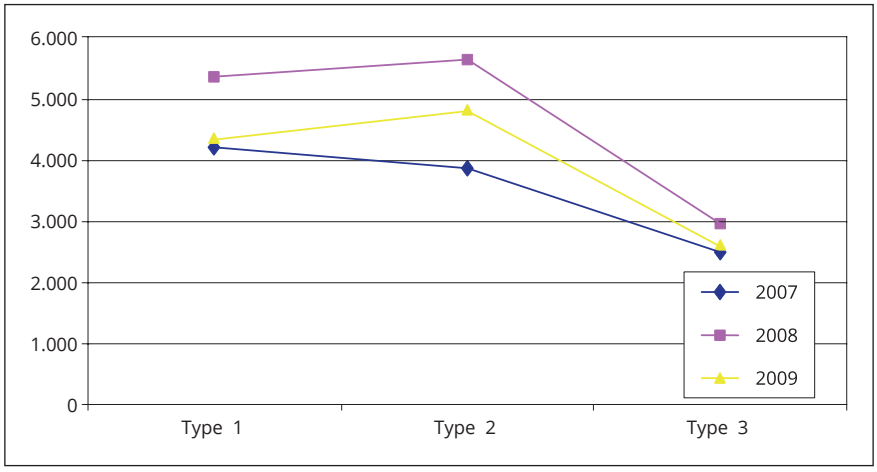

Figure 6. Behavior of disclosure types adopted by the companies for disclosure on sustainability dimensions in the sustainability reports

Source: Research data.

In Figure 6, it is observed that, in 2009, type 1 *disclosure* (declarative disclosure) registered the strongest drop in the number of phrases published in the reports when compared to 2008. This finding is in accordance with the results by Kuasirikun and Sherer (2004), which highlight that most information disclosure about the environment by Thai companies is published in the declarative form.

In addition, type 3 disclosure (monetary quantitative disclosure) was the least representative and varied less across the triennium, differently from the findings by Moura, Nascimento and De Luca (2010). In an investigation of voluntary disclosure of social information by companies from the North, Northeast, Central-West and Southeast listed on BM&FBovespa, according to the indicators in the UN Guide, found that non-financial information was the least evidenced.

Table 3 presents the combination between data from Tables 1 and 2, with a view to presenting the type of disclosure adopted for the phrases related to each of the corporate sustainability dimensions in the research companies' reports for 2007, 2008 and 2009.

Table 3

Corporate sustainability dimensions per disclosure type – 2007/2008/2009

Economic Dimension						
Disclosure type	2007		2008		2009	
	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)
1	770	35.1	940	31.4	890	30.7
2	805	36.7	1,217	40.6	1,073	37.0
3	618	28.2	838	28.0	938	32.3
Total	**2,193**	**100.0**	**2,995**	**100.0**	**2,901**	**100.0**

Internal Social Dimension						
Disclosure type	2007		2008		2009	
	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)
1	1,059	41.9	1,493	43.3	1,061	37.1
2	950	37.5	1,385	40.1	1,091	38.1
3	521	20.6	574	16.6	711	24.8
Total	**2,530**	**100.0**	**3,452**	**100.0**	**2,863**	**100.0**

External Social Dimension						
Disclosure type	2007		2008		2009	
	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)
1	1,260	42.3	1,393	37.0	1,262	39.3
2	1,005	33.8	1,460	38.8	1,430	44.6
3	711	23.9	913	24.2	517	16.1
Total	**2,976**	**100.0**	**3,766**	**100.0**	**3,209**	**100.0**

Environmental Dimension						
Disclosure type	2007		2008		2009	
	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)	Nº of phrases	Proportion (%)
1	1,116	38.9	1,433	38.3	1,126	41.0
2	1,110	38.7	1,636	43.7		43.9
3	641	22.4	675	18.0	415	15.1
Total	**2,867**	**100.0**	**3,744**	**100.0**	**2,744**	**100.0**

Source: Research data.

In Table 3, it is observed that, to disclose information on the economic dimension, the companies mainly adopted type 2 disclosure (non-monetary quantitative disclosure). The same is true for the external social and environmental dimensions in 2008 and 2009. For the internal social dimension, then, type 1 disclosure information (descriptive disclosure) is preponderant, in line with the results by Gallon and Ensslin (2008).

Among the four dimensions under analysis, information about the economic dimensions was the most and about the environmental dimension the least measured in terms of monetary values, which may indicated companies' difficulty to disclose and measure environmental assets, liabilities, costs and expenses. These results reject the findings by Clarkson et al. (2007) who, in a review of the relation between disclosure and environmental performance in North American companies from polluting sectors, found

that a positive association exists between environmental performance and the level of discretionary environmental disclosure. They also differ from the results by Al-Tuwaijri, Christensen and Hughes II (2004), which indicate that a good environmental performance is associated with a quantitatively more extensive environmental disclosure of specific pollution measures and events.

Based on the identification that the awarded companies most frequently evidenced the external social dimension across the three years, it is important to relate this finding with other variables that can justify this result, in view of premises and statistical techniques (an aspect that was not investigated in this purely qualitative research).

4.3. Identification of possible indicators of disclosure levels about sustainability dimensions in the research companies' reports

It should be clarified that, to achieve the second specific research objective – the identification of possible indicators of disclosure levels about the sustainability dimensions in the research companies' reports –, the analysis was focused on disclosure in the 2009 sustainability reports. Hence, the 23 companies that elaborated and published their sustainability reports for 2009 on their respective websites participated in the analysis.

The following possible indicators were considered for this purpose: activity sector, effect of activity on the environment, size, capital structure and listing segment on BM&FBovespa. The choice of these factors is due to the fact that they were also considered in other studies about voluntary disclosure, such as Cunha and Ribeiro (2008).

Table 4 displays the quantitative distribution of phrases published about the corporate sustainability dimensions, stratified among the possible indicators of disclosure levels in the reports for 2009.

Table 4
Possible indicators of disclosure levels in 2009

Factor	Nº of companies	Number of phrases about sustainability dimensions of research companies, per factor, dimension, total and mean per company					
		Economic	Internal Social	External Social	Environmental	Total	Mean per Company
Activity sector							
Consumption goods	3	300	549	613	481	**1,943**	**647.7**
Electro-electronics	1	94	118	124	97	**433**	**433**
Energy	5	785	803	742	811	**3,141**	**628.2**
Finance	3	858	398	457	284	**1,997**	**665.7**
Construction industry	1	42	87	82	90	**301**	**301**
Informatics	1	9	35	145	52	**241**	**241**
Wood	1	92	103	127	133	**455**	**455**
Mining	1	87	49	66	105	**307**	**307**
Paper and pulp	2	272	341	333	303	**1,249**	**624.2**
Insurance and social security	1	118	55	39	8	**220**	**220**
Services	2	190	235	288	191	**904**	**452**
Iron and steel	1	34	32	69	68	**203**	**203**
Retailing	1	20	58	124	121	**323**	**323**

Factor	Nº of companies	Number of phrases about sustainability dimensions of research companies, per factor, dimension, total and mean per company					
		Economic	Internal Social	External Social	Environmental	Total	Mean per Company
Effect of activity on the environment							
Polluting	15	1.706	2.082	2.156	2.088	**8,032**	**535.5**
Non polluting	8	1.195	781	1.053	656	**3,685**	**460.6**
Size							
Large	22	2.783	2.808	3.170	2.736	**11,497**	**522.6**
Medium	1	118	55	39	8	**220**	**220**
Capital structure							
Publicly traded	11	2.002	1.770	1.849	1.538	**7,159**	**650.8**
Closed	12	899	1093	1360	1.206	**4,558**	**379.8**
Listing segment							
–Traditional	2	316	339	335	254	**1,244**	**622**
Level 1	3	385	454	524	413	**1,776**	**592**
Level 2	1	598	130	110	30	**868**	**868**
New Market	5	703	847	880	841	**3,271**	**654.2**

Source: Research data.

Initially, it should be emphasized that some analysis about the possible indicators of disclosure levels in the 2009 sustainability reports were compromised, due to the concentration of some companies in certain categories, such as size (concentration of large-sized companies), pulverization of the 23 companies in 13 activity sectors and the small number of companies that participated in the BM&FBovespa listing segments (11). Independently of the analytic limitations, however, the main results highlighted in Table 4 are discussed next.

In the comparison per activity sector, companies from the finance, consumption goods, energy and paper and pulp sectors show the highest disclosure levels, while companies in the iron and steel, insurance and social security and informatics sectors present the lowest levels. In some sectors, information related to some corporate sustainability dimensions is predominant, like information on the environmental dimension in energy, mining and retailing sectors, and on the external social dimension in consumption goods, energy, informatics, paper and pulp, services and retailing sectors.

Concerning the effect of the activity on the environment, the 2009 sustainability reports for polluting companies contain more phrases and prioritized the disclosure of information on the external social and environmental dimensions, differently from the companies characterized as non-polluting, with a lower disclosure level, which disclosed more economic information, indicating the effect of the activity on the environment as an indicator of the disclosure level and focus about the sustainability dimensions in the companies' reports.

As regards the company size, although almost all companies (21) were large, medium–level disclosure in these companies was higher than in medium-sized companies.

An interesting fact relates to the analysis of disclosure about the companies' capital structure, considering that publicly traded companies present a much higher disclosure level than closed companies, suggesting that the capital structure serves as an indicator of the disclosure level about the sustainability dimensions in the companies' reports. Lins and Silva (2009) discuss the importance of information disclosure as a way to attract investors, considering that disclosure plays an essential role in the reduction of information asymmetry between company managers and stakeholders.

Despite the limitations of the analysis according to listing segments, as only 11 of the research companies are listed on BM&FBovespa, one cannot infer that a clear correspondence exists between the respective listing segment and the information disclosure level about the corporate sustainability dimensions in each company's reports. The results demonstrate that: (i) the companies that, despite being traded on BM&FBovespa, do not participate in any of the three distinguished corporate governance levels, show a higher mean number of disclosed phrases than Level 1 companies; and (ii) Level 2 companies show a higher mean number of disclosed phrases than New Market companies. These findings go against the assertion by BM&FBovespa (2011) that the companies listed in these three special segments offer better corporate governance practices, enhancing the rights of minority stockholders, and increase companies' transparency by disclosing more and higher-quality information, which makes it easier to monitor their performance. The results go against the study by Cunha and Ribeiro (2008) who, in an investigation of publicly traded companies' incentives towards voluntary social information disclosure concluded that this spontaneity is positively associated with the corporate governance level.

At this point in the research, it should be highlighted that the preliminary results based on the qualitative analysis of the contents of the awarded companies' sustainability reports also needs to be examined with the help of some multivariate techniques, capable of confirming the relation among variables.

5. Conclusion

The main goal in this research was to analyze the contents of information disclosure about the corporate sustainability dimensions – economic, social and environmental – in the sustainability reports of companies that won awards for the socio-environmental accountability practices. In the content analysis of the companies' sustainability reports (2007, 2008 and 2009), the phrases were considered as the analysis units, with two observation fields: the corporate sustainability dimensions and the types of disclosure adopted.

According to the results obtained, the companies that participated in the research – awarded in the *Guia Exame de Sustentabilidade* (2009) and winners of the ECO Award by AMCHAM and Valor Econômico (2007, 2008 or 2009) – are mostly large-sized, with closed capital, are active in the energy, finance and consumption goods sectors and their activities are characterized as polluting, according to Attachment VIII of Law 10.165/2000, about the National Environmental Policy.

Based on the qualitative analysis of the reports, considering the disclosure level about the sustainability dimensions and the types of disclosure adopted in the research companies, it cannot be affirmed that the quantity of information published in the reports evolved across the triennium under analysis. In general, it could be observed that the external social dimension was the most evidenced during the years analyzed, followed by the environmental dimension in 2007 and 2008. The economic dimension was the least expressive during the first two years under analysis, revealing that the companies essentially used the sustainability report as an instrument to disclose their socio-environmental responsibility practices. As regards the types of disclosure, it was verified that, in 2007, type 1 – declarative disclosure was preponderant, against type 2 – non-monetary quantitative disclosure in 2008 and 2009. In addition, during the three years studied, type 3 – monetary quantitative disclosure was the least used.

Concerning the identification of possible indicators of disclosure levels about the sustainability dimensions in the research companies' reports, despite the analytic limitations, it was verified that: (i) the companies from the finance, consumption goods, energy and paper and pulp sectors presented the highest disclosure levels, while companies from the iron and steel, insurance and social security and informatics sectors showed the lowest levels; (ii) the factors, effect of activity on the environment and capital structure were considered indicators of the disclosure levels about the corporate sustainability dimensions in the companies' reports; (iii) no clear correspondence exists between the companies' listing segments on BM&FBovespa and the information disclosure levels about the sustainability dimensions in the respective reports.

Finally, it should be reminded that the qualitative analysis developed, even if embryonic, indicated important aspects about the voluntary disclosure of corporate sustainability dimensions in the reports of companies who received awards for the socio-environmental sustainability practices. The need to complement these reports is highlighted though, through the application of statistical analyses in future studies, with a view to confirming possible relations among variables, as well as to elaborate statistical analyses to check for differences between: (i) the group of closed and publicly traded companies, and (ii) the group of companies that received no awards with those that did, with a view to confirming whether the companies that received awarded can be considered benchmarks in terms of disclosure for other companies that are not part of this universe and seek social acknowledgement with a view to achieving legitimacy.

Specifically regarding the identification of the higher disclosure levels for the factors activity sector, effect of the activity on the environment and capital structure, it should be clarified that, despite the scientific rigor applied, it is important to use multivariate statistical techniques in future studies, such as Correspondence Analysis (Anacor) and Discriminant Analysis, with a view to perceiving not only indicators, but also explanatory or conditioning factors of voluntary socio-environmental information disclosure levels in Brazilian companies.

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Costs Systems: Relevance, Feasibility And Usefulness According To Public Officials In The State Of Paraná (Brazil)

Abstract

The aim in this study is to get to know the level of understanding and adoption of cost systems in cities in the State of Paraná. A descriptive study with a qualitative approach was undertaken. Data were collected through the application of a questionnaire in 67 cities in the State of Paraná. Descriptive analysis was used and Spearman's correlation coefficient was applied to achieve the research objective. Among the study results, the following stand out: the incipient nature of knowledge about the relevance, feasibility and usefulness of a cost system; resulting from public officials' limited knowledge, mainly about topics related to the budgetary and financial feasibility of adopting cost systems; an environment for the cost system, implemented costs systems and operating systems; although the answers obtained to proposals about cost information and control were significantly coherent.

Key words: Cost System. Cost Accounting. Public Sector.

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1. Introduction

Brazilian public management, like in different developed countries, has gone through different reforms (Di Giácomo, 2005), aimed at promoting the overcoming of bureaucratic models and at incorporating management techniques and notions of quality, productivity, feasible results and accountability (Pereira, 1998). The first countries to adhere to State management reforms were the United Kingdom, Australia and New Zealand (Dias, Gondrige, Clamente, Espejo & Voese, 2009). *"The New Public Management"* was a term coined in the 1980's to designate the new form of public management that was aimed at incorporating experiences from the private sector by professionalization efforts in public service delivery and the establishment of doctrines that are sometimes linked with economic rationalism (Hood, 1989).

Numerous constitutional amendments, laws and decrees have been issued in recent decades to support the implementation of the Master Plan for the Reform of the State, under Fernando Henrique Cardoso's mandate (Pereira, 1998). The established objectives included the reduction of the state administrative machine and the decentralization of government actions, supplying the State with effective control and decision making tools, applied to the budget, accounting, finance, equity and internal control sectors. These innovations contributed to the need for managers to get to know the costs of public entities, with a view to deciding among production, purchase, outsourcing or privatization alternatives.

As a result of the legal obligation to adopt cost systems and their role as an important tool for control and decision making, this study is guided by the following research question: to what extent to cities in the State of Paraná understanding and adopt cost systems in terms of relevance, feasibility and usefulness? Other perceptions derive from the answers obtained from public officials, as indicated in the study results.

In that sense, the aims in this research are to: get to know the level of understanding and adopting of cost systems in cities in the State of Paraná, specifically considering the answers to the survey applied, analyze the level of implementation difficulties perceived, the degree of knowledge about cost systems among these professionals and notions of structural and financial conditions.

The study is justified by the fact that it identifies the level of understanding and adoption of cost systems among municipal professionals, as these instruments can turn into an important control tool in government activities, can guarantee the achievement of budgetary objectives and, consequently, compliance with the institutional mission. Another relevant factor is the public officials' assessment of the notion about the availability of financial and structural resources to fund the implementation of new systems, which can be a guiding element in the search for internal and/or external resources to comply with the demand. On the other hand, it is verified that research to assess the adoption of public cost systems in Brazil is still incipient and that no scientific signs of this kind exist for the State of Paraná.

Paraná is located in the South of Brazil and occupies a geographically strategic position, bordering on important economic centers like the State of São Paulo and the countries Paraguay and Argentina. The State also characterizes a corridor that links the rest of the country with the other Southern states Santa Catarina and Rio Grande do Sul. Paraná occupies an area of 199,880 km² and the state's economy is the fifth largest in the country. The State is currently responsible for 6% of the Brazilian gross domestic product (GDP) and registered a per capita income of R$ 21.1 thousand in 2010, higher than the R$ 19.3 thousand for Brazil (Instituto Paranaense de Desenvolvimento Econômico e Social, *Ipardes*, 2010).

This paper is structured in five sections besides this introduction: (i) theoretical framework, including citations from the literature about the modernization of Brazilian public accounting, compulsory implementation of public cost systems and accounting systems for Paraná public sector, (ii) method, including the research design, population and samples, data collection and statistical procedures applied, (iv) study results, (iv) final considerations and, to finish, the (v) References.

2. Theoretical framework

The theoretical framework, literature review, theoretical framework, theoretical arguments or theoretical background, according to Boaventura (2004), is aimed at reviewing or "demonstrating what has been written about the theme. It consists in the analysis and synthesis of information with a view to defining the action lines to address the problem and generate new and useful ideas".

2.1 Modernization of Brazilian public administration

Following the example of what has been happening in different countries since the 1980's, like Australia, England, United States, New Zealand, Japan, Italy, Canada, Spain, Sweden, Switzerland, Argentina, Turkey, Austria, Mexico, Ireland, Portugal, South Korea and Finland, Brazil has gone through different economic reforms (Di Giácomo, 2005), aimed at promoting the "overcoming of past bureaucratic models, with a view to incorporating management techniques that introduce fundamental notions of quality, productivity, results and employee accountability into the culture of public activities" (Pereira, 1998, p. 28).

This new public management concept was based on academic studies called "The New Public Management (NPM)", a concept that, since its preliminary mentions in the studies by Hood (1995), is aimed at combining management experiences and techniques between the public and private sectors. In summary, that authors presents the following main characteristics of NPM: the disaggregation of organizations into entities for separate management, the search for greater competition among organizations from the public and private sectors, the use of management practices that are common in companies; greater discipline in the use of resources and search for alternatives to relieve service delivery and the adoption of performance and control measures (Hood, 1995, p. 95).

Thus, the new version of public management starts to conceive administration in accordance with a professional and technical model that aims to respond to the society's demands by means of an effective public service, in accordance with the taxpayers' rights and expectations. In that sense, professionalization is expected to intensity economic development and, at the same time, maintain the political capacity to govern on behalf of the people, guaranteeing the administrative and financial commitment to put in practice public policies, without room for "bureaucratic and prebendary nobility" (Di Giácomo, 2005).

In Brazil, the 1990's were marked by different reform, as a result of Constitutional Amendments 01 to 24, related to public sector aspects. The experience started in 1995 when the Master Plan for the Reform of the State Apparatus was put in practice. Its management objectives were to reduce the state's administrative machine and decentralized government actions, however, without losing the focus on the eminently public function, on behalf of the citizens-taxpayers (Dias *et al.*, 2009). A series of measures were implemented in all Brazilian States and cities, with a view to professionalizing public management, supplying the State with effective management tools for control and decision making, applied to the budget, accounting, finance, equity and internal control sectors.

The characteristics of public administration clearly differ from the management of private institutions and, in this context, the restrictive apparatus the principle of legality imposes on managers should be highlighted, that is, in public administration, one can only do what the law permits. In private administration, on the other hand, it is legal to do anything the law does not prohibit (Meirelles, 2009). Thus, the implementation of accounting and cost systems stops being a faculty for managers and becomes compulsory. In case of non-compliance, the manager and/or public entity can be held accountable.

2.2 Legal and regulatory compulsoriness of implementing public cost systems

In the year 2000, the Federal Complementary Law 101/2000, also known as Fiscal Responsibility Law (FRL) was issued, which was revolutionary in its establishment of limits on public indebtedness and on the control of spending on human resources, besides the determination of accountability criteria to guarantee the planned balance of public accounts. The text of the Law incorporates the concept of costs, which has been firmly valued in public accounting since 1964, through article 85 of Federal Law 4.320/64:

> Accounting services will be organized to permit monitoring the budgetary execution, knowing the equity composition, determining the costs of industrial services, surveying general balance sheets, analyzing and interpreting economic and financial results (LF 4320/64) [authors' italics]

Sendo assim, a LRF traz nova conotação ao antigo preceito de gestão pública: a necessidade da implantação de sistemas de custos por parte de todas as entidades governamentais brasileiras. O artigo 4º, da LRF, ainda, impõe à Lei de Diretrizes Orçamentárias (LDO) a devida instrumentalização de termos norteadores à efetiva implantação dos sistemas de custos públicos, em atendimento às normas constitucionais:

> Art. 4 The law of budgetary guidelines will comply with determinations in § 2o of art. 165 in the Federal Constitution and:
> I – will also determine one:
> (...)
> e) regulations to control the costs and assess the results of programs funded with budgetary resources; (LC 101/2000 - FRL) [author's italics]

Moreover, article 50 of the FRL establishes that the bookkeeping of public accounts should heed, among other aspects, the need for permanent maintenance of cost systems that permit assessing and monitoring budgetary, financial and equity management by public managers, like health system costs, educational costs, administrative costs, program costs, charge costs and debt execution for example. Other determinations, like article 14 in the FRL, regulate cost control as a fundamental additional measure to comply with legal determinations, like the control of foregone revenues and the concession of tax benefits.

> Art. 50. Besides complying with the other public accounting standards, the bookkeeping of public accounts has to comply with the following: (...)
> § 3º Public Management is to maintain a **cost system** that permits the assessment and monitoring of budgetary, financial and equity management. (LC 101/2000 - FRL) [authors' italics]

> Art. 14. The concession or expansion of tax incentives or benefits that give rise to foregone revenues should be accompanied by the estimated budgetary-financial impact during the year it is to gain force and the two subsequent years, comply with the legal determinations of the law of budgetary guidelines and with at least one of the following conditions:
> (...)
> § 3º The determinations in this article do not apply:
> (...)
> II – to the cancelation of debts whose amount remains below that of the respective charge **costs**. (LC 101/2000 – FRL) [authors' italics]

Another landmark took place in 2008, when the Secretary of the Treasury (MF) issued Decree 184/08 and determined that the Secretary of the National Secretary (STN) should promote convergence between the International Accounting Standards published by the International Federation of Accountants

(IFAC) and the Brazilian Standards applied to the Public Sector, issued by the Federal Accounting Council (CFC), considering the adoption of good accounting routines as a credibility factor and an instrument for economic-financial and performance monitoring and comparison in public entities, besides granting economical and efficient resource allocation (Decree 184/2008).

In Brazil, through joint efforts that involved professional and governmental entities and accountancy researchers, this convergence has been taking place since 2010. The ministerial authorization provoked a range of studies all over the countries and culminated in the Federal Accounting Council's (CFC) publication of ten Brazilian Accounting Standards Applied to the Public Sector (NBCASP), numbered from 16.1 to 16.10. Among these regulations, NBCASP 16.2 is cited, attested in Resolution 1.129/2008-CFC, called Equity and Accounting Systems, whose contents describe, among other aspects, the implementation of cost systems as a a modality of the accounting subsystem.

> 12. The accounting system is structured into the following information subsystems:
> (a) Budgetary - registers, processes and discloses the acts and facts related to budgetary planning and execution;
> (b) Financial – registers, processes and evidences the facts related to financial inflows and outflows, as well as capital available at the start and end of the period;
> (c) Equity - registers, processes and discloses non-financial facts related to qualitative and quantitative variations in public equity;
> (d) **Costs** - registers, processes and discloses the costs of goods and services the public entity produces and offers to society;
> (e) Compensation – registers, processes and discloses the management acts whose effects can produce modifications in the public sector entity's equity, as well as acts with specific control functions. (CFC, NBCASP 16.2) [authors' marks]

NBCASP 16.2 also establishes that the respective accounting subsystems need to be integrated mutually and with other operational electronic and information systems, so as to help public administration to comply with its institutional mission, related to the assessment of the results obtained through the execution of its programs, focusing on the preservation of principles like economy, efficiency, effectiveness and efficacy, also permitting the assessment of planned and budgetary targets, as well as the analysis of the risks and contingencies public entities are subject to.

2.3 The State of Paraná and its cities

This study is focused on the cities in the State of Paraná, which is one of the most important units of the federation in economic terms, with is 399 cities and the state capital Curitiba. The State holds the fifth highest number of cities, preceded by Minas Gerais with 853 cities, São Paulo with 645, Rio Grande do Sul with 496 and Bahia with 417 cities. Paraná figures among the eight Brazilian states that concentrate 80% of the national GDP, together with São Paulo, Rio de Janeiro, Minas Gerais, Rio Grande do Sul, Bahia, Santa Catarina and the Federal District. In that sense, the industrial center in metropolitan Curitiba, the seaports of Paranaguá and Antonina and tourism in the Western region, represented by the border city of Foz do Iguaçu, are relevant. The State is divided in ten greater regions, which are: Metropolitan region of Curitiba, Central-Western Paraná, Central-Eastern Paraná, Central-Southern Paraná, North-Western Paraná, Central-Northern Paraná, Pioneering Northern Paraná, Western Paraná, South-Eastern Paraná and South-Western Paraná (Ipardes, 2010).

As a result of these signs, the group of cities in Paraná attracts researchers' attention, given its economic importance, as evidenced in the public balance sheets and social and economic indicators, whether because of their physical and geographic wealth or the degree of expansion of their business. On the other hand, at the same time, their income concentration entails the need for skillful control in order to allow administrative managers to guarantee the performance society expects in terms of services and public works.

2.4 Accounting Systems for the municipal public sector in Paraná

Since the financial year 2001, when the Fiscal Responsibility Law was enacted, the State of Paraná has implemented electronic procedures to supervise municipal public accounts. These measures ended up imposing modernization on the accounting sectors in all cities in the state, as accountability, compulsory by law, was done only electronically from that moment onwards, through systems created and supplied directly by the supervisory entity, the Paraná State Court of Auditors. The main system, in the municipal sphere, was called the Municipal Information System (MIS).

The MIS was officially established in the Paraná State Court of Auditors (TCE-PR) Provision 46/2001, with a view to the rationalization of information for the sake of external control, to receive the data needed for accountability purposes. Its main goal is to speed up the verification of accounts, help to monitor the cities' budgetary, accounting, financial, equity and operational management, with compulsory use by the Legislative and Executive Powers, including authorities, foundations, inter-municipal consortia and Municipal Public Power corporations. MIS data should be properly based on accounting recorded, in compliance with the CFC's Brazilian Accounting Standards, making agents responsible for their trustworthiness and exactness (TCE-PR, 2001).

Therefore, the electronic systems created in Paraná represent a fundamental element for the convergence between public accounting and international standards, considering that computerization lies at the heart of accounting modernization, without which it becomes impossible to implement the cost systems established by law and in NBCASP 16.2. In line with that standard, provided that cities in the state of Paraná have already implemented a modern electronic accounting system, the road remains open for future adaptations, in the cultural or structural sense, or for the implementation of public cost systems.

2.5 Functions of Cost Accounting in the public sector

The modernization of the public sector entailed innovations that contributed to the need for public managers to know the partial and total costs of their entities, with a view to making the best decisions among production, purchase, outsourcing or privatization alternatives. Therefore, cost is conceptualized as any sacrifice (consumption) of assets to achieve products or services (Slomski, 2006). The same author considers that public entities can successfully use the main costing methods, that is, the Absorption Costing; Variable or Direct Costing; Activity-Based Costing as well as the Standard Costing Methods can be used to measure their costs.

In public management, a costing system represents a fundamental instrument to verify results and assess resource management, considering the effectiveness and efficiency of the services produced, the works accomplished and the government programs (Dias *et al*, 2009).

Martins (2003, p. 21) indicates two relevant functions for cost accounting: support control and support decision making. According to that author, regarding control, its "most important mission is to provide data to set standards, budgets and other forms of forecasting" and, in a subsequent stage, to support the monitoring of actions. As regards decisions, "cost accounting consists in the input of information on relevant values" to be managed.

In line with Silva (2007), the cost system has to provide information for certain objectives, including the planning and control of operations and activity costs, through the creation of reports on costs and assets per management unit, per cost center, for the managers. According to (IFAC, 2000) *apud* Dias *et al* (2009), cost information can attend to different management needs in public management, highlighting the six social functions of cost accounting, as displayed in Figure 1.

Social Function	Management Needs
Budget	Cost information can help to decide on the allocation of resources among different activities. The costs of past activities can be used as budgetary estimates of future costs.
Cost Reduction and Control	Cost behavior analysis can help to take appropriate actions in order to eliminate inefficiencies.
Adjustment of Prices and Tariffs	Help to establish price and tariff scenarios for goods and services supplied by the government, especially when these are provided at a price below the cost, as a result of governmental policies.
Performance Assessment	Can help to measure financial and non-financial performance. The efforts and results of an entity's services can be assessed based on the following measures: cost of resources and inputs used to provide the services and the result achieved.
Program Assessment	Cost information can support political decisions related to their authorization, modification and discontinuity.
Other Economic Decisions	The choice among alternative actions requires cost comparisons or increased revenues, like decisions to privatize for example, to accept or reject a proposal for a governmental project, to continue or discontinue a product or service.

Figure 1. Management needs of public administration.

Source: Dias *et al.* (2009).

Wiemer and Ribeiro (2004) defend the relevance of cost determination in view of the need for social control, as the determination and publication of costs grants users and auditors information about the quality of service delivery. The authors add that, due to the inexistence of a cost system, this control is only centered on the formal and legal aspects of management acts.

According to Rezende, Cunha and Cardoso (2010), the importance of information about the government's costs is not limited to their possible contribution to public spending efficiency and effectiveness, but also in view of what it represents in the light of the need for an in-depth reform of public management in Brazil, fundamental to allow the public power to appropriately respond to the contemporary challenges the Brazilian society is confronted with.

It should be mentioned that cost information can permit a range of improvement for public management as well as for the citizens who use public services and works, in Brazil and around the world, according to the research by Costa, Santos, Rodrigues, Barreto and Roberts (2005), who estimated the costs of tuberculosis for the health system in Salvador; by Turner, Woolley and Kingsley (2007), who estimated the costs of building popular houses in the United States; and by Sonfield, Host, Gold and Finer (2011), who identified the costs of unwanted pregnancies for public health insurance programs in New York.

Therefore, the cost systems, which have always represented a fundamental instrument for decision-making in private initiative, now turn into a compulsory element for the responsible management of public resources.

3. Method

This study uses descriptive methods to achieve the proposed objective, which is to get to know the level of understanding and adoption of cost system in cities in Paraná. The research is characterized as descriptive because it attempts to describe the behavior of phenomena or characteristics of the target population, measure and/or quantify the events (Cooper and Schindler, 2003).

The data collection method is based on the interrogation/communication procedure, through an *ex post facto* research, in which the set of data obtained from the respondents is neither altered nor manipulated. The study is also cross-sectional, as it represents a momentary picture. The approach is qualitative, also dealing with the bias of subjectivity in the survey answers (Cooper and Schindler, 2003).

In terms of range and depth, the data are submitted to statistical treatment, initially to descriptive analysis, followed by Spearman's correlation coefficient technique, whose model permits assessing the data to provide whether one proposal explains another (Cooper and Schindler, 2003). To accept or reject the

research proposals, significance is set at 0.05 and 0.01. Spearman's correlation coefficient is a non-parametric statistical technique, which first ranks the data and then applies Pearson's equation (Field, 2009). For statistical treatment, SPSS – Statistical Package for the Social Sciences software, version 17 was applied.

The elaboration of this study departs from a literature review and the consultation of documents and cost control and cost system standards in force. A form was developed with direct proposals, about which the public officials' perceptions were requested, using a five-point Likert scale with the following options: (1) I completely disagree, (2) I disagree, (3) indecisive (4) I agree and (5) I fully agree.

The population includes all cities in the State of Paraná, totaling 399. Data were collected from controllers, accountants or public servants working in municipal accounting sectors. Each city received a survey for completion. The sample was defined by the number of complete forms that were returned, that is, 67 cities, related to the financial year 2010.

4. Study results

The research theme is subdivided in topics. This facilitates the understanding of the proposals the public officials were asked to opine on. The same subdivision also permits a detailed analysis of the collected data, considering: 1- relevance of cost information; 2 – budgetary and financial feasibility of adopting cost systems; 3 – accrual base of cost information; 4 – environment for the cost system; 5 – cost systems implemented; and 6 – operating systems.

4.1 Descriptive analysis of the data

The research results are submitted to descriptive analysis of the data, which express the public officials' position towards each proposal, whose results are presented as percentages. In topic 1, aspects related to the relevance of cost information are investigated. In this context, internal disclosure, cost control and the adoption of a cost system are addressed. In Table 1, the consulted public officials' perception is presented.

Table 1
Conceptions about the importance of cost information

Proposals related to topic 1	I completely disagree (%)	I disagree (%)	Indecisive (%)	I agree (%)	I completely agree (%)
1.1 Internal information is disclosed about the need for cost controls.	40.3	13.4	10.4	34.4	1.5
1.2 Discussions about the cost of services or cost systems are common at the institution.	46.2	23.9	7.5	13.4	9
1.3 The institution adopts some kind of cost control for the administrative sector.	4.5	25.4	10.4	55.2	4.5
1.4 The institution adopts some kind of cost control for the education sector.	11.9	13.4	3	65.7	6
1.5 The institution adopts some kind of cost control for the health sector.	4.5	19.4	1.5	58.2	16.4
1.6 The institution adopts some kind of cost control for the public works sector.	10.4	26.9	17.9	34.4	10.4
1.7 The institution adopts some kind of cost control for other sectors not identified in phrases 1.3; 1.4; 1.5; 1.6 listed above.	35.8	49.2	7.5	1.5	6
1.8 I find the administration's efforts to adopt cost systems important.	1.5	0	3	19.4	76.1

Source: Empirical research data.

According to data displayed in Table 1, 53.7% of the public officials consulted about the importance of cost information disagree about the existence of internal information disclosure with a cost control focus. And 70.1% reveal disagreement about discussions on the costs of services or cost systems. Therefore, in proposals 1.1 and 1.2, limited internal disclosure is verified about cost control and cost system, according to the interviewees.

The interviewees' responses to proposals 1.3; 1.4; 1.5 and 1.6 indicate a favorable position to the adoption of some form of cost control in the administrative, education, health and public works sectors. According to 95.5% of the interviewees, the administration's efforts to adopt cost systems is important, in line with the intent to support the importance of cost information in public management.

Topic 2 refers to aspects related to the budgetary and financial feasibility of adopting cost systems, focusing on the year the system was implemented. In Table 2, the public officials' opinions are classified.

Table 2
Conception about the budgetary and financial feasibility of adopting cost systems

Proposals related to topic 2	I completely disagree (%)	I disagree (%)	Indecisive (%)	I agree (%)	I completely agree (%)
2.1 The implementation of cost systems in the next year is considered feasible in budgetary and financial terms.	1.5	4.5	14.9	53.7	25.4
2.2 The implementation of cost systems in 2012 is considered feasible in budgetary and financial terms.	1.5	1.5	10.5	49.2	37.3
2.3 The implementation of cost systems after 2012 is considered feasible in budgetary and financial terms.	6	1.5	44.7	7.5	40.3

Source: Empirical research data.

The results identified in Table 2 permits inferences about the lack of budgetary and financial feasibility to adopt cost systems in the year the research applied to, that is, 2010. Although a significant part of the public officials find it possible to implement the cost system in 2011 or 2012, 44.7% are indecisive towards the implementation after 2012. Hence, one tends to accept the fact that the public officials are unaware of the city's actual conditions regarding the budgetary and financial feasibility of adopting cost systems.

Topic 3 relates to the officials' conception about the accrual basis of cost information. In this context, aspects about project and activity costs were investigated, as well as knowledge about cost standards for the public sector, training for public servants and operating systems, as presented in Table 3.

Table 3
Conceptions about the accrual base of cost information

Proposals related to topic 3	I completely disagree (%)	I disagree (%)	Indecisive (%)	I agree (%)	I completely agree (%)
3.1 The institution knows the factors that influence the cost of its projects and activities.	19.4	13.4	61.2	3	3
3.2 Some professionals know the cost standards for the public sector.	35.8	7.5	3	49.2	4.5
3.3 Public servants receive training about cost systems.	40.3	28.4	1.5	16.4	13.4
3.4 Established operating systems have been prepared to adopt cost subsystems.	9	0	26.9	59.6	4.5
3.5 Some professionals are specialized in costs.	17.9	16.4	37.3	20.9	7.5
3.6 Technical staff members exist who possess specialized knowledge in costs.	35.8	22.4	28.4	13.4	0

Source: Empirical research data.

Based on the data in Table 3, proposal 3.1 stands out, in which 61.2% of the officials declare their indecision as to whether the institution knows the factors that influence the costs of projects and activities. It is verified that 53.7% agree with the existence of professionals who know the cost standards for the public sector, and that 64.1% agree with the existence of established operating systems prepared for the adoption of cost subsystems. Nevertheless, the data indicate disagreement about training for public agents and only 7.5% of the respondents agree that there are professionals with specialized knowledge about costs.

In topic 4, the public officials' conception about the environment for the cost system is investigated. The aim is to identify the intention of managers, public servants and legislators about the adoption perspective of the cost system, also considering the municipal government and the implementation timetable. In Table 4, the classification of the public officials' conceptions is displayed.

Table 4
Conceptions about the environment for the cost system

Proposals related to topic 4	I completely disagree (%)	I disagree (%)	Indecisive (%)	I agree (%)	I completely agree (%)
4.1 The public managers intend to adopt a cost system.	50.7	38.9	1.5	7.4	1.5
4.2 Managers and public servants interact with a view to the adoption of cost systems.	55.2	6	28.3	3	7.5
4.3 The public servants intend to adopt cost systems.	32.8	31.3	21	10.4	4.5
4.4 Municipal legislators intend to adopt cost systems.	43.3	35.8	14.9	6	0
4.5 The institution intends to implement costing techniques over the next years.	3	19.4	4.5	55.2	17.9
4.6 The municipal government has a timetable for the implementation of a cost system.	56.6	23.9	9	7.5	3
4.7 A cost control system can be implemented in the municipal government today.	31.3	13.4	43.3	9	3
4.8 The implementation of a cost system would respond to the institution's operational needs.	0	7.5	13.4	76.1	3

Source: Empirical research data.

According to Table 4, considerable disagreement exists about the managers' intent to adopt a cost system in 89.6%; servants in 64.1%; and legislators in 79.1%, according to the public officials. Proposal 4.7 stands out, with 43.3% of indecision towards the possibility of implementing a cost system in the municipal government. According to 79.1% of the opinions, on the other hand, this implementation would respond to the operational needs.

Topic 5 relates to the conception about cost systems put in practice. In that sense, the intent is to verify aspects like: cost information control; direct, indirect costs and activity-based costing method (ABC) and its relation with projects and activities, feedback, decision making and the elaboration of financial reports. Table 5 displays the public officials' perception.

Table 5

Conceptions about cost systems put in practice

Proposals related to topic 5	I completely disagree (%)	I disagree (%)	Indecisive (%)	I agree (%)	I completely agree (%)
5.1 Cost information control exists in the form of worksheets and/or independent, non-integrated systems.	1.5	14.9	23.9	46.3	13.4
5.2 Cost information is controlled through an integrated system.	38.8	22.4	28.3	4.5	6
5.3 Direct costs are related to projects and/ or activities.	1.5	22.4	32.8	28.4	14.9
5.4 Indirect costs are related to projects and/ or activities on some cost-sharing base.	10.4	41.9	31.3	11.9	4.5
5.5 Costs are related to projects and activities through Absorption costing.	29.9	9	43.2	11.9	6
5.6 Costs are related to projects and activities through Activity-Based Costing (ABC).	34.3	6	55.2	4.5	0
5.7 The managers receive feedback on cost controls.	9	43.2	22.4	20.9	4.5
5.8 Cost system information has been useful for managers and sector heads' decision making.	23.9	13.4	19.4	37.3	6
5.9 The cost systems put in practice produce financial reports.	10.4	19.4	26.9	40.3	3

Source: Empirical research data.

Table 5 reveals that 59.7% agree with the existence of cost information in non-integrated worksheets and/or independent systems in the municipal governments. While 43.3% agree with direct costs linked with projects and activities, 52.3% disagree with indirect costs linked with projects and activities based on cost sharing. Indecision towards the use of absorption costing and ABC was identified in 43.2% and 55.2%, respectively. Disagreement as to feedback on cost controls was found in 52.2%; 43.3% agreed with the usefulness of information for decision-making purposes, and also with the fact that the cost systems put in practice generate financial reports.

To get to know the public officials' opinions about operating systems, in topic 6, a set of proposals is presented to verify: the integration among operating systems; origin, production and reliability of the data; and availability of databases. These aspects are displayed in Table 6.

Table 6

Conceptions about operating systems

Proposals related to topic 6	I completely disagree (%)	I disagree (%)	Indecisive (%)	I agree (%)	I completely agree (%)
6.1 The operating systems are mutually integrated, so as to use the same databases.	3	34.3	29.9	22.4	10.4
6.2 The data from the operating systems originate in different databases.	1.5	13.4	19.4	62.7	3
6.3 The data available in the databases are compatible and shared among the areas.	6	46.3	16.4	17.9	13.4
6.4 The data available in the operating systems contain many errors.	9	20.9	34.3	22.4	13.4
6.5 The data available in the operating systems are stable, do not very frequently and can therefore be considered reliable.	19.4	7.5	49.2	16.4	7.5

Source: Empirical research data.

According to Table 6, the public officials' opinions towards the use of the same databases based on integrated operating systems are balanced. Also, in proposal 6.4, a balanced opinion is verified about the presence of errors in the data available in the operating systems. On the opposite, in proposal 6.5, 49.2% were indecisive as to the stability and reliability of the data available in the operating systems. In addition, 65.7% agree about the different origins of the data, and 52.3% disagree about the availability and sharing of data among the areas.

This finishes the descriptive data analysis section. Next, inferences are presented about the correlation analysis applied to the proposals the public officials were asked to opine on.

4.2 Correlation analysis of the proposals

To relate the public officials' understanding about the research proposals on the relevance of cost information and the feasibility of usefulness of cost systems, Spearman's correlation coefficient was applied. Thus, the intent is to filter the correlation among proposals with regard to the responses obtained about the perception levels: I completely disagree; I disagree; indecisive; I agree; I completely agree. Correlations are established between proposals that address the same topic, so as to test the public officials' understanding about those proposals, as presented in Table 7.

Table 7
Spearman's Correlation and significance level

	N	Spearman Coefficient	Significance (1-tailed)
Correlation between proposals 1.3 and 1.6	5	1.000 **	0.000
Correlation between proposals 1.4 and 1.5	5	0.900 *	0.019
Correlation between proposals 1.7 and 1.8	5	-0.900 *	0.019
Correlation between proposals 2.1 and 2.2	5	0.975 **	0.002
Correlation between proposals 3.1 and 3.6	5	0.872 *	0.027
Correlation between proposals 4.1 and 4.3	5	0.821 *	0.044
Correlation between proposals 4.1 and 4.4	5	0.821 *	0.044
Correlation between proposals 4.1 and 4.6	5	0.821 *	0.044
Correlation between proposals 4.4 and 4.6	5	1.000 **	0.000
Correlation between proposals 5.1 and 5.9	5	0.900 *	0.019
Correlation between proposals 6.2 and 6.4	5	0.900 *	0.019

N: sample size.
* Correlation significant at 0.05%.
** Correlation significant at 0.01%.

Source: Empirical research data.

The results identified through the application of Spearman's coefficient vary between -1 (perfect negative correlation) and +1 (perfect positive correlation), including 0 (absence of correlation). After the application of the coefficient, whose results are displayed in Table 7, the following considerations are presented about the correlations found, as follows:

Correlation between proposals 1.3 and 1.6	Based on the correlation test applied to proposals 1.3 and 1.6, showing a Spearman coefficient of 1.000 at a significance level of 0.01%, the correlation, that is, the agreement about the adoption of some cost control for the administrative and public works sector can be considered as perfectly positive.
Correlation between proposals 1.4 and 1.5	The Spearman coefficient of 0.900 at a significance level of 0.019, makes the correlation between proposals 1.4 and 1.5 valid, regarding the adoption of cost control measures for education and health in the city.
Correlation between proposals 1.7 and 1.8	The correlation between proposals 1.7 and 1.8, with a Spearman coefficient of 0.900 for a significance level of 0.019, reveals agreement on the adoption of cost controls in different sectors, combined with the importance of the administration's efforts in the adoption of a cost system.
Correlation between proposals 2.1 and 2.2	The correlation coefficient between proposals 2.1 and 2.2, corresponding to 0.975, with a significance level of 0.002, indicates strong affinity in the conceptions about the budgetary and financial feasibility of implementing cost systems.
Correlation between proposals 3.1 and 3.6	Proposals 3.1 and 3.6 are strongly correlated, according to the Spearman coefficient of 0.875 at a significance level of 0.027, relating the indecision towards knowing the factors that influence costs with the non-agreement about the existence of technical staff specialized in the cost area.
Correlation between proposals 4.1 and 4.3	The correlation between proposal 4.1 and 4.3; 4.4; and 4.6 show a Spearman coefficient of 0.821 with a significance level of 0.044, which characterizes a positive correlation between disagreement about the managers, officials and legislators' intent to adopt a cost system and the presence of a timetable for the implementation of the cost system.
Correlation between proposals 4.1 and 4.4	
Correlation between proposals 4.1 and 4.6	
Correlation between proposals 4.4 and 4.6	The Spearman coefficient of 1.000 and the significance level of 0.01% reveal a strong positive correlation between proposals 4.4 and 4.6, showing disagreement on municipal legislators' intent to adopt cost systems combined with disagreement on the existence of a timetable for the implementation of the cost system.
Correlation between proposals 5.1 and 5.9	The correlation coefficient of 0.900 and the significance level of 0.019 between proposals 5.1 and 5.9 reveal affinity in the public officials' agreement on the control of cost information in non-integrated worksheets and/or independent systems and the respective production of financial reports.
Correlation between proposals 6.2 and 6.4	Proposals 6.2 and 6.4 show a Spearman coefficient of 0.900 at a significance level of 0.019, that is, a positive correlation between the origins of the operating system data in different databases and the presence of many errors in the data available in the operating systems.

Figure 2. Results regarding the correlation between the proposals.

Source: Empirical research data.

In view of the above, based on descriptive analysis and Spearman's correlation coefficient, the incipient nature of the public officials' conception about the relevance, feasibility and usefulness of a cost system is demonstrated. Nevertheless, in this study, a significant part of the public official reveal a coherent position when they agree with or disagree from proposals about cost information and control. It is definitely positive for the city to have public officials with that perception at their disposal when the implementation of a cost system is made compulsory.

5. Final considerations

The activities of public entities, in this case cities, encourage the search for information about public resource management practices. In this respect, the goals of the present study were achieved, which was to discover the level of understanding and adoption of cost systems in cities in the state of Paraná, through the application of a survey. Hence, the identified results cannot be generalized, as they exclusively relate to the study sample, whose data were submitted to descriptive analysis and the statistical correlation test using Spearman's coefficient.

In addition, the degree of professionals' implementation difficulties was analyzed, as well as their knowledge levels about cost systems and notions about structural and financial conditions. The results reveal the public officials' limited knowledge, mainly on topics about the budgetary and financial feasibility of adopting cost systems; the environment for the cost system, implemented cost systems and operating systems.

A bias of indecision is highlighted for the following proposals: 44.7% are indecisive about the budgetary and financial feasibility of implementing cost systems after 2012; 61.2% about whether the institution knows the factors that influence the cost of its projects and activities; 43.3% about the possibility of implementing a cost control system in the municipal government today; 43.2% about project and activity costs using Absorption costing; 55.2% about project and activity costs using ABC; 49.2% about the proposal that the data available in the operating systems are stable, do not vary frequently and can therefore be considered reliable.

According to Table 5, however, the respondents' conception about cost systems in cities in the state of Paraná should be highlighted. The low effective implementation levels of these systems are noteworthy, in view of the complete agreement on the existence of cost control through worksheets and/or systems, corresponding to 13.4% (topic 5.1), about the control of cost information through an integrated system, corresponding to 6% (topic 5.2) and about the fact that cost systems produce useful information for decision making, corresponding to 6% (topic 5.8).

Finally, the relevance of this descriptive study is highlighted, as it investigates aspects inherent in cost systems and their implementation in the cities. As the study is based on the public officials' conception about the topics related to cost systems, the incipient nature of knowledge about the relevance, feasibility and usefulness of a cost system is verified, although significant coherence was also revealed among the answers obtained on the proposals about cost information and control.

6. References

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Investment Strategy Based on Aviation Accidents: Are there abnormal returns?

Abstract

This article investigates whether an investment strategy based on aviation accidents can generate abnormal returns. We performed an event study considering all the aviation accidents with more than 10 fatalities in the period from 1998 to 2009 and the stock market performance of the respective airlines and aircraft manufacturers in the days after the event. The tests performed were based on the model of Campbell, Lo & MacKinlay (1997) for definition of abnormal returns, by means of linear regression between the firms' stock returns and the return of a market portfolio used as a benchmark. This enabled projecting the expected future returns of the airlines and aircraft makers, for comparison with the observed returns after each event. The result obtained suggests that an investment strategy based on aviation accidents is feasible because abnormal returns can be obtained in the period immediately following an aviation disaster.

Keywords: Aviation accidents, event study, investment strategy, abnormal returns, normal returns.

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1. Introduction

Aviation accidents, because they are uncommon events that generally cause a heavy death toll, have high social repercussion and exert a strong influence on public sentiment. The behavioral finance literature reports that certain situations can generate a misperception of reality that in turn causes stock prices to diverge from what is indicated by the underlying fundamentals. This phenomenon is called market sentiment and has been examined by Baker & Wurgler (2007). This sentiment can work both ways, either irrationally boosting or depressing stock prices, of the market as a whole or of certain firms. For example, events that cause foreboding and anxiety tend to make people more pessimistic about future returns and more averse to assuming risks (Kaplanski & Levi, 2010).

This article investigates whether the market overreacts with a pessimistic bias to the news of aviation disasters, so that level-headed investors can take advantage of the decline in the stock price of the companies associated with the accident (manufacturer and airline) by investing in these shares to obtain better returns than the market average in the ensuing period, as these stock prices rebound when the pessimism dissipates. The study of this theme is relevant because it helps understand how investors react to strongly bad news and how efficient the market is in adjusting the prices of the shares traded on exchanges.

According to Kaplanski & Levi (2010), the average loss in market value caused by a major aviation disaster is some US$ 60 billion, in contrast to the average actual loss of only US$ 1 billion. However, they also show a price reversal in approximately two days. Here we study the impacts on the stock prices of the air carriers as well as the aircraft makers and the possibility of obtaining abnormal returns from a strategy that relies on news of aviation disasters as a trigger for buying the stocks of the companies involved.

The aviation accidents considered here occurred between 1998 and 2009. However, we only analyzed those involving a company (airline or aircraft maker) with shares listed for trading on a stock exchange at the time of the accident, in the home country and/or other countries. Since there is no single definition of "aviation accident" or "aviation disaster", we only considered accidents claiming at least 10 lives.

Aviation accidents are rare and unexpected events whose occurrence depresses the stock prices of the companies involved, as mentioned by McWilliams & Siegel (1997) and Kaplanski & Levy (2010). Since aviation accidents are events that influence the stock prices of the firms involved and this influence is measureable, we formulated the following research question: Is it possible to obtain abnormal returns through an investment strategy based on aviation accidents?

More formally, we considered the null hypothesis (h_0) that an investment strategy based on purchasing the shares of companies involved in aviation disasters just after the event does not provide abnormal returns, versus the alternative hypothesis (h_1) that such a strategy does provide abnormal returns.

The concept of abnormal returns means that the stocks of the companies involved outperformed the market in general (based on a benchmark index of the exchange where the firms' shares are traded) in the period just after the event. The theoretical reason for such market behavior is the phenomenon of investor overreaction. As stated by Barberis, Shleifer & Vishny (1998, p. 7) "[...] overreaciton occurring when the average return following not one but a series of announcements of good news is lower than the average return following a series of bad news announcements".

Because aviation accidents are rare and unanticipated events, the natural method to investigate their effect on stock prices is an event study. According to the definition of MacKinlay (1997), an event study allows measuring the impact of a specific event on the market value of a particular company or the companies in a certain segment.

2. Theoretical Framework

The analysis of the return on stock market investments requires the use of theories and models that have been tested previously. For this purpose, we use the concepts defined by Campbell, Lo & MacKinlay (1997) in their book *The Econometrics of Financial Markets* as well as the article by MacKinlay (1997), "Event Studies in Economics and Finance", in which statistical and economic models were considered to measure abnormal returns. In this study, based on the premises defined by the above authors, we adopted the statistical model of risk-adjusted and market-adjusted returns.

McWilliams & Siegel (1997) reassessed the previous work of Wright et al. (1995), who used the event study method, and compared the results with the earlier ones. McWilliams & Siegel identified that during the event window selected by the latter authors, various events occurred that impacted their result but were left out of the analysis. They also observed that when including new variables, such as the size of the window, the abnormal returns found were insignificant and did not support the thesis of Wright et al. (1995).

McWilliams & Siegel (1997) also stressed that the event study method is popular due to the fact that measures based on accounting profit had been heavily criticized as not being robust indicators of the true performance of firms, hence giving rise to the need for models that more quickly reflect the occurrences in markets and that are based on the evolution of stock prices.

According to Prabhala (1997), event studies typically have two purposes: (i) to test for the existence of an "information effect" on the firm's value; and (ii) to identify factors that explain changes in the value of a firm just after the event date. Further according to him, although the event study method is widely used in empirical works, there is insufficient understanding of their consistency and power in a setting of rational expectations.

The existence of rational expectations (on average) is a cornerstone of the efficient market theory. Efficient capital markets are defined by Ross, Westerfield & Jaffe (2007, p. 277) as being those in which:

> [...] current market prices reflect available information. This means that current market prices reflect present value of securities and it is not possible to gain extraordinary earnings using available information.

According to McWilliams & Siegel (1997, p. 650), an event study should provide a true measure of the financial impact of an event, and for this purpose a set of premises must be satisfied: (i) markets are efficient; (ii) the events were not anticipated; and (iii) there were no confounding occurrences during the event window.

In a subsequent study, Barberis & Thaler (2002, p. 2) stated that behavioral finance is a new way to analyze the financial market and that this approach has much to offer because of the difficulties faced by traditional models, since some financial phenomena are better understood when applying models in which the agents are not completely rational. In this sense, Gigerenzer (2004) and **Flannagan & Sivak (2004)** studied the effect of aviation accidents on the behavior of the customers of airlines and concluded that the negative environment provoked by the September 11th attacks had a significant effect by increasing the number of cars on highways and decreasing the number of airline passengers in the United States.

Daniel, Hirshleifer & Subrahmanyam (1998) conducted an empirical study of investor sentiment. They applied psychology to support the idea of under and overreaction, even though the basis of the work was overconfidence and self-attribution. Their study differed from the subsequent article by Barberis et al. (1998). However, we believe that the two articles had the same intention, to generate empirical evidence in the field of behavioral finance.

Daniel et al. (1998) defined an overconfident investor as one who overestimates the precision of the signal of the private information received, but not of the information received publicly by all investors. Baker & Wurgler (2007) studied two scenarios. In the first, investors receive bad news and this has a strongly negative effect on the stock price. But in the second scenario, when investors receive good news, although the variation in investor sentiment is positive, the effect on the stock return is not as great as the negative effect in the first case. The results of Baker & Wurgler (2007) are coherent with the findings of Barberis et al. (1998), according to whom when there is underreaction, the average return of the shares of companies after an an-

nouncement of good news is greater than the average return in a period after the announcement of bad news. This underreaction to good news should then be corrected in the period following the announcement of the event, when the return will be greater. They defined "good news" as the announcement of greater profits than expected by the market, although they also believe there is evidence of underreaction to other types of news.

Further according to Barberis et al. (1998, p. 7), overreaction occurs when the average returns – considering a statistically representative series after the disclosure of good news – are lower than the returns of another corresponding series after the disclosure of bad news. Their explanation for this is that:

> The idea here is simply that after a series of announcements of good news, the investor becomes overly optimistic that future news announcements will also be good and hence overreacts, sending the stock price to unduly high levels. Subsequent news announcements are likely to contradict his optimism, leading to lower returns (Barberis et al. (1998, p. 7).

Kaplanski & Levy (2010) studied the effect of the news received by investors and found evidence that negative mood and anxiety that negative sentiment driven by bad mood and anxiety affects stock investment decisions. They specifically investigated the effect of aviation disasters on stock prices and found empirical evidence that the stock price of the company associated with the accident suffers significant negative effects compared to the average market price. They also found average losses of US$ 60 billion for each air disaster and noted empirical evidence of increased implied volatility after airplane crashes.

With respect to the calculation of abnormal returns, Martinez (2004) suggests that they are the difference between the normal return of the stock, if the event (accident) had not occurred, and the return actually observed after the event. He also suggests and describes some techniques considered suitable that can be followed to calculate these normal and abnormal returns.

The event study technique to identify abnormal returns was used in Brazil by Nakayasu (2006), who in analyzing the "impact of the announcement of the listing of firms in trading segments that require enhanced corporate governance in Brazil," concluded that the event "day of the announcement" of the migration to one of the three special trading segments of the São Paulo Stock Exchange (Bovespa, now called BM&FBovespa) caused a positive reaction in the market, while the event "date of adhesion" did not have any impact on the market reaction.

3. Methodology

The data on aviation accidents were obtained from the database at the site www.planecrashinfo.com, between 1998 and 2009. The number of aviation accidents and fatal victims broken down by airline considered in this article are summarized in Table 1.

Table 1
Number of fatal victims and accidents per airline

Airline Company	Number of Fatal Victims	Number of Accidents
American Airlines	427	4
Gol Linhas Aéreas	154	1
TAM	187	1
Total	768	6

Source: www.planecrashinfo.com

The number of aviation accidents and fatal victims broken down by aircraft manufacturer considered in this article are summarized in Table 2.

Table 2

Number of fatal victims and accidents per aircraft maker

Aircraft Maker	Number of Fatal Victims	Number of Accidents
Airbus	1211	7
BAE Systems	38	3
Boeing	4551	53
Embraer	114	5
Lockheed	239	6
Textron	110	10
Total	6263	84

Source: www.planecrashinfo.com

The total numbers of accidents and victims in Tables 1 and 2 differ because not all the airline companies have shares listed for trading. Considering the criterion that the airline and aircraft maker must both have shares listed on an exchange, our sample consisted of 84 accidents claiming at least 10 lives between 1998 and 2009 throughout the world. We obtained the data on stock returns (adjusted for earnings) from the Economática database and the site http://www.finance.yahoo.com.

3.1. Definition of the steps in an event study

Although there is no rigid structure for conducting an event study, we relied on the models proposed by MacKinlay (1997) and Campbell et al. (1997), with seven steps: (1) definition of the event, (2) selection of the sampling criteria, (3) measurement of the normal and abnormal returns, (4) application of estimation procedures, (5) application of testing procedures, (6) calculation of the empirical results, and (7) interpretation of the results and presentation of conclusions.

After defining the event, it is necessary to define the interval around the event (event window) to be analyzed. Although this criterion is a decision of the researcher, it is important for the event window to contain the days considered relevant to investigate the existence of an abnormal return pattern.

After identifying the events to be analyzed, it is necessary to select the sample of companies whose data will be tested. In this case our focus was on both the airlines and aircraft makers involved in each air crash, under the assumption that they will feel the main effects of the event in their stock prices.

The measure of the impact of the event depends on an adequate way to measure the abnormal return. This entails comparing the normal return of the security with the return obtained by the estimation model. The normal return is defined as the return the stock in question would have obtained if the event had not happened. For this analysis, according to Campbell et al. (1997), it is best that the date of the event not be considered in the calculations of expected returns, so as not to impair the result obtained by the estimation model. According to the model of MacKinlay (1997, p.15), for firm *i* on date *t*, the abnormal return is given by:

$$AR_{it} = R_{it} - E(R_{it}/X_t)$$

Where:

AR_{it}, R_{it} and $E(R_{it}/X_t)$ are the abnormal return, actual return and normal return for stock *i* on date *t*, respectively; and

X_t is the conditioning information for the normal return model, determined by the return adjusted by an estimation model previous to the event.

According to MacKinlay (1997), there are two common ways to model the normal returns: (1) the constant mean return model, in which X_t is a constant; and (2) the market model, where X_t is the market return. We chose the market model, which assumes a stable linear relation between the market return and the stock return.

To calculate the return of the investment in the stock of interest, we used the continuous capitalization regime, in which the natural logarithm (ln) is used to calculate the return of the stock versus a portfolio used for benchmarking. The continuous compounding model, according to equation 1, is the model suggested by Campbell et al. (1997).

The expression for this model is:

$$R_{it} = \frac{ln\ (lnP_{t)}\ )}{ln\ (lnP_{t-1})} \quad (1)$$

Where:
R_{it} = the return of stock *i* on date *t*;
ln P_t = the natural logarithm of the price of stock *i* on date *t*;
ln P_{t-1}= the natural logarithm of the price of stock *i* on date *t-1*.

After defining the model for calculating the abnormal return, the next step is to define the "estimation window", which will result from the parameters of the estimation model. MacKinlay (1997) suggests that the "event window" should not be included in the "estimation window", so as not to influence the calculation of the parameters that will serve as the based for the estimation model. After defining the parameters of the normal returns of the model, according to Nakayasu (2008) the next step is to formulate the procedures for calculating the abnormal returns and the technique for aggregating these returns. This is the stage at which the null hypothesis (H_0) and alternative hypothesis (H_1) are formulated.

The presentation of the results, according to MacKinlay (1997), should follow the formulation of the econometric design. The analysis of the results must consider identification of possible outliers, especially when the sample is not large.

In this last step, the hypothesis is tested, to reject or not the existence of abnormal returns after the occurrence of the aviation accident. At this point it is possible to infer if the event under analysis had an effect on the market price of the air carriers and aircraft manufacturers.

3.2 Calculation using normal returns

To calculate the difference between the normal returns of the securities of the companies involved and the market indexes used for benchmarking, we used the ANOVA F-test for analysis of variance and the F-test of equality of variances between the normal daily returns and the cumulative normal returns, for both the airlines and aircraft makers involved.

After calculating the normal stock return or each company involved and the portfolio considered for comparison, according to equation 1, we sought to identify the presence of abnormal returns, based on the model suggested by Martinez (2004), which is a statistical model of market-adjusted returns. These returns are obtained by the difference between the return of the stock of interest and that of the market-tracking portfolio, in which we used the normal daily and cumulative returns, obtained between trading days +2 and +360 after the event and comparing them with the market portfolio in the same period. The formula for the market-adjusted returns is as follows:

$$A_{.i,t} = R_{i.t} - R_{m.t} \quad (2)$$

Where:
$A_{i.t}$ = the abnormal return calculated on date *t*;
$R_{m.t}$ = the market portfolio return on date *t*;
$R_{i.t}$ = the normal return of stock *i* on date *t*.

After analyzing the normal returns, we applied the T-test for two samples, assuming different variances, to compare the daily and cumulative normal returns of the shares of the airlines and aircraft makers against the portfolio returns.

3.3 Calculation using the estimation model

Based on the model for conducting an event study defined by MacKinlay (1997, p.20), we defined the expected normal returns (ER) and abnormal returns. The normal return ($R_{i.t.}$) was calculated as the expected return E(R) if the event had not happened, defined based on the intercept ($\hat{\alpha} i$) and angular coefficient ($\hat{\beta} i$) resulting from the linear regression between the stock return of the companies involved (x) and the market portfolio (y) used as a benchmark.

The event study presented here was structured considering: (1) the "estimation window", defined as the period of 60 days (closing prices) before the accident; (2) the "comparison window", the period of 59 days (closing prices) after the accident; and (3) the "event window", the interval of 2 days between the "estimation window" and the "comparison window", to prevent the event's occurrence from interfering in the result of the estimation model's variables (Campbell et al., 1997).

To estimate the future return of the stocks, we used a simple linear regression between the return of the companies involved in the accident and the market portfolio's return. To define the parameters of the equation ($\hat{\alpha} i$ e $\hat{\beta} i$) the constant and linear regression coefficient, the independent variable was the market portfolio return ($R_{m.t}$) and the dependent variable was the firm's observed stock return.

After defining the constant and coefficient of the regression between the return of the stock of interest and the market portfolio's return, we identified, based on the assumptions of Campbell et al. (1997), the estimation model equation, which is the expected (normal) return of the stock:

$$E(R_{i,t}) = (\hat{\alpha} i + \hat{\beta} i \times R\, m.t) \quad (3)$$

Where:
$E(R_{i,t})$ = the expected (normal) return of stock *i* on date *t*
$\hat{\alpha} i$ = the estimated constant of the linear regression
$\hat{\beta} i$ = the estimated angular coefficient of the regression
$R\, m.t$ = the market portfolio return on date *t*

Based on the same assumptions of equation 3, we calculated the abnormal returns after each event, on each day (closing price) of the comparison window, according to the following formula:

$$AR_{i,t} = R_{i,t} - (\hat{\alpha} i + \hat{\beta} i \times R\, m.t) \quad (4)$$

Where:
$AR_{i,t}$ = the abnormal return of stock *i* on date *t*
$R_{i,t}$ = the observed return of stock *i* on date *t*
$\hat{\alpha} i$ = the estimated constant of the linear regression
$\hat{\beta} i$ = the estimated angular coefficient of the regression
$R\, m.t$ = the market portfolio return on date *t*

After determining the abnormal returns (AR) for each event, according to equation 4, in line with the assumptions of the model of Campbell et al. (1997), we calculated the abnormal returns (AR) and mean abnormal returns ($\overline{AR}$), based on the sum of the daily abnormal returns for each event, divided by the total number of events. We also ascertained the cumulative abnormal return ($\overline{CAR}$), obtained by the sum of the daily average abnormal returns ($\overline{AR}$) for each event analyzed.

After determining the average abnormal returns ($\overline{AR}$) and the cumulative abnormal return ($\overline{CAR}$), we performed new T-tests for two samples, assuming different variances. However, at this stage, the tests were based on days 15, 30, 45 and 60 of the comparison window. On the occurrence of positive abnormal returns, the T-test allowed identifying in what period of the comparison window it would be feasible to formulate an investment strategy based on aviation disasters.

3.3.1 Diagnosis of the regression model

After calculating the parameters for projecting the expected returns of the stock for each event, obtained based on the linear regression between the return of each stock and the portfolio return, we applied the linearity test of the regression function to verify the existence or not of a linear relation between the return of the stocks of the analyzed companies and the portfolio.

The linearity tests, both for the airlines and the aircraft makers, were carried out considering the return of the stocks and of the portfolios in a single time interval. The levels of significance, using Student's t-statistic for the coefficient (β) of the tested model, should present significance values of at least 10%, so we excluded from the analysis the companies that did not attain this minimum significance. Therefore, the final analysis was applied to 57 events of the aircraft makers and 5 events of the air carriers, which were the events that presented a significant linear relation.

4. Results of the Tests

The results presented below aim to identify whether the returns obtained by an investment in the stocks of the aircraft makers and airlines involved in an air crash, made the day after the event, are different in relation to the market portfolio used for benchmarking.

4.1 Tests of difference of means

The results of the T- and F-tests presented below were based on the normal return of the stocks and revealed information on the behavior of the daily returns of the aircraft manufacturers and airlines in comparison to the market portfolio considered for each event.

On stratifying the analysis, the result of the F-test for equality of the variances between the average daily returns of the aircraft makers and the average daily market portfolio returns revealed F = 3.65, significant at 0.01. This result suggests there are no indications that the null hypothesis holds (that the average variance of the daily stock returns and the average variance of the portfolios analyzed are equal).

The result of the F-test of two samples for variance between the average cumulative daily stock returns of the aircraft makers and the market returns confirmed the above results. The result of F = 2.69, significant at 0.01, indicated non-acceptance of the null hypothesis that the variances are equal, arguing that the samples have different variances.

The result of the F-test for two variances considering the general average of all the daily returns of the airline companies, of F = 7.94 and significance of 0.01, suggested there is a difference between the variances of the daily stock returns of these companies and the variance of the portfolios used for benchmarking.

The application of the F-test for two variances considering the average cumulative daily returns of the airlines and the market indexes revealed F = 67.39 and significance of 0.01, suggesting the existence of a difference between the variance of the returns, indicating the possible existence of abnormal returns.

The tests to verify the difference of variance utilized, based on the definition of Stephan et al. (2005, p. 357), revealed the existence of a difference between the variance of the returns of both the airlines and aircraft makers versus the portfolio.

We also applied the T-test for two samples, assuming different variances, to identify the difference between the average cumulative returns of the aircraft makers and air carriers and the average cumulative returns of the indexes used for benchmarking. When considering the cumulative returns up to 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330 and 360 trading days after the accident, the test revealed that the null hypothesis should not be accepted (t = -7.4872 for aircraft makers and t = -3.86 for airlines), suggesting that the stock returns of the manufacturers and carriers after an accident involving their airplanes is lower than the return of the market portfolios in the same period.

The results obtained based on normal returns, although suggestive, did not allow identifying the existence of abnormal returns. Therefore, we applied new tests, as discussed next.

4.2 Results of the regression model

To be used as estimators of the expected returns, the results of the regression model in the period defined as the estimation window should present a significance level of at least 10%, so we eliminated the events that did not meet that significance threshold.

We then divided the results into four tables for better visualization. Table 3 summarizes the results obtained in the period between 2 and 15 trading days after the event (accident), along with the mean abnormal returns (Mean AR) and cumulative abnormal returns (Mean CAR) obtained for the shares of the airlines and aircraft makers and the respective values of the Z-test for statistical significance.

Table 3

Results of the event study for aircraft makers and airlines between 2 and 15 trading days after the accident

Days from the event date	Airplane Makers		Airlines	
	Mean AR	Mean CAR	Mean AR	Mean CAR
2	0.185%**	0.185%	1.147%*	1.147%
3	-0.103%	0.082%	1.009%*	2.168%
4	-0.070%	0.012%	-0.374%	1.785%
5	0.083%	0.095%	-1.431%	0.328%
6	0.214%*	0.309%	-0.068%	0.260%
7	0.454%*	0.764%	-0.123%	0.136%
8	0.371%*	1.138%	0.842%*	0.979%
9	0.027%	1.165%	-0.123%	0.854%
10	0.135%	1.302%	1.497%*	2.364%
11	0.235%*	1.540%	-0.087%	2.276%
12	0.110%	1.652%	-0.061%	2.214%
13	0.513%*	2.173%	1.100%*	3.338%
14	0.003%	2.176%	1.120%*	4.495%
15	0.689%*	2.880%	0.172%	4.674%

Notes. * 1% significance.
** 5%.significance.
*** 10% significance.

The analysis of this interval led to the identification of abnormal returns for the airplane makers on trading days 2, 6, 7, 8, 11, 13 and 15, and for the airlines on days 2, 3, 8, 10, 13 and 14.

Table 4 presents the average abnormal returns and cumulative abnormal returns and the respective Z-scores in the interval between 16 and 30 trading days after the event.

Table 4

Results of the event study for aircraft makers and airlines between 16 and 30 trading days after the accident

Days from the event date	Airplane Makers		Airlines	
	Mean AR	Mean CAR	Mean AR	Mean CAR
16	-0.082%	2.796%	0.725% *	5.433%
17	0.098%	2.896%	-1.277%	4.086%
18	-0.264%	2.625%	0.595% **	4.706%
19	0.052%	2.678%	3.388% *	8.253% *
20	-0.045%	2.632%	-2.369%	5.689%
21	-0.414%	2.207%	0.544% **	6.263%
22	0.082%	2.290%	0.654% *	6.958%
23	0.100%	2.392%	-0.833%	6.067%
24	0.405% *	2.807%	-1.526%	4.449%
25	-0.165%	2.637%	0.223%	4.682%
26	-0.067%	2.568%	-0.170%	4.504%
27	-0.065%	2.501%	-1.159%	3.293%
28	0.238% *	2.745%	-0.357%	2.924%
29	-0.113%	2.629%	-0.285%	2.631%
30	1.063% *	3.719% ***	0.486% ***	3.130%

Notes. * 1% significance.
** 5%.significance.
*** 10% significance.

As can be seen in Table 4, the greatest mean abnormal return (AR) for the aircraft makers, with 1% significance, occurred on the 30th trading day after the event, and on this same day, the cumulative abnormal return (CAR) was significant at 10%. With respect to the shares of the airlines, the highest mean AR was on trading day 19, with a return of 3.38% and on this same day the CAR was significant at 1% and reached a total of 8.25%.

The results obtained for abnormal returns up to 30 trading days after the accident suggest that an investment strategy based on investing in the stocks of the companies involved and selling the stocks 30 trading days afterward would have little statistical likelihood of producing better returns than the market in general. The reason is the weak significance of the average CAR for this period.

Table 5 summarizes the average abnormal returns and cumulative abnormal returns along with the respective Z-scores for statistical significance in the period between 31 and 45 trading days after the accident.

Table 5

Results of the event study for aircraft makers and airlines between 31 and 45 trading days after the event

Days from the event date	Airplane Makers		Airlines	
	Mean AR	Mean CAR	Mean AR	Mean CAR
31	-0.407%	3.297%	0.902% *	4.060%
32	0.055%	3.354%	-1.554%	2.443%
33	0.168% **	3.527%	0.296%	2.746%
34	-0.232%	3.287%	0.862% *	3.632%
35	0.186% **	3.480%	0.649% *	4.305%
36	-0.035%	3.443%	0.197%	4.511%
37	-0.097%	3.343%	-0.231%	4.270%
38	0.189% **	3.538%	-0.418%	3.834%
39	0.100%	3.641%	0.508% ***	4.361%
40	0.338% *	3.992% *	-0.352%	3.994%
41	0.379% *	4.386% *	-1.226%	2.720%
42	0.204% *	4.599% *	2.049% *	4.824%
43	0.013%	4.613% *	1.874% *	6.789%
44	0.124%	4.743% *	1.806% *	8.717% *
45	0.594% *	5.365% *	2.946% *	11.920% *

Notes. * 1% significance.
** 5%.significance.
*** 10% significance.

Table 5 shows that for the aircraft makers, the average abnormal returns (AR) continue having statistical significance of 1% or 5% and as of the 40th trading day after the accident, the average cumulative abnormal returns (CAR) start to occur and present significance of 1% between 40 and 45 days, when the CAR reaches 5.36% for the manufacturers and 11.92% for the airline companies.

Until the 40th trading day after the accident, although there are significant average cumulative abnormal returns, it was not possible to verify a tendency. From then on the existence of persistent statistically significant abnormal returns at 1%, 5% or 10% shows a cumulative abnormal return, with an apparent growing trend.

Table 6 shows the mean abnormal returns and cumulative abnormal returns and the respective Z-scores between 46 and 60 trading days after the accident.

Table 6

Results of the event study for aircraft makers and airlines between 46 and 60 trading days after the accident

Days from the event date	Airplane Makers		Airlines	
	Mean AR	Mean CAR	Mean AR	Mean CAR
46	-0.170%	5.186% *	-0.923%	10.887% *
47	-0.062%	5.121% *	0.542% **	11.488% *
48	0.129%	5.257% *	-0.050%	11.433% *
49	-0.427%	4.807% *	0.566% **	12.063% *
50	-0.060%	4.744% *	1.028% *	13.215% *
51	0.492% *	5.260% *	0.842% *	14.168% *
52	0.342% *	5.620% *	0.242%	14.444% *
53	0.182% **	5.811% *	1.147% *	15.757% *
54	0.225% *	6.050% *	-1.127%	14.453% *
55	-0.131%	5.910% *	-1.564%	12.663% *
56	0.435% *	6.370% *	-0.072%	12.582% *
57	-0.280%	6.073% *	1.497% *	14.268% *
58	0.055%	6.131% *	-0.247%	13.986% *
59	0.177% **	6.318% *	1.853% *	16.099% *
60	0.341% *	6.681% *	1.882% *	18.283% *

Notes. * 1% significance.
** 5%.significance.
*** 10% significance.

The results presented in Table 6 show a higher frequency of significant average abnormal returns (AR) at 1% and 5%, for the shares of both the aircraft makers and air carriers. Regarding the average cumulative abnormal returns, in both cases they are statistically significant at 1% on all days in the period between 46 and 60 trading days after the accident. On the 60th trading day, the average cumulative abnormal return reached 6.68% for the aircraft makers and 18.28% for the airlines.

5. Final Considerations

This study sought to show whether or not an investment strategy based on aviation accidents can generate abnormal returns. We applied an appropriate method, an event study, based on the model developed by Campbell et al. (1997), the one most tested and referred to in the literature. For this purpose, we also investigated concepts of behavioral finance, such as over and underreaction, since aviation disasters are unexpected events in the capital market and are thus prone to causing sudden shifts in investor sentiment.

The hypothesis tested was that a strategy based on aviation accidents would generate abnormal returns, for which we analyzed the stock performance after accidents claiming more than 10 fatalities of all the airlines and aircraft manufacturers with stocks listed for trading.

To create a model that could define the future stock returns, we considered the reference portfolios of the market of each country where the companies involved in the accidents are listed, namely the Dow Jones Index of the New York Stock Exchange, the Ibovespa of the São Paulo Stock Exchange and the CAC40 of the Paris Bourse.

The F-test for difference of variance, applied to the normal returns, demonstrated the existence of a difference between the variances of the normal returns of the stocks of the airlines and airplane makers versus the market portfolios. In turn, the ANOVA F-test revealed the existence of at lease one sample in which the variance of the mean was different. These results suggested the need for specific tests for this study.

Therefore, we applied the T-test for difference of means, assuming different variances. We analyzed the average normal returns (daily and cumulative) of all the events, 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330 and 360 trading days after each accident. This permitted identifying the average normal stock returns of the airlines and aircraft makers were lower than the respective average portfolio returns. Since these tests were based on the difference between the normal returns versus the portfolios, these results were insufficient to indicate or reject the presence of abnormal returns.

Although the tests mentioned so far were not conclusive, they served to diagnose the need to find a statistical model that better reflected the reality of the data and brought less bias in its interpretation. The new tests had to be robust regarding the premise that the data were normally distributed. The aim of these tests was to provide a base to infer whether or not, statistically, an investment strategy based on aviation accidents could generate abnormal returns. For this purpose we used an estimation model based on the market model, as developed by MacKinlay (1997) and Campbell et al. (1997). According to these authors, the market model eliminates most of the errors committed by other models that also are used to calculate asset returns.

The results obtained by applying the model Campbell et al. (1997) revealed the existence of abnormal returns both for the aircraft makers and airlines. However, the average cumulative abnormal returns were only significant as of the 40th trading day after the accident for the manufacturers and 45 trading days afterward for the airlines.

The T-tests applied to the two samples, presuming different variances, used to compare the mean daily abnormal returns (mean AR) for both types of companies presented strong fluctuation, indicating positive and negative abnormal returns on trading days 15, 30, 45 and 60. The results obtained also indicated that on the 60th trading day post-accident, which was the last day analyzed, the mean CAR was 6.68% for the aircraft makers and 18.28% for the air carriers.

Overall, the results obtained indicate it is possible to obtain abnormal returns through an investment strategy based on aviation accidents. Thus the returns obtained by a strategy formulated according to the points presented here would be higher than those obtained from an investment in an index-tracking fund in the respective markets.

Because of the complexity of the financial market variables involved in calculations of the behavior of securities, it must be stressed that other events could have happened during the periods analyzed, influencing the calculation of the returns, and consequently the model for estimating normal and abnormal returns. However, since the statistical tests followed the premise that the data were normally distributed, we believe the results obtained were not greatly influenced by exogenous variables that could not be controlled in the model used.

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Continuity And Inclusion Of Actors In Scientific Production In Accounting Between 1994 And 2009

Abstract

This research was aimed at verifying, within a longitudinal perspective (1994-2009), the role of authors in the development of Brazilian scientific production in accounting. A bibliometric and sociometric research was undertaken, in which 4,052 papers were consulted. Production and continuity categories were analyzed, classifying the authors as continuant, transient, entrant, one-timer and withdrawing. The results demonstrated the importance of continuant authors for the development, consolidation and maturing of accounting research. That is so because these authors displayed the greatest productivity in quantitative terms; intermediate the relationship with other categories, that is, they serve as agents for information from different researchers; the eight continuant authors with the highest number of publications play a central role in their networks, articulating research by different researchers; and are the main responsible for international partnerships. Despite the importance of continuants, they represent the lowest percentage among the categories. On the opposite, most of the authors identified were classified as one-timers, that is, they published a single study across the study period. This last category, in combination with entrant authors, indicate the attractiveness of the knowledge area for researchers, and can serve as the main sources of innovations and novel approaches. As regards the withdrawing authors, some degree of rotation was observed, which is natural in all research areas.

Key words: Scientific production in accounting. Continuity of authors. Internationalization of partnerships. Bibliometrics. Sociometrics.

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1. Introduction

Research contributes to scientific knowledge production and dissemination (Silva & Ensslin, 2008), and the most used means for its communication is dissemination in congress annals and journals (Araújo, Oliveira & Silva, 2009). In accounting, scientific productions contribute to a further understanding and dissemination of procedures and techniques related to entities' social and economic equity. This made accounting, including cost management, more active in the business context, contributing to interpret the complexity of information that is to be considered for decision making (Silva & Pires, 2009).

In this context, the relevance of analyzing scientific production is defended in the Brazilian context. This production is normally oriented by bibliometrics. That is the case, for example, in the studies by Riccio, Sakata and Carastan (1999), Oliveira (2002), Mendonça Neto et al. (2004), Cardoso et al. (2005), Leite Filho (2006) and Araújo, Oliveira and Silva (2009). Souza et al. (2008), Espejo et al. (2009) and Walter, Cruz, Espejo & Gassner (2009), on the other hand, combine sociometrics and bibliometrics, but without investigating the authors' continuity and without classifying them according to production and continuity criteria. That is the case, for example, in the studies by Guarido Filho, Machado-da-Silva and Gonçalves (2009) about institutional theory, and by Walter, Lanza, Sato, Silva & Bach (2010) in the strategic area. Hence, the researchers believe that the combination between sociometrics and classification into production and continuity criteria can entail implications that are capable of stimulating growth and development in the area.

Aiming to complete that gap, this study was developed to answer the following question: **How has Brazilian scientific production in accounting been characterized in terms of the continuity and inclusion of researchers and cooperation among authors?** The answer to that question involves verifying how researchers and institutions have been active in scientific research development, considering information exchange (co-authorship networks) as well as their production and continuity in the area.

In this context, the objective was defined as: verifying, from a longitudinal perspective (1994-2009) and according to production and continuity categories, the role of the authors in the development of Brazilian scientific production in accounting. Therefore, a bibliometric and sociometric research was undertaken by consulting papers from four Brazilian accounting events classified as Qualis A.

This paper is structured in five parts. Besides this introduction, in section two, the literature review is presented, including sociometric concepts and the continuity categories. In the third section, the bibliometric and sociometric methodological procedures are highlighted. Data analysis is discussed in section four. Finally, in the fifth section, the final considerations, research limitations and suggestions for future research are presented.

2. Literature review

Scientific knowledge construction is understood as a social and dynamic process, which takes place through interactions among the actors in their scientific areas (Guarido Filho, Machado-da-Silva & Gonçalves, 2009). One of the tools used to study this interaction among the actors in an area is sociometrics, also known as social network analysis.

According to Galaskiewicz and Wasserman (1994), social network analysis concentrates its attention on social actors or entities that interact mutually and on the fact that these interactions can be studied and analyzed as a sole structure or scheme. Hence, according to Wasserman and Faust (1994), social networks can be defined as a set of "knots" corresponding to actors (people or organizations) who are linked through social relations or specific kinds of affiliations. In other words, social processes can be considered through networks of authorship relations that join authors or institutions (Walter & Silva, 2008). In the present research, the relationship structure among authors and among institutions will be analyzed, which are related through the joint publication of accounting papers. This analytic possibility is called co-authorship network analysis (Liu, Bollen, Nelson & Van de Sompel, 2005).

According to Powel, Koput and Smith-Doerr (1996) and Stuart and Podolny (1999), besides increasing information access, network connections represent an opportunity to get access to innovations through the knowledge produced in individual relations. From an institutional perspective, as highlighted in Smitt-Doerr and Powell (2003), networks govern the distribution of and access to resources and information, so that the connections can lead to the strengthening of activities, opportunities and learning. When this access is restricted, however, it can lead to social closure. In co-authorship networks, these connections turn into opportunities for the exchange of information and ideas, which are put in practice in further research development, which in turn can contribute to the development of the knowledge area.

Some sociometric concepts are important to analyze the cooperation among authors and institutions in a research area. The "knots", for example, correspond to each actor who cooperate with at least one of the items in a network and are characterized by circles with different colors in a network (Walter et al., 2010). The knots in this research refer to the researchers or institutions the authors of the papers were affiliated with at the time of the publication.

Strong affiliation is the direct connection between actors in a network (Granovetter, 1973), in which the information that is to be shared tends to be the same, with a slight trend towards change (Burt, 1992). In this study, strong affiliation refers to two authors (researchers or institutions) who published a paper in partnership. Weak affiliation, in turn, is the representation of indirect contacts, constituted by points that provide different information sources and make the network prone to innovation (Granovetter, 1973). In that sense, in cooperative networks among authors, weak affiliation relates to indirect bonds, put in practice through the interaction of one author who publishes with other researchers. A structural gap represents contacts that are not connected in a network, granting a competitive advantage to the individual who connects different networks (Burt, 1992). Hence, an author who links up networks has the power to serve as an agent of contact among the authors from the different groups he is linked to.

According to Marsden (1993), the density of a network reflects how many actors in that network are mutually connected so that, the larger the number of strong bonds among network actors, the greater its density. The concept of structural equivalence, developed by White, Boorman and Breiger (1974) and Burt (1992), happens when two actors occupy similar positions in a social system and have the same types of relations. Actors' centrality in a network, in turn, reflects their importance in that network, in which, the more central, the more important the authors will be (Wasserman & Faust, 1994). In line with Knoke (1990), the actor's position in the network can influence other actors' attitudes and behaviors, based on his prominent role in that network, in which information and scarce resources are transferred from one author to another.

To establish a well-structured network of relations among authors in a knowledge area, some degree of continuity in scientific production is needed. According to Guarido Filho, Machado-da-Silva and Gonçalves (2009), that continuity is sustained by a group of researchers who articulate and cooperate to constitute and adopt a reference framework for the knowledge area. Shah (2000) asserts that those actors who remain in a network for a long time gain a central role. Walter et al. (2010) add that researchers' continuity in an area enhances its development and maturity through the application of the knowledge they hold. Also, the entry of new researchers can be important to introduce new knowledge, approaches and views.

One means used to analyze researchers' continuity in a knowledge area is their classification into categories of production and continuity (Braun, Glänzel & Schubert, 2001; Gordon, 2007; Guarido Filho et al., 2009; Walter et al., 2010), in which the authors are classified according to the regularity and distribution of their publications over time. Researchers who are considered as continuant present different publications across distinct time periods, also recently, that is, they are the common members of a field in which they have been active for a long time (Walter et al., 2010). The number of these authors is usually limited when compared to other categories, although they tend to be the most productive, pointing towards the fact that a small number of researchers is responsible for the largest number of publications in a study area or theme (Guarido Filho et al., 2009). These researchers can also intermediate among other categories and researchers in a network, that is, they usually act as central authors in their networks.

The difference between transient and continuant authors is that the former's number of publications is more restricted. They are therefore a bit less persistent and stable than the latter (Walter et al., 2010). Although less persistent, transient authors tend to play a role that is similar to continuant authors in a knowledge area, so that these two categories are considered essential to sustain and continue research in a study area (Guarido Filho et al., 2009).

One-timers, on the other hand, are sporadic authors in the area, who have published only once across the analysis period (Walter et al., 2010). Guarido Filho, Machado-da-Silva and Gonçalves (2009) highlight that these publications probably derive from master's theses under the advice of more established researchers in the area or originated in researchers concentrated in other areas, but who at some point envisaged the possibility of publishing in the area under analysis as well. Also, in the future, part of these researchers could be reclassified as entrant or transient authors, provided that they publish again in the area (Guarido Filho et al., 2009).

Entrant authors have been included in the area quite recently, showing more current publications only. These researchers represent the degree of attraction of the research area to new researchers, as well as the possibility of innovations and transformations, deriving from researchers with new ideas and perspectives (Walter et al., 2010).

Finally, withdrawing authors have left the area, that is, they have not published in recent years (Walter et al., 2010). These include researchers who are terminating their academic careers, slowing down the rhythm of publications, as well as researchers who are migrating to other knowledge areas.

3. Methodological design

To achieve the research objective, a bibliometric - which, according to Macias-Chapula (1998), consists in the study of the quantitative aspects of the production, dissemination and use of the information registered; and sociometric research was undertaken, which explores the relationship matrix established among social actors (Galaskiewicz & Wasserman, 1994), considered as authors and institutions here. As regards the time perspective, a longitudinal design was adopted, considering a 16-year period: from 1994 till 2009.

Through a documentary research, 4,052 scientific papers were collected, including publications in Qualis A Brazilian congress annals (up to 2009) in accounting: a) International Accounting Congress, held by the National Association of Graduate Accountancy Programs (IAAER-ANPCONT), between 2007 and 2009, totaling 346 papers; b) *Congresso Brasileiro de Custos* (CBC), between 1994 and 2009, considering all of its 16 editions, totaling 2,530 papers; c) USP Congress of Controllership and Accounting, between 2001 and 2009, totaling 473 papers; and d) Meeting of the National Association of Graduate Programs and Research in Business Administration (EnANPAD), between 1998 and 2009, specifically its theme areas Accounting (CON) and Accounting Teaching and Research (EPQ), totaling 703 papers. These four events were selected because they are classified by the Coordination for the Improvement of Higher Education Personnel (CAPES) as level "A" and because of their importance and representativeness in the Brazilian context.

For data analysis, the year of publication, the event where the papers were published, authors, primary institution of affiliation informed at the time of publication and country of origin of the institution were considered. To guarantee distinctions between authors' names with the same nominal citation form. Names were individually checked by consulting the authors' Lattes curriculum, on the platform of the Brazilian Scientific and Technological Development Council (CNPq). After checking for possible homonyms, the researchers decided to maintain the last name and write out the first name.

Data analysis was focused on: scientific production per event and year; classification of researchers according to production and continuity categories; scientific production per category and year; scientific production per event in each category; co-authorships among categories; most prolific authors with larg-

est number of affiliations; social networks of cooperation among actors; affiliations per category of most prolific authors; social networks of cooperation between Brazilian and foreign institutions; Brazilian institutions that linked up with foreign ones; and production and continuity categories of authors involved in international partnerships.

To analyze the production and continuity categories, the (absolute and relative) volume of papers, researchers and authorships in each year under analysis was assessed in quantitative terms. Thus, based on the criteria by Walter et al. (2010) – adapted from Braun, Glänzel and Schubert (2001), Gordon (2007) and Guarido Filho, Machado-da-Silva and Gonçalves (2009) –, the researchers were classified as: (a) **continuant**: two or more publications in five or more different years and at least one in the last three years; (b) **transient**: two or more publications in up to four different years (not more) and at least one in the last three years and at least one in earlier years; (c) **one-timers**: only one publication in the period under analysis; (d) **entrant**: two or more publications in one or more different years exclusively in the last three years; and (e) **withdrawing**: two or more publications in one or more different years, but without any publication in the last three years. It is highlighted that these categories are mutually exclusive, as perceived based on the definition and criteria for each category, displayed in Figure 1.

Category	Definition	Criteria for classification
Entrant	New researchers in the area (published at least 2 papers in the last 3 years only)	≥ 2 papers between 2007 and 2009
		No publications between 1994 and 2006
Transient	Relatively permanent researchers in the area (published at least 2 papers in up to 4 different years, in the last 3 years and before)	≥ 2 papers in up to 4 years
		≥ 1 paper between 2007 and 2009
		≥ 1 paper between 1994 and 2006
Continuant	Consolidated researchers in the area (published at least 2 papers in 5 or more different years, including the last 3 years)	≥ 2 papers in ≤ 5 years
		≥ 1 paper between 2007 and 2009
One-timers	Sporadic researchers (published only 1 paper across the period)	1 paper between 1994 and 2009
Withdrawing	Researchers who are withdrawing from the area (published at least, 2 papers, but none in the last 3 years)	≥ 2 papers between 1994 and 2006
		No publications between 2007 and 2009

Figure 1. Definition and author classification criteria in production and continuity categories.

Source: Adapted from, Machado-da-Silva and Gonçalves (2009).

Concerning the analysis of social networks, the researchers chose to explore the co-authorship networks between authors and institutions, representing a branch of social network analysis (Liu et al., 2005), using the software UCINET® 6, based on the publication year of the papers analyzed. To count the affiliations per author and institution, each association was considered as an affiliation.

4. Data presentation and analysis

In this section, the analysis of scientific production in accounting is presented for the last 16 years. First, in Table 1, the number of papers published is displayed per year and event, as considered in this research.

Table 1

Number of papers published per year, per event and total

Eventos	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
ANPCONT	–				–			–			–			47	95	204	346
														23.25% (346)			
CBC	27	81	42	49	76	106	139	133	179	139	238	351	212	238	267	253	2,530
	100% (199)				85.6% (321)			53.56% (451)			69.77% (801)			50.94% (758)			
Congresso USP	–				–			74	85	101	33	30	35	30	44	41	473
								30.88% (260)			8.54% (98)			7.73% (115)			
EnANPAD	–				12	10	32	24	47	60	78	82	89	112	90	67	703
					85.6% (321)			15.56% (131)			21.69% (249)			18.08% (269)			
Total	27	81	42	49	88	116	171	231	311	300	349	463	336	427	496	565	4,052
	199				375			842			1,148			1,488			

Table 1 shows that, in general, the number of papers published over the years increased. Also, new accounting events were created, like the USP Congress in 2001 and ANPCONT in 2007. The CBC is the first event in the study universe, which started in 1994 and stands out by the number of papers published per edition and in total.

Table 2 shows the distribution of researchers per category.

Table 2

Distribution of researchers according to production and continuity categories

Production and continuity categories	Authors independently of number of publications[1]	Authors considering the number of publications[2]	Papers[3]	Journals with production[4]
Continuant	8.2% (400)	3,067	75.7% (3,067)	100.0% (16)
Transient	13.9% (679)	1,526	37.7% (1,526)	100.0% (16)
One-Timers	50.8% (2,478)	2,478	61.2% (2,478)	100.0% (16)
Entrant	10.0% (488)	984	24.3% (984)	18.7% (03)
Withdrawing	17.1% (835)	1,731	42.7% (1,731)	81.3% (13)
Total	4,880	9,786	4,052	16

As many papers have more than one author, so that authors from the same paper can fit into different categories, some quantification criteria were adopted:

[1]Considers the number of authors who can be classified in each category without repeating the author, that is, each author is counted only once, independently of the number of publications. The percentage is calculated on the total number of different authors during the period (4,880).

[2]Considers the number of times the authors classified in each category published, that is, admits repetition of the same author according to the number of publications during that period.

[3]Considers the number of papers in which the authors classified in each category contributed as authors or co-authors. The percentage is calculated on the number of papers published (4,052).

[4]Considers the number of years, from 1994 to 2009, during which the authors classified in each category published papers. The percentage is calculated on the total number of years during the study period (16).

As observed in Table 2, continuant authors represent 8.2% of all authors over the 16-year period. These researchers appeared 3,067 times as authors or co-authors of studies and represent 75.4% of the production volume in the area. This percentage of continuant authors is higher than findings in more specific knowledge areas, like 5.5% in the institutional perspective in organizational studies (Guarido Filho et al., 2009) and 2.9% in organizational strategy (Walter et al., 2010). Thus, it is perceived that the accounting area as a whole shows a higher percentage of traditional researchers, with constant and representative publications. Future studies could focus on whether this result also applies to more specific accounting areas.

The continuant authors correspond to a quantitative productivity index (division of number of papers by number of authors independently of number of publications) of 7.67, higher than the transient authors with 2.25; withdrawing authors with 2.07; and entrant authors with 2.02. The first category stands out because they contribute to the consolidation of knowledge in the area, in view of their experience and knowledge about accounting themes. In addition, they also contribute to the dissemination of legitimation of knowledge practiced in the field through their continuity and high productivity.

Transient authors, the second most stable category in terms of publications, corresponded to 13.9% of all authors, involving 679 researchers with 1,526 cases of authorship or co-authorship. Together, continuant and transient authors correspond to 22.1%, but with a mean productivity level of 4.96. According to Guarido Filho, Machado-da-Silva and Gonçalves (2009), these two categories of authors together represent the bases to sustain and continue research activities in a study area.

One piece of information that stands out is the number of one-timers, totaling 50.8% of all authors. This is inferior to the findings of Guarido Filho, Machado-da-Silva and Gonçalves (2009), with 59.8%, and Walter et al. (2010), with 72.9%, but is nevertheless noteworthy, as these researchers analyzed more specific knowledge areas. The one-timers, according to Guarido Filho, Machado-da-Silva and Gonçalves (2009), can be researchers who are predominantly interested in another area and provide a punctual contribution to the field under analysis. In combination with entrant authors (10%), one-timers also represent the area's attraction power, given that researchers without a history of publications in accounting are submitting their papers to events in the area.

When comparing entrant (10% of the authors who participated in 24.2% of the publications) and withdrawing authors (17.1% of the authors who participated in 42.7% of the publications), it is observed that the number of authors who leave the area and their productivity is larger than the number of newly included authors. This may represent a drawback in the area's quantitative development when ignoring that part of the authors classified as one-timers can turn into entrants in future years.

Table 3 displays the number of papers published per category and year. This table was constructed so that authors are first classified in one of the production and continuity categories; next, the number of publications by all authors in each category is added up in each year.

Table 3

Papers published per category and per year

Categories	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Continuant	17	27	23	32	56	81	88	163	209	284	272	365	302	389	401	358	3,067
	28.13% (99)				31.08% (225)			34.95% (656)			32% (939)			29.44% (1.148)			
Transient	2	3	5	5	9	17	21	49	48	71	98	200	238	311	284	165	1,526
	4.26% (15)				6.49% (47)			8.95% (168)			18.27% (536)			19.49% (760)			
One-timers	13	61	20	15	34	71	123	102	139	152	246	279	216	271	311	425	2,478
	30.97% (109)				31.49% (228)			20.94% (393)			25.26% (741)			25.83% (1.007)			
Entrant	–				–			–			–			257	360	367	984
														25.24% (984)			
Withdrawing	14	39	37	39	62	58	104	198	196	266	256	300	162	–			1,731
	36.65% (129)				30.94% (224)			35.16% (660)			24.47% (718)						
Total	46	130	85	91	161	227	336	512	592	773	872	1,144	918	1,228	1,356	1,315	9,786
	352				724			1,877			2,934			3,899			

In Table 3, the period 1994-1997 stands out because of the lower levels of continuant and transient authors, as well as the second highest number of one-timers. Hence, in the first period, publications by sporadic and withdrawing authors are paramount. In the period 1998-2000, the percentage of transient authors is the second highest and the percentages of continuant authors, one-timers and withdrawing authors are similar, revealing a balanced period. In 2001-2003, the second highest percentage of withdrawing authors appears, higher than in the earlier period. The same period also shows the highest percentage of continuant authors and the smallest number of one-timers, highlighting traditional and withdrawing authors. In 2004-2006, a rise in transient and a drop in withdrawing authors are observed, movements that continue in 2007-2009. During that last period, the highest percentage of transient authors is observed, as well as the emergence of entrant authors. In that sense, it is emphasized that entrant authors in 2007-2009 can turn into transient, continuant or withdrawing authors in the future, just like one-timers from the previous periods can turn into entrant authors in the future (Guarido Filho et al., 2009).

In Table 4, the number of papers published per event is displayed per category.

Table 4

Papers published per event in each production and continuity category

Categories	ANPCONT	USP Congress	CBC	EnANPAD
Continuant	34.10% (179)	34.38% (384)	28.60% (1,830)	38.62% (674)
Transient	16.00% (84)	15.76% (176)	14.96% (957)	17.71% (309)
One-timers	24.57% (129)	22.20% (248)	27.33% (1,749)	20.17% (352)
Entrant	25.33% (133)	6.80% (76)	9.38% (600)	10.03% (175)
Withdrawing	–	20.86% (233)	19.74% (1,263)	13.47% (235)

Table 4 reveals that, at all events, the percentage of continuant authors is higher than the other categories, particularly at EnANPAD. Regarding the same event, it is observed that, when adding up the percentages of continuant and transient authors, which are more stable categories in accounting publications, this corresponds to more than 50% of the papers. The same event reveals the smallest percentage of one-timers. Hence, it appears as an event with publications by more traditional researchers.

The CBC, on the opposite, shows the highest percentage of one-timers, and thus represents the event with the highest percentage of sporadic authors. This result may be related to the range of papers accepted, which may attract new authors who have not published in the area yet. Another possibility is that, due to the focus on strategic cost management, the event also attracts researchers from areas like business and economics, who may publish in other events than those investigated in this study. This second possibility turns the event more multidisciplinary, permitting the compilation of contributions from different areas to the theme.

ANPCONT stands out because of the percentage of entrant authors, possibly because it is the most recent event in the research universe. When added up, the percentage of entrant authors and one-timers (which can become entrants, as there have been few editions of the event so far) at ANPCONT corresponds to almost 50%. This percentage represents a strong sign of innovation, as an important means of inclusion for new researchers, and possibly for the inclusion of perspectives in accounting. The USP Congress, on the counterpart, revealed the lowest percentage of entrant authors, despite being the second most recent event.

In the analysis of co-authorships in each category of production and continuity, it was verified that continuant authors mainly publish together with one-timers (939), but also with transient (765), withdrawing (671) and entrant authors (509). The higher levels of continuant authors publishing together with one-timers can be related to the fact that these publications by one-timers can derive from Master's theses under the advice of other established researchers in the area (continuant), according to Guarido Filho, Machado-da-Silva and Gonçalves (2009). They can also result from other graduate program activities, like publications deriving from isolated subjects or temporary participations in research groups, reflecting these authors' transition (Walter et al., 2010).

Transient authors published with continuant authors (890), one-timers (647), entrant (292) and withdrawing authors (277). One-timers, on the other hand, published with continuant (917), transient (610), withdrawing (490) and entrant authors (331). Entrants published with continuant (490), one-timer (311) and transient authors (263). Finally, withdrawing authors published with continuant (693), one-timer (519) and transient authors (233). Hence, transient, one-timer, entrant and withdrawing authors publish mainly with continuant authors. These figures permit inferring that continuant authors intermediate relations with different categories, in line with the statement by Braun, Glanzel and Schubert (2001) about continuant authors' important role in knowledge construction, especially in the consolidation of the production and articulation with other categories of authors. This may indicate their stronger influence on the flow and contents of information in the area. Publications involving continuant and transient authors, for example, indicate a greater possibility of long-lasting associations in the field, besides the fact that continuant authors may be attracting entrants and one-timers, who may turn into entrants in the area.

In Table 5, the 25 authors with the largest number of publications during the period are displayed.

Table 5

Most prolific authors

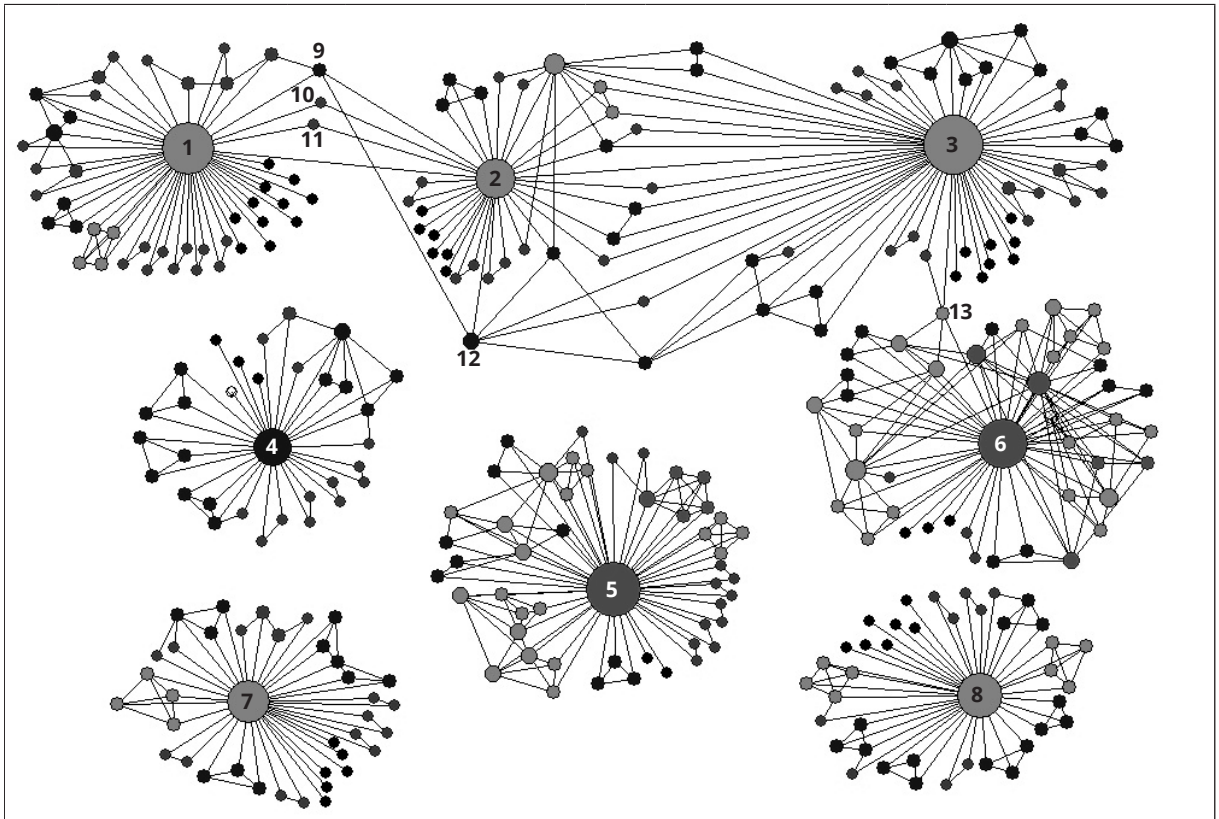
Authors	Papers published																Total articles	Bonds	Isolated	Category of the author
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009				
BEUREN, I. M.	–	–	1	2	3	1	1	7	6	6	4	4	4	7	6	6	58	84	3	C[2]
MIRANDA, L. C.	–	–	–	–	–	1	4	7	15	5	2	2	–	2	3	4	45	108	1	C
CORRAR, L. J.	–	–	–	1	1	3	1	–	3	5	4	1	2	5	3	9	38	64	2	C
SOUZA, M. A. de	–	–	–	–	–	–	–	2	2	3	3	6	3	6	5	5	35	60	1	C
SOUZA, A. A. de	–	–	–	–	1	–	2	2	3	3	4	5	3	4	3	5	35	98	–	C
SILVA, C. A. T.	–	1	1	1	2	1	2	4	2	5	2	5	3	3	1	2	35	52	6	C
GUERREIRO, R.	–	1	1	–	2	2	1	–	4	5	3	3	3	3	4	3	35	51	–	C
BORNIA, A. C.	2	2	1	2	–	5	2	6	1	–	2	3	2	1	3	2	34	55	3	C
CALLADO, A. A. C.	–	–	–	–	1	2	2	1	8	1	1	4	2	3	4	1	30	55	–	C
OTT, E.	–	–	–	–	–	–	–	3	3	3	2	4	3	3	3	6	30	47	2	C
MACEDO, M. A.da S.	–	–	–	–	–	–	–	–	–	1	3	3	4	5	7	7	30	51	–	C
CALLADO, A. L. C.	–	–	–	–	1	1	1	1	7	1	1	5	3	3	4	1	29	57	–	C
WERNKE, R.	–	–	–	–	–	3	1	4	3	1	3	3	3	2	2	3	28	29	–	C
NOSSA, V.	–	–	–	–	1	1	2	–	1	7	5	3	–	3	1	4	28	59	1	C
PEREIRA, C. A.[1]	–	–	–	–	–	1	–	–	–	3	7	3	4	4	4	1	27	51	–	C
TEIXEIRA, A. J. C.	–	–	–	–	–	–	–	–	1	9	2	4	–	4	2	4	26	63	–	C
SLOMSKI, V.	–	–	–	–	–	–	–	–	–	7	3	4	3	5	2	2	26	51	–	C
DIEHL, C. A.	–	–	–	–	–	1	1	–	3	1	2	2	1	6	4	5	26	34	7	C
BORBA, J. A.	–	–	–	1	–	–	1	–	–	2	4	4	4	2	4	3	25	42	1	C
FREZATTI, F.	–	–	–	–	1	1	1	–	1	1	1	3	1	5	7	3	25	48	3	C
NASCIMENTO, A.M.	–	–	–	–	–	–	–	–	–	2	3	4	6	7	2	1	25	47	–	C
BACIC, M. J.	2	2	2	2	2	1	1	1	2	1	2	2	1	1	2	–	24	28	4	C
KASSAI, J. R.	–	–	–	–	2	3	3	3	1	3	3	2	–	2	2	–	24	41	5	C
FREIRE, F. de S.	–	1		1	2	2	–	4	2	1	2	1	2	2	1	3	24	49	2	C
MARTINEZ, A. L.	–	–	–	–	1	2	–	–	–	2	4	2	5	2	2	4	24	18	10	C

[1]PEREIRA, Carlos Alberto

[2]Continuant

Based on Table 5, it is observed that César A. T. Silva and Miguel J. Bacic had their papers published in 15 off the 16 years under analysis, followed by Ilse M. Beuren and Antonio C. Bornia, who published in 14 different years. Ilse M. Beuren also stands out as the most prolific author, followed by Luiz C. Miranda, the author with the largest number of cooperation bonds. Antonio L. Martinez was the author with the largest number of papers published as the sole author. In addition, all authors shown in Table 5, are classified as continuant.

In Figure 2, the cooperative networks of the eight authors with the largest number of publications during the study period are highlighted. This methodological technique was used because it was impossible to represent the cooperative networks among all authors due to limited space.



Legend of knots/authors in Figure 2:							
1	BEUREN, I. M.	5	MIRANDA, L. C.	8	BORNIA, A. C.	11	BOFF, M. L.
2	GUERREIRO, R.	6	SOUZA, A. A. de	9	FREZATTI, F.	12	AGUIAR, A. B. de
3	CORRAR, L. J.	7	SILVA, C. A. T.	10	BORINELLI, M. L.	13	MACEDO, M. A.da S.
4	SOUZA, M. A. de						

Figure 2. Social networks of cooperation between Brazilian and foreign institutions

In Figure 2, it is observed that the eight authors (knots) with the largest number of publications occupy central positions in their networks. This result supports the observations of Shah (2000), who states that authors who continue in a network for a long time, like the continuant authors in Figure 2, tend to gain a central role. This centrality is important for the researchers, as it reflects their importance as the main point of reference in their networks and as the main point of articulation among different pieces of information, studies and researchers (Wasserman & Faust, 1994). Also, Knoke (1990) indicates that the prominent role of an actor in a network can enable him/her to influence the attitudes and behaviors of other authors in that network.

Among the eight most prolific authors, four – Ilse M. Beuren, Reinaldo Guerreiro, Luiz J. Corrar and Antônio A. de Souza – linked up with some of the other main eight. Reinaldo Guerreiro (2), affiliated with USP, for example, linked up with Ilse M. Beuren (1) – who was initially affiliated with UFSC, currently with FURB and who obtained her doctorate degree at – and with Luiz J. Corrar (3), affiliated with USP. These cases of cooperation took place directly through strong bonds among the researchers, as well as indirectly, based on bridges or weak bonds (Granovetter, 1973). Hence, Ilse M. Beuren and Reinaldo Guerreiro collaborated by publishing in partnership as well as with other common authors, like Fábio Frezatti (9), affiliated with USP; Márcio L. Borinelli (10), initially affiliated with UEM and currently with USP; and Marines L. Boff (11), affiliated with FURB. The connection between Luiz J. Corrar and Reinaldo Guereiro also takes place in both manners, but the number of authors both have published with is larger.

The relationship between the networks in which Luiz J. Corrar (3) and Antônio A. de Souza (6) – currently affiliated with UFMG – serve as the central actors was only established through indirect contact (weak link), based on the author Marcelo A. da S. Macedo (13), affiliated with UFRJ (professor) and USP (post-doctoral fellowship). In this case, a structural gap is observe, which according to Burt (1992) offers a competitive advantage for the individual who establishes the connection, as (s)he has access to information from both networks. As highlighted in Powel, Koput and Smith-Doerr (1996) and Stuart and Podolny (1999), the connection with a network also grant access to the innovation different individuals offer. The same individual can also conquer the power to serve as the contact agent among the authors in the different groups they are affiliated with.

Andson B. de Aguiar (12), affiliated with USP, stands out in the cooperative networks because of his connections with three different groups. He published in partnership with Luiz J. Corrar (3) and Reinaldo Guerreiro (2), representing strong bonds, as well as with the network in which Ilse M. Beuren (1) is the central actor, through Fábio Frezatti (9), affiliated with USP, representing a weak bond. Thus, through the dialogue among these groups, Fábio Frezatti can also play a relevant role in contacts and information exchange among the members of the three networks, and enhance innovations and contributions.

The other central authors – Marcos A. de Souza (4), affiliated with UNISINOS (professor) and USP (doctorate); Luiz C. Miranda (5), currently affiliated with UFPE; César A. T. Silva (7), affiliated with UnB; and Antonio C. Bornia (8), currently affiliated with UFSC –, establish bonds with different authors in their networks, but do not link up with the other most prolific authors analyzed.

In Table 6, the number of bonds between each of the eight most prolific authors and each of the categories is highlighted.

Table 6
Number of affiliations of more prolific authors per category

Authors	Continuant	Transient	One-timers	Entrant	Withdrawing	Total
BEUREN, I. M.	34.52% (29)	33.33% (28)	21.43% (18)	2.38% (2)	8.33% (7)	84
MIRANDA, L. C.	31.48% (34)	10.19% (11)	19.44% (21)	10.19% (11)	28.70% (31)	108
CORRAR, L. J.	56.25% (36)	20.31% (13)	9.38% (6)	3.13% (2)	10.94% (7)	64
SOUZA, M. A. de	40.00% (24)	20.00% (12)	15.00% (9)	11.67% (7)	13.33% (8)	60
SOUZA, A. A. de	33.67% (33)	10.20% (10)	18.37% (18)	18.37% (18)	19.39% (19)	98
SILVA, C. A. T.	25.00% (13)	17.31% (9)	13.46% (7)	7.69% (4)	36.54% (19)	52
GUERREIRO, R.	64.71% (33)	9.80% (5)	7.84% (4)	5.88% (3)	11.76% (6)	51
BORNIA, A. C.	34.55% (19)	12.73% (7)	23.64% (13)	9.09% (5)	20.00% (11)	55

Table 6 reveals that the eight most prolific authors mainly publish with continuant authors, underlining their importance in the consolidation of scientific knowledge in the area. Ilse M. Beuren, for example, practically balanced her publications between continuant and transient authors, showing most partnerships with the latter. In addition, the same author shows the smallest percentage of publications with entrant authors.

Luiz C. Miranda mainly published with continuant and withdrawing authors, and also shows the smallest percentage of publications with transient authors. Hence, this author usually published with more traditional researchers in the area.

Luiz J. Corrar and Marcos A. de Souza mainly published with continuant authors. Antônio A. de Souza also stands out with the highest percentage of partnerships with entrants. Hence, that author is attracting new researchers into the field.

César A. T. Silva, on the opposite, mainly cooperates with withdrawing authors. This result is related to the fact that that author is one of the pioneers in the area, with publications in 15 out of 16 years analyzed (Table 5).

Reinaldo Guerreiro reveals the highest percentage of publications with continuant authors and the smallest with one-timers, in line with what was identified in the cooperative networks (Figure 2) about that author's large number of strong bonds with different authors from two important groups of researchers, involving Ilse M. Beuren and Luiz J. Corrar as the central actors.

Finally, Antonio C. Bornia mainly publishes with continuant authors, also showing most partnerships with one-timers though.

In Figure 3, the international cooperation networks during the study period are displayed (Brazilian institutions with co-authorships with foreign institutions), totaling 174 institutions involved.

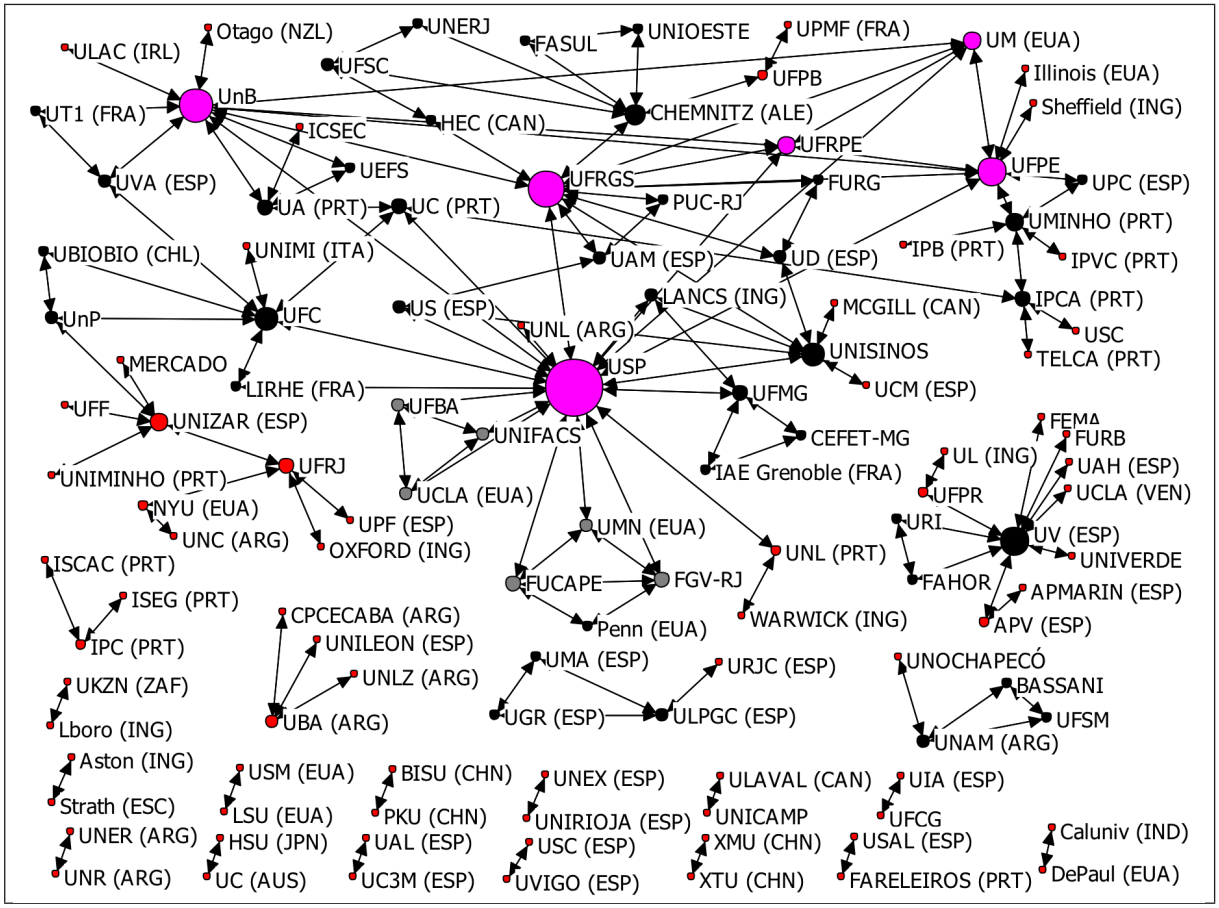


Figure 3. Social networks of cooperation between Brazilian and foreign institutions

Figure 3 reveals that that the 38 Brazilian institutions that linked up with foreign institutions did so with 39 establishments from 13 different countries: one German, two Argentinean, one Australian, three Canadian, one Chilean, ten Spanish, six North American, four French, three British, one Irish, one Italian, one from New Zealand and five Portuguese.

Among the 128 foreign institutions, 84 published in cooperation, while the other 44 published alone. As regards the cooperation with Brazilian institutions, at the top of Figure 3, a large cooperative network is perceived, in which the following central actors stand out: USP, with 13 bonds in 13 papers, involving nine different foreign institutions; UFRGS, with eight bonds, in eight papers, with five institutions; UnB, with eight bonds, in six papers, with six institutions; UFPE, with six bonds, in six papers and five institutions; UNISINOS, with seven bonds, in seven papers, with five institutions. In addition, there is a network with one foreign institution in the central role, the UV from Spain (on the right in Figure 3). That institution established partnerships with six Brazilian and three other foreign institutions.

The analysis of the general internationalization picture reveals that the range of associations between each Brazilian institution and foreign universities remains limited. Due to the wealth of possible knowledge exchanges with foreign universities and researchers, however, considerable space for growth exists in these partnerships.

As regards the production and continuity categories of the authors who closed international partnerships, it is highlighted that 42 (33.07%) were classified as continuant, 23 (18.11%) as transient, 27 (21.26%) as one-timers, 19 (14.96%) as entrants and 16 (12.6%) as withdrawing authors, totaling 127 who published with foreign authors. This result emphasizes the importance of continuant authors for the maturing and development of a scientific area, also regarding information exchange and the development of international cooperative activities.

5. Final considerations

This research was aimed at verifying, from a longitudinal perspective and according to categories of production and continuity, the role of authors in Brazilian scientific production in accounting. The results demonstrate the relevance of the authors classified as continuant for the development of accounting research and, consequently, for the consolidation and maturing of this knowledge area. That is so because these authors revealed the greatest quantitative productivity among the categories, demonstrating their potential in accounting knowledge dissemination and in the development of studies aimed at enhancing the knowledge accumulated in the area.

Also, it was observed that continuant authors intermediate relations with different categories, given that the highest rate of co-authorships for the other categories relates to continuant authors, that is, they serve as agents of information and knowledge for different research groups. Partnerships with transient authors, for example, reflect the flow of more stable information in the network. Publications with withdrawing authors, then, indicate the continuant authors' access to more traditional knowledge. In research with entrants and one-timers, on the other hand, they can get access to innovations and new perspectives on the treatment of knowledge in the field. In line with this result, the eight continuant authors with the largest number of publications play a central role in their networks. Thus, these authors can act by articulating research and knowledge linked with different researchers in the area.

Another aspect that demonstrates the important role of continuant authors is the fact that this category is the main responsible for the international partnerships closed. In that sense, the large space that exists for partnerships with foreign authors is also underlined, as these are still limited and different foreign institutions have published in Brazil (with or without Brazilian partners), demonstrating their interest in publishing in the country.

Despite the importance of continuant authors for the development of accounting research, they do represent the smallest percentage among the categories. On the opposite, most of the authors identified were classified as one-timers, that is, they published only once across the entire period. In combination with entrant authors, this category indicates the attraction the knowledge area exerts on researchers, and may represent the main sources of innovations and new approaches. Entrant authors do reveal a trend towards stabilization in accounting, offering a broader contribution to its development.

Finally, what the withdrawing authors is concerned, some degree of rotation was observed, which is natural in all research areas. Nevertheless, it is healthy for this percentage to remain within the number of researchers attracted to the area. Hence, although the percentage of withdrawing authors in this research is higher than that of entrants, it is probable that some of the researchers considered as one-timers in more recent periods will soon be considered as entrants.

As a study limitation, the event-focused sample is highlighted, which could be expanded to include journals as well. For the sake of future studies, it could be verified whether these study results continue in the sub-areas of accounting.

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Articles containing tables or figures, they [the tables and figures] should be in a format that allows them to be edited. In case some of these Figures or Tables have been imported from other programs such as Excel, Power Point etc.., the source file must also be sent as Supplementary File.

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- The pages of the articles should be properly numbered in the upper right corner, typed with Word for Windows, under the following conditions:
  - A4 paper (210 x 297 mm);
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3. Tables and Figures[1]

Tables and figures should be used in articles whenever their information make text comprehension more efficient, without repeating information already described in the text.

3.1 Tables

The table should usually show numeric or textual information organized in an orderly exposition of columns and rows. Any other statement should be characterized as textual figure.

The table should be displayed with its information visible and sufficient for their understanding and should be formatted as follows:

Table editor	Word for Windows 97 or superior. In case authors have drawn their tables in Microsoft Excel or in a similar program, please remake the tables using the feature in Word.
Font	Times New Roman, size 10.
Line spacing	Simple.
Spacing before and after paragraphs	3 pt.
Table colors	Use only black and white (grayscale).
Title	The table title must be brief, clear and explanatory. It should be placed above the table, in the top left corner, and on the next line, just below the word Table (with a capital initial), followed by the number that designates it. The tables are presented with Arabic numerals in sequence and within the text as a whole. Eg: Table 1, Table 2, Table 3, and so on.
Citation of tables	When citing tables in the text, type only the number referring to the table, for example Table 1, Table 2, Table 3 and so on. (the word 'Table' should be presented with the first letter capitalized). Never write 'table below', 'table above' or 'table on page XX' because the page numbers of the article may change while formatting.
Table notes	The font used in the notes of the table should be Times New Roman, size 10, single spaced. The notes should be described in the footnote of the table, and they serve to indicate the Source of the information of the table, and other information important to understanding the table.

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The figure should show a flow chart, a chart, a photograph, a drawing or any other illustration or textual representation.

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