DISCLOSURE AND COST OF EQUITY CAPITAL IN EMERGING MARKETS: THE BRAZILIAN CASE*

ALEXSANDRO BROEDEL LOPES**-1
ROBERTA CARVALHO DE ALENCAR

1. Introduction. 2. Motivation and hypothesis development. 3. Research design. 4. Data and results. 5. Additional analysis. 6. Conclusion. References.

1. Introduction

There is an important strand of the financial accounting literature that investigates the relation between disclosure and cost of equity capital (Botosan, 1997; Botosan & Plumlee, 2002; Hail, 2002; Francis, Khurana, & Pereira, 2005; Chen, Chen, & Wei, 2003). The basic idea is that higher levels of disclosure contribute to a reduction in information asymmetry between managers and investors and, consequently, cause a reduction in the idiosyncratic component of cost of equity capital (Verrechia, 2001; Diamond & Verrechia, 1991). However, results of these investigations have not been conclusive (Botosan, 1997). Some authors (e.g., Hail, 2002) argue that the absence of statistical and economically significant associations between disclosure and cost of capital can be the result of measurement problems because both variables are not directly observed and proxies need to be used. In this paper, we investigate another possibility. We conjecture that the weak relation between firm-level disclosure measures and cost of equity capital is not significant in the United States because the overall disclosure level is already high and firm-level actions do not have a significant marginal impact. Consequently, the weak association between disclosure and cost of capital observed in the United States may result from low variation in disclosure levels because the mandatory disclosure threshold is already high. We believe that firms' actual disclosure policies depend on their incentives. However, incentives only play an important role if the firm's chosen level of disclosure is superior to the minimum level required by the market regulator. If the firm's policy put its disclosure level below the minimum required level, then it has to be increased by force of regulation. Thus, if the minimum disclosure level is already high, many firms will not adopt their optimal policies and instead will adopt the minimum level. Consequently, the disclosure variation will be reduced in the whole sample of firms. Conversely, in environments where the re-

* Artigo publicado pelo *The International Journal of Accounting* 45 (2010) 443-464, com sua permissão, ora reproduzido.

** E-mail address: *Broedel@usp.br* (A. B. Lopes)

1. Disclaimer: this paper does not reflect any official position of the Securities and Exchange Commission of Brazil.

doi:10.1016/j.intacc.2010.09.003.

quired minimum disclosure level is not so high, it is more likely that firms will present a higher cross-sectional variation in actual (adopted) disclosure policies. Based on prior research (Lopes & Walker, 2008), this high variation in disclosure levels is what we expect to see in Brazil.

One could argue about the relevance of a single-country analysis. Recent cross-sectional studies (Francis et al., 2005) investigated the relation between disclosure indexes and cost of equity capital for a sample of firms extracted from 34 countries. We believe that more detailed within-country studies can complement the results of cross-country investigations. We believe there is considerable sample selection bias in the databases used in recent work. In Francis et al. (2005), for example, only 10 Brazilian firms are covered and there is no discussion about sample selection procedures and representativeness. Other studies that investigate corporate governance arrangements across a large number of firms have the same problem. Doidge et al. (2007) consider only 28 Brazilian firms of which 14 are cross-listed. Lang, Raedy, & Wilson (2006) only consider 1 Brazilian firm. We believe these small and biased samples can compromise the results.

To investigate our hypothesis, we built a detailed disclosure index and applied it to a more representative sample of firms listed in Brazil. To proxy for disclosure, we built the Brazilian Disclosure Index (BCDI), which measures disclosure across 6 components and 47 specific attributes. The index is applied to the 50 most liquid shares traded on the São Paulo Stock Exchange (Bovespa) for the years 1998, 2000, 2002, 2004, and 2005. Our sample is very close to the Bovespa Index, which is composed of the most liquid shares. The index is based on a set of questions used in previous research (Botosan, 1997; Francis et al., 2005) and adaptations to reflect Brazilian regulations and accounting standards. Table 1 features the questionnaire and the percentage of positive answers. Our questionnaire was not sent to the firms or to analysts; rather, it is based on objective answers obtained from public sources of information — annual reports, websites, Bovespa filings, and the files obtained from the Brazilian Securities and Exchange Commission (CVM). Answers are binary, with 1 indicating a positive answer and 0 indicating a negative answer. We believe that the BCDI provides a comprehensive picture of corporate disclosure policies in Brazil. We are not aware of a detailed investigation of disclosure policies done outside the United States. To measure cost of equity capital, we used the model proposed by Ohlson & Juetnner-Nauroth (2005), which has been used in previous papers (e.g., Francis et al., 2005).

Table 1 – Composition of BCDI and percentage of positive answers over time

	1998 (%)	2000 (%)	2002 (%)	2004 (%)	2005 (%)
General information about the company — GI					
1. Does the annual report provide a general description of the firm's business?	93	100	96	100	94
2. Does the annual report provide a description of the major corporate goals for the future?	33	38	57	65	74
3. Are these corporate goals expressed quantitatively?	13	13	28	27	54
4. Does the report describe the major markets where the firm operates?	82	91	100	100	92
5. Are these markets described quantitatively?	36	55	66	71	88

	1998 (%)	2000 (%)	2002 (%)	2004 (%)	2005 (%)
6. Does the annual report describe the major products or services that the firm is involved with?	82	89	98	98	98
7. Does the report provide quantitative information about the firm's major products or services?	44	60	72	71	88
8. Does the annual report describe the general business and economic environment where the firm is immersed?	80	81	91	94	92
9. Are the main corporate events, like the building of a new plant, internal restructurings, and acquisition of new equipments, described in detail?	76	79	85	94	94
10. Are these main corporate events described quantitatively?	36	36	49	55	82
Relationship with employees and managers — REM					
11. Does the firm inform the number of employees?	56	74	85	96	90
12. Does the firm inform the mean compensation per employee?	24	34	47	55	64
13. Are the training and developing investments described quantitatively?	36	36	62	63	82
14. Does the firm provide quantitative information about employees like turnover, satisfaction, and value added per employee?	20	28	57	76	60
15. Does the firm provide information about management compensation?	33	55	70	82	62
Non-financial information about markets, sales and products — NFI					
16. Does the report inform the firm's market share?	27	51	51	63	86
17. Are the revenues detailed by product, business segment, currency, and quantity?	60	68	77	84	88
18. Are the revenues informed in quantity as well as currency terms?	64	68	83	82	82
19. Is there a time series of revenues that allows for the calculation of growth rates (3 or more years)?	31	30	36	49	66
20. Are the prices of each product sold informed?	7	11	9	12	30
21. Is there information provided about new products or services that will be launched?	7	13	21	18	64
Forecasting — F					
22. Did the firm inform sales forecasts for the next year?	0	2	2	6	16
23. Did the firm inform sales forecasts for more than one year ahead?	0	2	2	2	10
24. Did the firm inform earnings forecasts for next year?	0	0	0	2	12
25. Did the firm inform earnings forecasts for more than one year ahead?	0	0	0	0	4
26. Did the firm inform cash flow forecasts for the next year?	0	0	0	0	2

	1998 (%)	2000 (%)	2002 (%)	2004 (%)	2005 (%)
27. Did the firm inform cash flow forecasts for more than a year ahead?	0	0	0	0	2
28. Did the firm inform forecasted investments in research and development and other intangible assets?	0	2	9	8	26
29. Did the firm inform market share forecasts?	0	0	0	0	12
Discussion and analysis of financial data — DAF					
30. Did the firm present a time series of revenues (3 or more years)?	18	28	47	65	56
31. Did the firm comment about and explain changes in revenues over the last years?	20	34	43	41	82
32. Did the firm present time series information about cost of goods sold and services provided?	2	6	17	18	30
33. Did the firm comment and explain about cost of goods and services sold and provided over the last years?	4	15	23	22	56
34. Did the firm present time series information about earnings (3 or more years)?	20	36	62	67	62
35. Did the firm comment and explain about changes in earnings over the last year?	24	38	51	45	84
36. Did the firm present time series information about general and administrative expenses (3 or more years)?	0	6	13	22	24
37. Did the firm comment and explain about changes in general and administrative expenses over the last year?	2	13	17	20	50
38. Did the firm present time series information about financial expenses and revenues (3 or more years)?	0	4	15	27	28
39. Did the firm comment and explain about changes in financial expenses and revenues over the last year?	4	13	32	39	58
40. Did the firm inform the amount invested in research and development and other intangible assets?	4	17	23	20	36
41. Did the firm comment and explain about changes in other items like receivables and non-operational expenses?	4	19	30	31	36
Other Information — OI					
42. Did the firm present time series information about the Return on Assets (*ROA*) for 3 or more years?	0	2	11	12	8
43. Did the firm present time series information about the Return on Equity (ROE) for 3 or more years?	7	9	30	33	14
44. Did the firm present time series information about asset turnover for 3 or more years?	0	2	6	8	6
45. Did the firm explain how taxes are calculated?	36	66	81	78	66
46. Did the firm present the Social Balance or Statement of Value Added?	24	55	79	80	70
47. Did the firm present statement of cash flows?	13	32	60	65	66

The results confirm our hypothesis. Initially we observe a lower mean and greater variation in disclosure scores in Brazil than previously reported in the United States (Botosan, 1997), Swiss (Hail, 2002) and for a sample of developed countries (Francis et al., 2005) corroborating the idea that in low-level disclosure environments there will be more cross-sectional variations in disclosure policies. It is very hard to perform international comparisons between our index (BCDI) and the indexes used in previous studies because they use different methodologies and consequently arrive at different results. However, we believe our findings are robust because this phenomenon (huge variation in disclosure policies) has already been reported in the literature, which our evidence corroborates. Francis et al. (2005), see Table 2) reports the disclosure levels in 34 countries according to the Center for International Financial Analysis Research (CIFAR) index. Brazil presents the higher standard deviation of the 34 countries investigated. Standard deviation for the subsample of Brazilian firms is 17.11, while the mean deviation number for all countries is 7.09. For the United States, the standard deviation of the CIFAR metric is 4.42. Thus, we believe there is compelling evidence (based on our study as well as others) that the variation of disclosure levels in Brazil is far superior to the levels in other developed countries and especially to the levels in America.

Our main analysis reveals that disclosure levels measured by the BCDI are negatively associated with cost of equity capital for our sample of Brazilian firms using a panel data specification and several control variables as suggested by Larcker & Rusticus (2005) and Nikolaev & van Lent (2005). This result shows a more significant association between voluntary disclosure actions and cost of capital for firms immersed in the low-disclosure Brazilian regime than previously found in the United States. Additionally, we investigate the relation between the six BCDI components and cost of capital. Interestingly, results show that the relation between disclosures of non-financial information is positively correlated with cost of capital. One possible explanation for this result is that firms can reveal valuable proprietary information about their business activities through voluntary disclosure of non-financial information (Verrechia, 2001). One alternative explanation for this result is that non-financial information is disclosed more frequently and, consequently, is more used by speculators which induce volatility in stock returns thus increasing cost of capital. Unfortunately, we do not have evidence to prove which of the following explanations is better suited for our sample.

Table 2 – Descriptive statistics

Variables	Mean	Standard Deviation	Max	Min
ks	0.24	0.13	0.66	0.01
BCDI	0.43	0.22	0.78	0.15
SIZE	13.58	4.51	23.8	1.05
MB	1.47	2.34	4.67	0.2
BETA	0.61	0.32	1.32	0.24
DE	−0.26	0.37	−0.12	−0.67
ROA	0.17	0.45	0.67	−0.23
GROWTH	0.08	0.37	0.45	−0.017
EXTFINANCE	0.22	0.36	0.76	0.00

Number of observations 276 firm-year observations for 1998, 2000, 2002, 2004, and 2005

This table presents descriptive statistics for a sample selected of the 50most liquid shares (trading volume) traded on the São Paulo Stock Exchange (Bovespa: where *ks* refers to cost of equity capital calculated according to the Easton PEG ration (Easton, 2004; Hail & Leuz, 2005); *BCDI* refers to the score on the Brazilian Corporate Disclosure Index; *SIZE* is the natural logarithm of total assets; *MB* measures the market-to-book ratio; *BETA* is the stock market beta; *DE* is the natural logarithm of the debt-to-equity ratio. *ROA* is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH* is the change in revenues from year *t* to year *t* − 1; *EXTFINANCE* is the ratio of foreign debt outstanding divided by total long-term liabilities – this measure relates to amortized cost.

We also investigate whether the effect of disclosure on cost of equity is more pronounced for firms that receive less analyst coverage. We hypothesize that disclosure and analyst coverage act as substitutes, and the effect of disclosure on firms' cost of equity capital is less pronounced for firms that receive more attention from analysts. Our results confirm this hypothesis and show that the impact of disclosure on cost of equity is three times higher for firms with lower coverage. Our results are robust for controlling for cross-listing. An increase of 1 point in BCDI causes a decrease of 9 basis points in cost of equity for firms that receive more coverage from analysts and a decrease of 25 basis points for firms that receive less coverage. In addition, we examine the impact of ownership concentration on the relation between disclosure and cost of capital.

We also expect disclosure to be less important for firms with higher ownership concentration. Controlling shareholders have direct access to insider information and do not depend on public disclosures. The results confirm our expectations: an increase of 1 point in BCDI causes a decrease of 27 basis points in cost of capital for firms with low ownership concentration. For firms with high ownership concentration, the relation is not statistically significant. We also investigate the likely determinants of BCDI scores and find, as expected, that growth opportunities and board composition are positively related to the association between disclosure and cost of capital.

We perform several robustness checks and controls. Our results appear to be robust to changes analysis, Fama-Macbeth regressions, the use of instrumental and proxy variables, and other attempts to uncover endogeneity and other econometric problems. Our results continue to be statistically significant in these alternative specifications. Additionally, we also investigate the relation between BCDI and cost of debt capital and find a strong negative statistical association (as expected). Thus, we believe all results are robust and statistically reliable with important economic meanings.

We contribute directly to the literature on the relation between disclosure and cost of capital (Botosan, 1997; Botosan & Plumlee, 2002; Hail, 2002; Francis et al., 2005) by showing that high disclosure levels are strongly associated with lower cost of capital for firms immersed in countries with huge variation in disclosure policies. Previous research on this topic has been based on samples of firms from developed countries with low dispersion in disclosure levels. Our research also contributes to recent studies that investigate the determinants of the actual properties of accounting reports (Ball, Kothari, & Robin, 2000; Ball, Robin, & Wu, 2003; Ball & Shivakumar, 2005), which suggest that financial reporting practices depend on managers' incentives to provide informative numbers and not on standards and regulations. This literature, however, is silent about the effect of firm-level actions designed to improve the quality of financial reports. We show that financial reporting practices of firms with incentives to produce high-quality reports reduce significantly their cost

of equity capital even under inimical circumstances.

Our research does not directly address the policy implications related to disclosure levels. However, our results coupled with other previous works (Lopes & Walker; Ball et al., 2000, 2003) seem to suggest that optimum disclosure levels (and the quality of accounting reports associated) are a function of firms' incentives and that an increase in these levels are related to a decrease in cost of equity capital for firms immersed in low-disclosure-level countries. Consequently, these results seem to suggest that rules intended to increase the disclosure threshold in countries with low institutional disclosure levels seem reasonable and could provide important reductions in cost of capital for firms. However, additional research must be conducted on this topic before any reliable conclusion is established.

The rest of the paper is organized as follows. Section 2 explains the motivation behind the work and develops the hypothesis. Section 3 details the research design employed. Section 4 documents the data selection process, the construction of the BCDI, and the results of our econometric specifications. Section 5 offers additional analysis. Section 6 presents a conclusion.

2. Motivation and hypothesis development

Financial statements play an important role in reducing information asymmetry among firms and investors. Disclosure practices complement the role performed by accounting numbers in producing more accurate pictures of firms' economic positions. We can classify disclosure practices in two levels: (1) institutional and (2) voluntary or firm-specific. Institutional disclosure practices are required by laws, regulations, and widely used business practices. In this category, we can classify all practices that are common to all firms immersed in the same environment. Voluntary (or firm-specific) disclosure practices complement institutional disclosure and depend on firms' incentives to better inform external users. Institutional and voluntary disclosure practices can be complements or substitutes. Some firms may complement general regulations by providing information about idiosyncratic aspects of their business that are not required by the rules and norms. Alternatively, a general increase in the regulated disclosure level may substitute for disclosure practices that were previously voluntarily reported by some firms. Therefore, we expect voluntary disclosure practices to be marginally more important in countries where the general disclosure environment is weak. We also expect to find higher cross-sectional variation among firms in that environment. Some firms may have incentives to provide disclosure levels superior to the average, while others do not thus causing a larger variation in disclosure levels than those observed in countries where the general disclosure environment is superior.

When a firm's environment (e.g., regulation) demands superior disclosure levels, there will be a lower variation in disclosure policies adopted by firms. As the variation in cost of capital is influenced by other factors, a lower variance in disclosure policies adopted by firms is likely to result in a weak relation between disclosure and cost of capital. We expect to see a stronger relation between disclosure and cost of capital when the cross-sectional variation in disclosure is higher (*ceteris paribus*).

Another argument that could be used to motivate this study relates to the incentives of firms immersed in environments with weak governance and disclosure levels. Some firms may have the appropriate incentives to differentiate themselves from their country's norm and to present superior disclosure and governance levels (Lopes & Walker, 2008; Houthaulsen, 2003) in order to attract external sources of funds and finance growth options. We do not take this direction, however; instead we fo-

cus solely on the variation of disclosure levels within Brazil without exploring the reasons behind these variations. We believe this is a topic for future research.

Thus we raise the hypothesis that disclosure and cost of equity capital are negatively associated for our sample of Brazilian firms. We also expect to see a stronger negative relation for firms that receive less attention from analysts and possess a more dispersed ownership structure.

3. Research design

Research that relates disclosure and cost of capital has inherent methodological problems because neither disclosure nor cost of capital (*ks*, hereafter) can be directly observed. Our major econometric specification follows the functional model proposed by Botosan (1997) and also used by Hail (2002) and Francis et al. (2005):

$$ks = f(\text{disclosure metric; control variables})$$

Which is implemented using the following panel data model:

$$ks = \alpha + \beta_1 DISCL + \beta_2 ADR + \beta_3 DE + \beta_4 SIZE + \beta_5 BETA + \beta_6 MB + \beta_7 ROA + \beta_8 GROWTH + \beta_9 EXTFINANC + \beta_{10} DYEAR + \beta_{11} DINSTRUSTY + \varepsilon \quad (1)$$

where *ks* is the cost of equity capital calculated according to the Ohlson & Juetnner-Nauroth (2005) model for firm *i* in year *t*; *DISCL* is the score on the Brazilian Corporate Disclosure Index for firm *i* in year *t*; *ADR* is a dummy variable that assumes the value of 1 if the firm *i* is cross-listed in year *t*, and 0 otherwise; *DE* is the debt-to-equity ratio for firm *i* in year *t*; *SIZE* is the natural logarithm of total assets for firm *i* in year *t*; *BETA* is the market beta for firm *i* in year *t*; *MB* is the market-to-book ratio for firm *i* in year *t*; *ROA* is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH* is the change in revenues from year *t* to year *t* − 1; *EXTFINANCE* is the ratio of foreign debt outstanding divided by total long-term liabilities – this measure relates to amortized cost; *DINSTRUSTY* is a dummy variable relating to industry classification; and *DYEAR* is a year-specific dummy variable included in all specifications.

The reasoning for this set of controls is the following. Initially, *ADR* controls for cross listing because firms that cross-list have to comply with more strict disclosure rules required by the U.S. Securities and Exchange Commission. In this work, we are investigating the marginal impact of voluntary disclosure actions taken by managers on cost of capital, we are not dealing with mandatory disclosures required by the Brazilian or foreign authorities; therefore, we use the following variables. *DE* measures the level of indebtedness of each firm because it's likely to be related to cost of equity – that is, more leveraged firms are likely to exhibit higher cost of capital; *SIZE* controls for firms' size because we expect larger firms to be less risky than small ones; *BETA* controls for the market component of firms' cost of capital. In this paper, we are also investigating the impact of disclosure on the idiosyncratic component of cost of equity capital, which explains the following variables. *MB* is a proxy for firms' specific risk and is also likely to be related to cost of equity capital; *ROA* relates to overall profitability because most profitable firms are more likely to disclose this information to external users; *GROWTH* controls for growth opportunities because firms with superior growth options are more likely to provide information in order to access external sources of funds to finance investments; *EXTFINANCE* is intended to control for the access firms have to external sources of funds; *DINSTRUSTY* is used because industry classification may impact disclosure policies; *DYEAR* controls for year-specific events. We belie-

ve that with this set of controls we address the concerns expressed by Ruland, Shohn, & Zhou (2007) for same-country studies.

The main methodological problem in our work is measuring cost of equity capital (*ks*) and disclosure (*DISC*). To measure *ks* we adopt the same methodology proposed by Hail & Leuz (2005) based on Ohlson & Juetnner-Nauroth (2005) and used by Easton (2004) and Francis et al. (2005) which define *ks* as:

$$ks = \frac{eps_t + 1 \cdot growth_{t+2}}{P_1} \quad (2)$$

where *ks* is cost of equity capital; eps_{t+1} is earnings per share forecasted for the year $t + 1$; P_t is stock price at t; and $growth_{t+2}$ is the growth rate for earnings per share between periods $t + 1$ and $t + 2$ and is calculated as:

$$growth_{t+2} = \frac{eps_{t+2} - eps_{t+1}}{eps_{t+1}} \quad (3)$$

This model is derived from the price-earnings growth ratio (PEG) and express cost of capital as a function of a firm's earnings and growth in earnings. We use this model because of its practicability and adherence to other proxies of cost of capital (Hail & Leuz, 2005). Data for forecasted earnings per share were obtained from the Data stream database and stock prices were obtained from the Economatica database. When choosing the appropriate proxy for calculation of cost of equity capital, the OJ (Ohlson & Juetnner-Nauroth, 2005) model was used because it is mainly based on accounting variables, and, consequently, it significantly increased our sample. Other models, such as the Capital Asset Pricing Model (CAPM), depend strongly on a long series of market data that was not available for all firms in our sample, as some were not liquid for the whole period of our sample.

Our choice of using implied cost of capital from accounting data instead of a more direct measure like the CAPM is inspired by the previous research of Lee, Walker, and Christensen (2008). Despite being commonly used by practitioners, the CAPM does not explain returns well. The search for alternative factor-based models to replace CAPM has not been very successful. There seem to be unsolvable problems in estimating cost of equity capital from historical realized returns using factor models, including model specification, error in factor loading estimation, and imprecise estimates of factor risk premiums (Fama & French, 1997). The need for a long series of historical information to increase statistical power also reduces the ability of the estimates to reflect recent changes in a firm's risk profile, which is especially concerning in a study for a country like Brazil because it has a shorter series of historical information and a high volatility in returns and market activity.

We believe the problems related to a historical CAPM estimation during the important market and economy-wide changes in Brazil are serious and can lead to significant inference problems. The estimation through accounting-based valuation models using sell side consensus earnings analysts' forecasts and equity prices essentially extracts the expected returns the market implicitly applies to discount the future cash flows of the firm, which is forward-looking and directly reflects the market perception of a company's risk. This advantage is especially important in our research design, which is intended to capture the impact of firm-level governance on valuation. Our work is essentially concerned with firm level behavior that can be easily underestimated using traditional CAPM-type estimations. It makes more sense for our research design to use a more direct and forward-looking metric that reflects current market conditions.

CAPM (and all factor models) relies on the assumption that a given (or a set of) parameter is enough to capture the systematic risk component of every security (all

idiosyncratic risk has been diversified). In this sense, all tests of the CAPM are a joint hypothesis test because the validity of the model is tested together with the efficient market hypothesis (EMH). We believe the problems that can reduce the efficiency of the market, at least in the short run, are more pronounced in a country like Brazil. Developing markets are more likely to have a poor information infrastructure that does not provide adequate flow of information through prices. The level of market efficiency in emerging markets is still a case for debate, but this factor can clearly influence the results. One could argue that accounting-based estimators suffer from the same problem, but we believe they provide more direct measures and rely on a shorter time series of returns. As they are forward-looking, we believe analysts' forecasts convey more precise information than historical realized returns. However, this point will certainly be addressed in future research. Botosan & Plumlee (2002) also show that implied cost of capital estimates from accounting data provide more reliable and stable measures of the cost of equity capital than traditional factor-based models.

Estimating the relation between cost of capital and disclosure is problematic from a methodological perspective. Initially, there is no accepted model relating analytical firm-level disclosure and cost of capital (equity or debt). Because of this, specifications like the one presented above can suffer from an omitted variables problem. Other factors not used in the control vector can also impact cost of capital and still be missing in the specification used. In our research, we use all control variables, which makes sense in the Brazilian environment and which have been used previously in the literature to mitigate this problem. However, a specification like this will benefit from advances in the theoretical literature on cost of capital. Measurement errors could also arise and have cross-section and time series implications for the explanatory variables. To address this problem, we use cluster-robust estimators in all specifications. Furthermore, additional analysis is presented in Section 5 to address these concerns in more detail.

There are several disclosure indices used on current accounting research, such as the *CIFAR-Center for International Financial Analysis and Research*, the *AIMR-Association for Investment and Management Report, and the Standard & Poor's* transparency index. We built the BCDI because the current indices provide very poor coverage of Brazil and because different regulations also change the required disclosures that firms must provide. We are interested in voluntary disclosures, and, consequently, we customized the questions applied to Brazilian firms (e.g., Question 47 of BCDI asks if statements of cash flows are provided because in Brazil this statement is not mandatory). To proxy for firm-level voluntary disclosure, we built the BCDI, which measures disclosure across six dimensions: (1) general information about the firm, its market, and major events over the last year; (2) relations to employees and managers regarding compensation and policies; (3) non-financial information about markets, sales, and products; (4) information about forecasts of sales, cash flows, and earnings; (5) discussion and analysis of financial data, including time series information about performance and explanations of past behavior; and (6) other information. The score is measured over 47 questions, with 1 indicating an answer considered to be good disclosure, and 0 otherwise. The BCDI was developed based on the indexes used by Botosan (1997); Hail (2002), and Francis et al. (2005), along with some adaptation to the Brazilian environment. The index computation did not depend on interviews or questionnaires and is based on public sources of information, including firm's websites, Bovespa files, and annual reports. Table 1 presents the questions and percentage of good (1) answers. Each

firm's score is based on a simple mean of the answers obtained on the 47 questions. We found no theoretical support to adopt different weights.

4. Data and results

The BCDI was applied to the 50 shares with higher liquidity (trading volume) on Bovespa in December 2005. Our sample excludes financial institutions and preset a wide coverage of sectors listed in Bovespa: telecommunications, oil and gas, mining, paper, retail, services, electronics, food and beverage, construction, chemicals, steel and transportation. We work only with the most liquid shares because our cost of capital metric depends on stock prices and, consequently, can be biased by illiquid shares. The 50 shares selected are basically the same ones that compose the São Paulo Stock Exchange Index (Ibovespa) and represent the most relevant shares traded in Brazil. Data for forecasted eps were obtained from the Datastream database, and stock prices were obtained from the Economatica database. We computed BCDI for the same set of shares for the years of 1998, 2000, 2002, 2004, and 2005, resulting in a panel data with 276 firm-year observations. The questions and percentage of good answers are presented in Table 1. The dates reflect data availability for the BCDI metric. We believe, however, that the two-year interval between measures is not a cause of concern because changes in disclosure policies are not likely to be reversed in short-term periods.

Low liquidity is a major problem in specifications that depend on market values. Market values in such illiquid markets can cause errors in variables. Where market values are used as a dependent variable, this is less likely to cause bias but it will reduce the R^2. In two subsamples where there are greater liquidity problems in one subsample than the other, it is necessary to note that R^2 for the low liquidity group may be lower for this reason. Liquidity problems could cause a measurement error in the dependent variable that is statistically independent of each explanatory variable. If this is true, the estimators are consistent and unbiased as well. In this sense, the measurement error in the dependent variable results in a larger variance than when the dependent variable is not measured with error (Wooldridge, 2002). A more serious problem a rises when the measurement error in the dependent variable is systematically related to one or more of the independent variables. We believe this is not a problem on the specifications used so far in this thesis. However, we address this question in more detail in the Section 5.

Another problem with studies using this specification is the cross-sectional and time series dependence of the variables used (Gow, Ormazabal, & Taylor, 2009). This problem can also cause misspecified test statistics with significant consequences for reported inferences. To address this problem, when appropriate, all the results are cluster-robust standard errors. Liquidity problems are likely to be both cross sectionally and time series correlated. Firms with low liquidity today are likely to have low liquidity in the future and are also likely to be clustered in given sectors or at least be related to some firm characteristics. These effects are not easy to account for and present a significant challenge for future research in both accounting and econometrics. We tried to minimize this problem by excluding firms without price quotes in any given day and by examining abnormal patterns of data with low or no variability. Given the nature of this problem and the current state of the literature, we believe our results are robust to liquidity problems. However, this is a significant point of concern and is likely to benefit from future developments in the literature.

Table 2 provides the descriptive statistics for the variables. As expected, BCDI presented a significantly lower mean and higher variation than comparable disclosu-

re measures applied to the United States (Botosan, 1997; Francis et al., 2005). This result corroborates our hypothesis that lower levels of required disclosure will result in higher variance in the disclosure levels adopted by firms. Interestingly, the statistics for the cost of capital estimated for our Brazilian sample are similar to the results of Botosan (1997) for the United States. For the regression analysis that is performed on sequence, these results are important. They show that the most significant difference between our sample and the U.S. sample used by Botosan (1997) is not on the dependent variable (cost of equity capital) but rather on the major independent variable (disclosure score), as we expected. These results eliminate the possibility that a higher association between disclosure and cost of capital in Brazil as compared to the United States is caused by a more disperse cost of capital estimates.

We control on a firm-by-firm basis for situations in which a given question may not be applicable. For example, question 28 may not be applicable if a firm has no actual plans to invest in research and development. However, this was not the case for any firm in our sample (we checked whether the firm has frequently reported investments in research and development).

Correlations presented in Table 3 confirm our expectations, except for the beta that we expected to have a positive and significant relation to *ks*. This result is not a surprise and confirms our expectations that betas are not good proxies for risk (Lee et al., 2008), especially in emerging markets, and corroborates our use of the implied cost of capital metric. Several reasons may explain why betas are not well behaved in our sample (e.g., poor model specification). However, this particular question is outside of the scope of our research.

Table 3 – Correlation among the variables

Variables	*Ks*	*BCDI*	*SIZE*	*MB*	*BETA*	*DE*	*ROA*	*GROWTH*	*EXTFINANCE*
ks	1								
BCDI	−0.29*	1							
SIZE	−0.16*	0.12**	1						
MB	−0.28*	0.23*	−0.03	1					
BETA	0.05	−0.09***	0.11*	−0.01	1				
DE	0.13**	0.03	0.16*	0.20*	0.02	1			
ROA	0.03*	0.01*	0.09	0.90	0.02	0.07	1		
GROWTH	0.15*	0.08*	0.10	0.87	0.98	0.01**	0.01*	1	
EXTFINANCE	0.05**	0.01*	0.08*	0.45	0.17	0.09*	0.19*	0.8**	1
Number of observations 276 firm-year observations for 1998, 2000, 2002, 2004, and 2005									

This table presents Pearson correlations among the variables used in this study.
*, **, *** mean that the correlations are statistically significant at the 1%, 5%, and 10% levels, respectively.

Table 4 – Time series evolution of *BCDI* and *ks*

Variables	1998	2000	2002	2004	2005
BCDI	0.24	0.32	0.42	0.46	0.54
GI	0.58	0.64	0.74	0.78	0.86
REM	0.34	0.46	0.64	0.74	0.72
NFI	0.33	0.40	0.46	0.51	0.69
F	0.00	0.01	0.02	0.02	0.10
DAF	0.09	0.19	0.31	0.35	0.50
OI	0.13	0.28	0.44	0.46	0.54
ks	0.31	0.22	0.34	0.21	0.18
Number of observations 276 firm-year observations for 1998, 2000, 2002, 2004, and 2005					

This table presents the sample mean for the Brazilian Corporate Disclosure Index (*BCDI*) and cost of equity capital (*ks*) over the years 1998, 2000, 2002, 2004, and 2005. *BCDI* stands for the score on the Brazilian Corporate Disclosure Index; *GI* stands for the score on the General Information component of *BCDI*; *REM* stands for the Relationship with Employees and Managers component of *BCDI*; *NFI* stands for the Non-Financial Information component of *BCDI*; *F* stands for the Forecasting component of *BCDI*; *DAF* stands for the Discussion and Analysis of Financial Data component of the *BCDI*; *OI* stands for the Other Information component of *BCDI*. *ks* refers to cost of equity capital calculated according to the Easton PEG ratio (Easton, 2004; Hail & Leuz, 2005).

Table 4 shows the evolution of BCDI and indicates that disclosure levels in Brazil are improving over time. It's interesting to note the time series evolution of BCDI scores. These results are consistent with Chong & Lopez-de-Silanes (2007) and Lopes & Walker (2008), which discuss the evolution of corporate governance in Latin America over the past decade. According to these authors, firms in Latin America are immersed in a poor institutional environment and yet face important growth opportunities produced by the recent period of macroeconomic and political stabilization. Some firms in the region decide to voluntarily adopt better corporate governance practices in order to differentiate themselves and access foreign sources of capital. This movement causes governance and disclosure practices to improve on average in the region but with significant dispersion. We do not have a plausible explanation for the abnormally low scores received in the forecasting component of the BCDI. This evolution of the BCDI is not due to new regulations. All initiatives to improve corporate governance in Brazil attempted in the last few years are voluntary in nature (e.g., the Bovespa New Market is intended to have only the best corporate governance firms listed; the listing choice, however, is voluntary). At the end of 2007, the Company Law was amended to oblige convergence to International Financial Reporting Standards (IFRS), which will potentially increase disclosure levels. This period, however, is not covered in our sample.

The low scores on the forecasting component of BCGI is an intriguing point. One possible explanation for this result may be related to the research on cultural dimensions presented by Hofstede (1980), Hofstede & Bond (1998), and Ding & Jean-Jean (2005). This line of research argues that cultural dimensions may explain the international variability in the features of accounting systems. Brazil is ranked very low in two of the cultural dimensions investigated in this research: (1) uncertainty avoidance and (2) long term orientation.

The low scores in these two dimensions may explain why companies are not interested in providing forecasting information – a feature clearly related to long-term orientation. This is not a surprise given the Brazilian history of macroeconomic instability, high inflation levels, and weak enforcement of the rule of law (Durnev & Kim, 2005). It will be very interesting to see if this behavior changes as a result of greater market stability and the development of capital markets.

We investigate the relation between *ks* and the BCDI, and the results are presented in Table 5, which shows robust coefficients estimated using a panel data method for our sample. Following recent research concerned with the effect of omitted variables and endogeneity on studies like ours (Larcker & Rusticus, 2005; Nikolaev & van Lent, 2005), we performed a panel data fixed-effects regression and included a set of control variables. Non-reported results show no significant difference between panel data and pooled, cross-section robust ordinary least squares estimators. We also include year dummy variables in all specifications investigated. Results confirm our main hypothesis and show that an increase of 1 point in BCDI results in a decrease of 14 basis points in *ks*. Additionally, we investigate the relation between the six components of BCDI and the cost of equity capital. Results in Table 6 show that of the six dimensions of BCDI there are three (General Information, Relationship with Managers and Employees, and other Information) that are negatively related to cost of equity capital as expected; two dimensions are not statistically related (Forecasting and Discussion and Analysis of Financial Data); and, interestingly, the Non-Financial Information about Market Sales and Products dimension is positively related to cost of equity capital. One possible interpretation of this

Table 5 – Panel data regression of *ks* on *BCDI* and controls

Dependent variable: *ks*			
Estimation method: panel data regression			
Independent variables	Expectation	Coefficient	p-value
BCDI	–	−0.12	0.00
ADR	–	−0.01	0.17
SIZE	–	−0.00	0.00
MB	–	−0.02	0.00
BETA	+	0.04	0.02
DE	+	0.03	0.00
ROA	–	0.01	0.12
GROWTH	–	−0.12	0.00
EXTFINANCE	–	−0.09	0.02
R^2	0.47		
Number of observations 276 firm-year observations for 1998, 2000, 2002, 2004, and 2005			

This table presents the results of a panel data model relating *ks* (dependent) on *BCDI* (independent variable) and a set of controls, where: here *ks* refers to cost of equity capital calculated according to the Easton PEG ratio (Easton, 2004; Hail & Leuz, 2005); *BCDI* refers to the score on the Brazilian Corporate Disclosure Index; *ADR* is a dummy variable that equals 1 if the firm is cross-listed in the United States, and 0 otherwise; *SIZE* is the natural logarithm of total assets; *MB* measures the market-to-

book ratio; *BETA* is the stock market beta; *DE* is the debt-to-equity ratio; *ROA* is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH* is the change in revenues from year *t* to year *t* − 1; *EXTFINANCE* is the ratio of foreign debt outstanding divided by total long-term liabilities – this measure relates to amortized cost. We also include but did not report the results of year and industry dummy variables.

result is that this dimension measures sensitive proprietary information, which can have adverse effects on firm value. Verrechia (2001) and Healy & Palepu (2001) discuss this aspect in detail.

Other explanations are also plausible to clarify this behavior. Non-financial information is more frequently disclosed than financial information. This may induce more actions from speculators who are more interested in short-term price movements. The actions of speculators trading on non-financial information can increase stock price volatility and, consequently, increase risk as measured in our study. This effect may result in a positive relation between non-financial information and cost of capital without a proper economic meaning. We, however, do not have reliable data to uncover this possibility in more detail.

To investigate the role played by analyst coverage in the relation between disclosure and cost of capital, we split our sample between firms with high (above-average) analyst coverage and low (below-average) coverage and show that these results are mainly driven by firms with low coverage. Results presented in Table 7 show that for firms with low analyst coverage an increase of 1 point in the BCDI results in a decrease of 26 basis points in cost of capital. For firms with high analyst coverage, this impact is much lower (9 basis points) and is of weak statistical significance. This result partially differs from Botosan (1997) because she found no association between disclosure and cost of equity capital for firms with large coverage. This result may be related to the main point of this research that disclosure practices among Brazilian firms are more disperse than the practices adopted by American firms. This result seems to hold also for highly covered firms. We tried alternative partitions of the sample (alternative definitions of high and low coverage), but our results are not sensitive to these partitions, which exclude the possible interpretation that differences between our results in the findings of Botosan (1997) are due to the method employed. Although it can be argued that this result may be caused by construct validity problems, which can be potentially higher when firms are more closely followed by analysts, we do not believe this to be the case because the BCDI results are not dependent on analysts' behavior. Unreported results show no connection between the BCDI and analysts' coverage. This is, however, a point for future research.

Table 6 – Panel Data Regression of *ks* on *BCDI* Components and controls

Dependent variable: *ks*			
Estimation method: panel data regression			
Independent variables	Expectation	Coefficient	p-value
GI	–	−0.12	0.00
REM	–	−0.07	0.03
NFI	–	0.10	0.02
F	–	0.26	0.12

Dependent variable: *ks*			
Estimation method: panel data regression			
Independent variables	Expectation	Coefficient	p-value
DAF	−	0.00	0.99
OI	−	−0.06	0.09
ADR	−	−0.01	0.23
SIZE	−	−0.03	0.09
MB	−	−0.01	0.00
BETA	+	0.08	0.00
DE	+	0.03	0.01
ROA	−	0.02	0.17
GROWTH	−	−0.13	0.00
EXTFINANCE	−	−0.07	0.01
R^2	0.47		
Number of observations 276 firm-year observations for 1998, 2000, 2002, 2004, and 2005			

This table presents the results of a panel data model relating *ks* (dependent) on *BCDI* (independent variable) and a set of controls, where: here *ks* refers to cost of equity capital calculated according to the Easton PEG ratio (Easton, 2004; Hail & Leuz, 2005); *GI* stands for the score on the General Information component of *BCDI*; *REM* stands for the Relationship with Employees and Managers component of *BCDI*; *NFI* stands for the Non-Financial Information component of *BCDI*; *F* stands for the Forecasting component of *BCDI*; *DAF* stands for the Discussion and Analysis of Financial Data component of the *BCDI*; *OI* stands for the Other Information component of *BCDI*; *ADR* is a dummy variable that equals 1 if the firm is cross-listed in the United States, and 0 otherwise; *SIZE* is the natural logarithm of total assets; *MB* measures the market-to-book ratio; *BETA* is the stock market beta; *DE* is the debt-to-equity ratio; *ROA* is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH* is the change in revenues from year t to year $t - 1$; *EXTFINANCE* is the ratio of foreign debt outstanding divided by total long-term liabilities – this measure relates to amortized cost. We also include but did not report the results of year and industry dummy variables.

Additionally, we investigate the impact of ownership concentration on the relation between disclosure and cost of equity capital. Brazil is a code law country with weak investor protection and law enforcement (Durnev & Kim, 2005; Chong & Lopez-de-Silanes, 2007; Lopes & Walker, 2008) and with high ownership concentration, as expected. Previous research has shown that ownership concentration is a natural response to poor protection environments (La Porta, Lopes-de-Silanez, & Shleifer, 2000; La Porta, Lopez-de-Silanes, Shleifer & Vishny, 2002). Thus, we believe that ownership concentration is one of the most distinguishing aspects of the Brazilian environment when compared to the United States and has an important effect on the relation between disclosure and cost of capital. High ownership concentration reduces the demand for public reports because the controlling shareholders have insider access to information about the firm. It also means that firms will rely on insider deals to obtain

financing, usually with banks, reducing the importance of financial statements in general and particularly disclosure. Thus, we expect the relation between disclosure and cost of capital to be less pronounced for firms with high ownership concentrations.

Table 7 – Panel data regression of *ks* on *BCDI* and controls split by analyst coverage

Dependent variable: *ks*				
Estimation method: panel data regression				
	High coverage		Low coverage	
Independent variables	Coefficient	p-value	Coefficient	p-value
BCDI	−0.09	0.04	−0.26	0.00
ADR	−0.03	0.00	−0.05	0.03
SIZE	−0.03	0.00	−0.02	0.40
MB	−0.02	0.00	−0.02	0.00
BETA	0.05	0.01	0.12	0.00
DE	0.02	0.00	0.05	0.00
ROA	0.00	0.30	0.01	0.17
GROWTH	0.12	0.00	−0.17	0.00
EXTFINANCE	−0.08	0.00	−0.12	0.00
R^2	0.37		0.59	
Number of observations	138 firm-years		138 firm-years	

This table presents the results of a panel data model relating *ks* (dependent) on *BCDI* (independent variable) and a set of controls for firms with high and low analyst coverage. High Coverage means that firms are on the top 50% of analyst coverage according to Datastream, and Low Coverage means that firms are on the bottom 50% of analyst coverage according to Datastream. *ks* refers to cost of equity capital calculated according to the Easton PEG ratio (Easton, 2004; Hail & Leuz, 2005); *BCDI* refers to the score on the Brazilian Corporate Disclosure Index; *SIZE* is the natural logarithm of total assets; *MB* measures the market-to-book ratio; *BETA* is the stock market beta; *DE* is the debt-to-equity ratio; *ADR* is a dummy variable which equals 1 if the firm is cross-listed, and 0 otherwise; *ROA* is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH* is the change in revenues from year t to year $t - 1$; *EXTFINANCE* is the ratio of foreign debt outstanding divided by total long-term liabilities – this measure relates to amortized cost. We also include but did not report the results of year and industry dummy variables.

To investigate this aspect in detail, we split our sample between firms where the controlling shareholder has more than 50% of the voting shares and firms where they do not. This cut-off value may seem too high but is reflective of the high ownership concentration level in Brazil. Our main hypothesis is that disclosure will have a superior impact for firms with more dispersed ownership structures. Firms with highly concentrated structures will probably base their financing on insider deals and private relationships. In this situation, creditors will not value superior disclosure levels because they can assure access to private sources of information. We expect more dispersed firms to rely more on public credit and equity markets to fund their activi-

ties, which will increase the usefulness of disclosure to reduce information asymmetry. Results presented in Table 8 confirm our hypothesis and show that the relation between disclosure and cost of capital is more pronounced for firms with more dispersed ownership structures. For these firms, an increase of 1 point in the BCDI results in a decrease of 27 basis points in cost of capital. For firms with more ownership concentration, this relation is not statistically significant.

Table 8 – Panel data regression of *ks* on *BCDI* and controls split by ownership concentration

Dependent variable: *ks*				
Estimation method: panel data regression				
	Low concentration		High concentration	
Independent variables	Coefficient	p-value	Coefficient	p-value
BCDI	−0.27	0.01	−0.05	0.18
ADR	−0.18	0.20	−0.05	0.01
SIZE	−0.03	0.01	−0.03	0.03
MB	−0.02	0.00	−0.02	0.00
BETA	0.07	0.03	0.06	0.02
DE	0.04	0.01	0.02	0.03
ROA	−0.01	0.00	−0.02	000.0
GROWTH	−0.11	0.00	−.005	0.03
EXTFINANCE	−0.03	0.00	−0.05	0.00
R^2	0.44		0.37	
Number of observations	138 firm-years		138 firm-years	

This table presents the results of a panel data model relating *ks* (dependent) on *BCDI* (independent variable) and a set of controls for firms with high and low ownership concentration. High Concentration means that the biggest shareholder has more than 50% of the voting shares; Low Concentration means that the biggest shareholder has less than 50% of the voting shares. *ks* refers to cost of equity capital calculated according to the Easton PEG ratio (Easton, 2004; Hail & Leuz, 2005); *BCDI* refers to the score on the Brazilian Corporate Disclosure Index; *SIZE* is the natural logarithm of total assets; *MB* measures the market-to-book ratio; *BETA* is the stock market beta; *DE* is the debt-to-equity ratio; *ROA* is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH* is the change in revenues from year *t* to year *t* − 1; *EXTFINANCE* is the ratio of foreign debt outstanding divided by total long-term liabilities – this measure relates to amortized cost. We also include but did not report the results of year and industry dummy variables.

One possible alternative explanation for this result is that for firms with high ownership concentration the disclosures are not as relevant (few owners) as for firms with lower concentration. Consequently, the disclosure level is homogeneously low. This is not the case because the dispersion of the BCDI is similar for firms with high and low ownership concentration. This result is not a product of low variability in disclosure levels for firms with more concentration.

Additionally, we also investigate the likely determinants of BCDI scores. In Ta-

ble 9, we present the results of a multivariate specification designed to investigate the impact of the usual variables used to proxy for high disclosure quality and two additional variables. We include the score on the Board Composition and Functioning component of the Brazilian Corporate Governance Index (BCGI) used by Lopes & Walker (2008). This score measures board independence; it is likely to be correlated to superior disclosure levels. More independent boards are more likely to demand more informative financial reports and to constrain actions taken by managers to hide relevant information from minority shareholders.

We also investigate the role played by growth opportunities. We expect firms with superior growth opportunities to disclose more information in order to facilitate monitoring by external investors. Results in Table 9 confirm our expectations and show that firms with stronger growth opportunities and more rigorous boards are more likely to adopt more transparent disclosure policies.

Table 9 – Panel data regression of *BCDI* on its determinants

Dependent variable: *BCDI*			
Estimation method: panel data regression			
Independent variables	Expectation	Coefficient	p-value
ADR	+	0.06	0.00
SIZE	+	−0.00	0.43
MB	+	0.01	0.40
BETA	+	−0.05	0.03
DE	+	0.01	0.17
GROWTH	+	0.01	0.06
BOARD	+	0.10	0.00
ROA	+	0.03	0.32
GROWTH	+	0.07	0.00
EXTFINANCE	+	0.02	0.00
R^2	0.17		
Number of observations	259		

This table presents the results of a panel data model relating *BCDI* (dependent) on its determinants. *BCDI* refers to the score on the Brazilian Corporate Disclosure Index; *SIZE* is the natural logarithm of total assets; *MB* measures the market-to-book ratio; *BETA* is the stock market beta; *DE* is the debt-to-equity ratio; *ADR* is a dummy variable which equals 1 if the firm is cross-listed, and 0 otherwise; *GROWTH* is a proxy for growth opportunities and it's measured as defined in Equation 4; BOARD is the score on Board Composition and Functioning component of the Brazilian Corporate Governance Index (BCGI); *ROA* is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH* is the change in revenues from year t to year $t-1$; *EXTFINANCE* is the ratio of foreign debt outstanding divided by total long-term liabilities – this measure relates to amortized cost. We also include but did not report the results of year and industry dummy variables.

5. Additional analysis

A major cause of concern in a study like ours is endogeneity, which refers to any situation where an explanatory variable is correlated to the disturbance (error) term. Endogeneity can cause misspecification and may arise in three major forms: (i) omitted variables problem, (2) measurement error, and (3) simultaneity. Omitted variables arise when we do not include all relevant explanatory variables because of data unavailability, and this omitted variable is correlated with the explanatory variables. Measurement error is a different problem and occurs when we do not measure the construct we originally wanted to measure but rather a proxy that does not represent the underlying variable well. Simultaneity occurs when both the dependent and the independent variable are determined together by another variable. In practice, it is not always easy to identify and separate these three problems. We are concerned with the three manifestations of endogeneity and took steps to mitigate this problem.

As a first step to solve this problem, we include a set of control variables that can potentially solve, at least partially, the possible endogeneity of the specifications. The *ROA* variable is likely to be an omitted variable because it can influence the relation between disclosure and cost of capital. More profitable firms are more likely to disclose information and are also more likely to have a lower cost of capital. The same happens for the *GROWTH* variable and for the *EXTFINANCE* variable. These variables are all likely to be associated with more disclosure and lower cost of equity capitals. We improve on these controls and present the following alternative specifications designed to improve the robustness of our analysis.

Next, we address the problem of measurement error and try an alternative specification designed to investigate the relation between disclosure and cost of debt capital. Despite being a different specification, the relation between disclosure and cost of equity capital is supposed to hold also for the cost of debt. In order to investigate this relation, we employ the following model:

$$kd_{it} = \alpha + \beta_1 BCDI_{it} + \beta_2 GIP_t + \beta_3 PTAX_t + \beta_4 SELIC_t + \beta_5 W_{it} + \varepsilon_{it} \quad (4)$$

where kd_{it} is the cost of debt for firm i in period t obtained from the Economatica database; $BCDI_{it}$ is the score on the Brazilian Corporate Disclosure Index for firm i in period t; GIP_t is the gross domestic product in period t; $PTAX_t$ is the average currency rate of the Brazilian currency (Real) against the U.S. dollar in year t; $SELIC_t$ is the average Brazilian nominal interest rate in year t; log (assets) it is the logarithm of total assets for firm i in period t. In addition, W_{it} is a set of control variables that includes: ADR_{it}, which is a dummy variable that equals 1 if the firm i has level i and IIADRs listed on the NYSE in period t, and zero otherwise; log (assets) it, which is the logarithm of total assets for firm i in period t; AGE, which is the log of firm age; Ibovespa which is a dummy variable that equals 1 if the firm i is included in the São Paulo Stock Exchange Index (Ibovespa); *ROA*, which is return over operational assets calculated as the ratio between annual operating profits and non-current assets; *GROWTH*, which is the change in revenues from year t to year $t - 1$; *EXTFINANCE*, which is the ratio of foreign debt outstanding divided by total long-term liabilities (this measure relates to amortized cost); *DINSTRUSTY*, which is dummy variable relating to industry classification; and *DYEAR*, which is a year dummy variables included in all specifications.

The results for this specification show that BCDI is negatively related to cost of debt with a coefficient of 0.37 (0.00, p-value). This result demonstrates, as expected, a strong negative association between cost of debt and disclosure. This association is

even greater than the one found for cost of equity. Despite not being the focus of our research, the relation between disclosure and cost of debt adds robustness to our investigation and corroborates the BCD metric that performs as expected in this relation.

One of the possible alternatives to solve the endogeneity problem is to find a proxy variable that could represent the omitted variable and also be associated both with the dependent (cost of equity capital) and the independent variable (BCDI). The search for a proxy variable is complicated and depends heavily on the research design employed. We propose to use the BCGI used by Lopes & Walker (2008) as a proxy variable in our study. BCGI is an index that measures firm-level corporate governance arrangements across four components: (1) disclosure, (2) ownership concentration, (3) board composition and functioning, and (4) shareholders' rights. The BCGI is likely to be related to both cost of equity capital as Lopes (2009) showed and also to the BCDI once one of the components of BCGI is disclosure. We collect the BCGI data for our sample of firms and run the model 1, adding BCGI as an explanatory variable. The BCDI coefficient is reduced from (the original model) −0.12 (0.00 p-value) to −0.10 (0.00 p-value) but remains both statistically and economically significant. This result confirms the proper use of BCGI as a proxy variable but does not change significantly the importance of our results.

Another possible and more robust estimation technique to address the relation between disclosure and cost of equity capital is change analysis, which investigates the association between changes in the explanatory and the dependent variables. It is presumably more robust than level analysis as the one used in this study. We did not use change analysis on the main specification in order to maintain a certain degree of consistency with prior studies and also because our research question was related to the association between levels and not changes. However, to increase the robustness of our study we performed a modification of the model 1 and used changes in the BCDI and *ks* as opposed to the levels of these variables. The coefficient on the BCDI variable decreases significantly (0.45) but still remains significant (0.00 p-value), which confirms the robustness of our specification. In the same fashion, Fama-Macbeth cross-sectional specifications also present similar results and do not change the major interpretations of our study.

6. Conclusion

We investigate the relation between disclosure and cost of capital for Brazilian listed firms. We select the most liquid shares on the São Paulo Stock Exchange (Bovespa) in 1998, 2000, 2002, 2004, and 2005. To proxy for disclosure level, we built the BCDI, which measures disclosure over six dimensions. To proxy for cost of capital, we use the model proposed by Hail & Leuz (2005) based on Ohlson & Juetner-Nauroth (2005) and Easton (2004). Using a panel data approach, we show that there is a significant negative association between disclosure and cost of equity capital for the firms in our sample. Additionally, we show that this relation is more pronounced for firms that receive less attention from analysts and have dispersed ownership structures. For these firms, an increase of 1 point in the BCDI results in a decrease of 26 (for firms with less coverage) and 27 (for firms with dispersed ownership) basis points in cost of capital. We also investigate the impact of BCDI scores on the relation between disclosure and cost of capital.

While the results are different from those obtained elsewhere, this work has implication for a number of groups. To financial executives, it shows that increased levels of disclosure result in inferior cost of capital, especially for firms that receive

less attention from analysts. For regulators, our results demonstrate that firms with superior growth opportunities will adopt better disclosure practices voluntarily even if they are immersed in weak governance and accounting regimes. We also contribute to a recent strand of the international accounting literature that investigates the determinants of the properties of actual reports. This literature (Ball et al., 2000, 2003; Ball & Shivakumar, 2005) has shown that the properties of published accounting numbers depend more on the incentives managers face to provide informative numbers than on standards and regulations. Our results confirm the hypothesis that firm-level incentives also play a significant role on firms' financial reporting practices.

References

BALL, R., ROBIN, A., & WU, J. (2003). "Incentives versus standards: Properties of accounting income in four East Asian countries". *Journal of Accounting and Economics*, 32, 1-37.

BALL, R., KOTHARI, S. P., & ROBIN, A. (2000). "The effect of institutional factors on the properties of accounting earnings". *Journal of Accounting and Economics*, 29, 1-51.

BALL, R., & SHIVAKUMAR, L. (2005). "Earnings quality in UK private firms". *Journal of Accounting and Economics*, 33, 66-98.

BOTOSAN, C. A. (1997). "Disclosure level and the cost of equity capital". *The Accounting Review*, 72(3), 323-349.

BOTOSAN, C. A., & PLUMLEE, M. A. (2002). "A re-examination of disclosure level and the cost of equity capital". *Journal of Accounting Research*, 40, 21-40.

CHEN, Kevin C. W., CHEN, Shilong, & WEI, K. C. John. (2003). *Disclosure, corporate governance, and the cost of equity capital: Evidence from Asia's emerging markets*. Working paper, Singapore University.

CHONG, A., & LOPEZ-DE-SILANES, F. (2007). "Investor protection and corporate governance – Firm evidence across Latin America". Stanford University Press and International Development Bank.

DIAMOND, D. W., & VERRECHIA, R. E. (1991). "Disclosure, liquidity and the cost of capital". *Journal of Finance*, 56(4), 1.325-1.360.

DING, Y., & JEANJEAN, T. (2005). "Why do national GAAP differ from IAS? The role of culture". *The International Journal of Accountin*g, 40(4), 325-350.

DOIDGE, C., KAROLYI, G., & STULZ, R. (2007). "Why do countries matter so much for corporate governance?". *Journal of Financial Economics*, 86, 1–39.

DURNEV, A., & KIM, E. H. (2005). "To steal or not to steal: Firm attributes, legal environment, and valuation". *Journal of Finance*, 60, 1.461-1.493.

EASTON, P. (2004). "PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital". *The Accounting Review*, 79(1), 73–95.

FAMA, E., & FRENCH, K. (1997). "Industry costs of equity". *Journal of Financial Economics*, 43, 153-194.

FRANCIS, J. R., KHURANA, I. K., & PEREIRA, R. (2005). "Disclosure incentives and effects on cost of capital around the world". *The Accounting Review*, 80(4), 1.125-1.162.

GOW, I., ORMAZABAL, G., & TAYLOR, D. (2009). "Correcting for cross-sectional and time-series dependence in accounting research". Working paper, Stanford University.

HAIL, L. (2002). "The impact of voluntary corporate disclosures on the ex ante cost of capital for Swiss firms". *The European Accounting Review*, 11(04), 741–773.

HAIL, L., & LEUZ, C. (2005). *Cost of capital and cash flow effects of U.S. cross-listings*. Working paper, University of Pennsylvania.

HEALY, P. M., & PALEPU, K. G. (2001). "Information assymetry, corporate disclosure, and the capital markets: a review

of the empirical disclosure literature". *Journal of Accounting and Economics*, 31, 405-420.

HOFSTEDE, G. (1980). *Culture consequences*. Thousand Oaks, CA, Sage Publications.

HOFSTEDE, G., & BOND, M. H. (1998). "The Confucius connection: from cultural roots to economic growth". *Organizational Dynamics*, 16(1), 5-21.

HOUTHAULSEN, R. W. (2003). "Testing the relative power of accounting standards versus incentives and other institutional features to influence the outcome of financial reporting in an international setting". *Journal of Accounting and Economics*, 36, 271-283.

LA PORTA, R., LOPES-DE-SILANEZ, F., & SHLEIFER, A. (2000). "Agency problems around the world". *Journal of Finance*, 55, 221-258.

LA PORTA, R., LOPES-DE-SILANEZ, F., & SHLEIFER, A., & VISHNY, R. (2002). "Investor protection and corporate valuation". *Journal of Finance*, 57(3), 1.147-1.170.

LANG, M., RAEDY, J. S., & WILSON, W. M. (2006). "Earnings management and cross listing: Are reconciled earnings comparable to US earnings?". *Journal of Accounting and Economics*, 42, 263-284.

LARCKER, D. F., & RUSTICUS, T. (2005). *On the use of instrumental variables in accounting research*. Working paper, University of Pennsylvania.

LEE, E., WALKER, M., & CHRISTENSEN, H. B. (2008). "Mandating IFRS: its impact on the cost of equity capital in Europe". *ACCA Research Report* 105.

LOPES, A. B., & WALKER, M. (2008). *The relation between firm-level corporate governance arrangements, crosslisting and the informativeness of accounting reports: the Brazilian case*. Working paper, University of Manchester.

LOPES, A. B. (2009). *The relation between firm-specific corporate governance, cross-listing and the informativeness of accounting numbers in Brazil*. Doctoral dissertation, University of Manchester.

NIKOLAEV, V., & VAN LENT, V. (2005). *The endogeneity bias in the relation between cost-of-capital and corporate disclosure policy*. Working paper, Tilburg University.

OHLSON, J. A., & JUETNNER-NAUROTH, B. E. (2005). "Expected EPS and EPS growth as determinants of value". *Review of Accounting Studies*, 10, 349-365.

RULAND, W., SHOHN, J., & ZHOU, P. (2007). "Effective controls for research in international accounting". *Journal of Accounting and Public Policy*, 26, 96-116.

VERRECHIA, R. (2001). "Essays on disclosure". *Journal of Accounting and Economics*, 32, 97-180.

WOOLDRIDGE, J. M. (2002). *Econometric analysis of cross section and panel data*. Cambridge, Mass., The MIT Press.