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Article

The impact of intellectual capital disclosure on cost of equity capital: A case of French firms

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ABSTRACT

The purpose of this paper is to examine empirically the impact of intellectual capital disclosure (IC) on cost of Equity capital. The empirical research is based on companies listed in the French SBF 120 stock market index. The findings confirm our hypotheses that stipulate the existence of a significant and negative association between intellectual capital disclosure with its two components (human capital, structural) and the cost of equity. However, the negative impact of the relational capital disclosure is not validated. The results in this paper are of considerable importance to both policy makers and firms. In fact, the understanding of the impact of Intellectual capital disclosure on cost of equity capital helps policy makers in the evaluation of the costs and benefits of disclosure. Moreover, with regard to managers of firms, the results show the benefit of enhanced IC disclosure regarding the reduction in their cost of capital. This study is one of the very first to provide empirical evidence of the association between Cost of equity capital and the level of disclosure in the three individual intellectual capital categories (human; structural and relational capital).

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El impacto de la divulgación de capital intelectual sobre el coste del capital social: el caso de las empresas francesas

RESUMEN

El objetivo de este trabajo es examinar el impacto de la divulgación del capital intelectual (CI) sobre el coste del capital social. La investigación empírica se basa en las empresas que figuran en el índice bursátil francés SBF 120. Los hallazgos confirman nuestras hipótesis, según las cuales existe una asociación significativa y negativa de la divulgación del capital intelectual con sus dos componentes (capital humano y estructural) y el coste de los fondos propios. No obstante, no se ha confirmado el impacto negativo de la divulgación del capital relacional. Los resultados de este trabajo tienen una importancia considerable tanto para los legisladores como para las empresas. De hecho, la comprensión del impacto de la divulgación del capital intelectual sobre el coste del capital social ayuda a los legisladores a evaluar los costes y beneficios de la divulgación. Además, con respecto a los gerentes de las empresas, los resultados muestran los beneficios de la mayor divulgación de CI en cuanto a la reducción de su coste de capital. Este estudio es uno de los primeros en proporcionar pruebas empíricas de la asociación entre el coste del capital social y el nivel de divulgación en las tres categorías de capital intelectual individual (capital humano, estructural y relacional).

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1. Introduction

Investigating the economic consequences of information disclosure is a matter of considerable interest in the accounting and finance research.

The main motivation for such research is their implications for policy making, especially, to the standard-setting process (Christensen et al., 2007).

In fact, understanding the economic consequences of information disclosure can provide a basis for evaluating the costs and benefits of disclosure (Leuz & Verrecchia, 2000; Verrecchia, 2001), which are an important consideration in the standard-setting process (Botosan, 2006).

In the context of the consequences of disclosure, the question of whether firms benefit from increased disclosure via a lower cost of capital remains a controversial issue.

In fact, although, a large number of studies have attempted to find answer to this question, however, they have generated mixed results. Results ranged from highly negative impact to an insignificant impact till having a significantly positive one (see Botosan, 1997; 2006)

To reconcile these conflicting results, several researchers adopted different types of disclosure, For example, the aggregate disclosures (Botosan, 1997; Botosan & Plumlee, 2002; Espinosa and Trombetta, 2007; Francis et al., 2005; Hail, 2002), social disclosures (Richardson & Welker, 2001), quarterly and other public relations disclosures (Botosan & Plumlee, 2002), timely strategic disclosures (Gietzmann & Ireland, 2005) and Intellectual capital disclosure (Mangena et al. 2010; Orens et al., 2009).

Through a literature review, Botosan (2006), reviews the relevant academic research that can provide insights into the issue of relationship between disclosure and cost of capital. She shows that the findings are generally mixed, and even more importantly, suggests that the impact of disclosure on cost of capital varies depending of the type of information.

For example, whilst some studies reveal a negative relationship with aggregate disclosures (Botosan, 1997; Francis et al., 2005; Hail, 2002) and timely strategic disclosures (Gietzmann & Ireland, 2005), others present a positive relationship with social disclosures (Richardson & Welker, 2001) and timely (quarterly report) disclosures (Botosan & Plumlee, 2002). Yet others show no relationship between the cost of capital and investor relations activities (Botosan & Plumlee, 2002) and no evidence of a lower cost of capital for switching from local to IFRS/US GAAP (Daske, 2006).

Botosan (2006), calls for additional research to enhance our understanding of the impact of different types of disclosure on cost of equity capital.

In this study, we investigate the role of information in affecting a firm's cost of capital. Our particular focus is on the specific roles played by the Intellectual capital disclosure.

The choice of the intellectual capital disclosure is motivated by first the importance of information related to the most relevant component in the value-creating processes, second for the growing demand of this kind of information and finally for the role played of the intellectual capital disclosure to compensate for the value relevance loss of traditional financial reporting

Intellectual capital disclosure comprises three categories: human capital, structural capital and relational capital. Human capital captures the knowledge, professional skills, experience and innovativeness of employees within an organization. Structural capital consists of the structures and processes employees develop and deploy in order to be productive, effective and innovative, whilst relational capital captures the knowledge of market channels, customer and supplier relationships, and governmental or industry networks. The key questions addressed by this study are:

- Is there a negative association between the cost of equity capital and level of intellectual capital disclosure in annual reports?
- Is there a negative association between the cost of equity capital and the level of disclosure in the three individual intellectual capital categories (human, structural and relational capital)?

The remainder of the present paper is structured as follows. Section 2 reviews prior literature and includes our hypotheses. Section 3 discusses the research design and Section 4 presents the results of the empirical analyses. Section 5 summarizes the paper and provides some questions for further research.

2. Literature review and hypothesis development

The impact of disclosure on cost of equity capital has been investigated in recent years by several theoretical and empirical studies. From the theoretical point of view it has been argued that disclosure reduces information asymmetry, and consequently reduces firms' cost of equity capital. However, empirical results are mixed and depend crucially on the measures of disclosure and cost of equity capital (Espinosa & Trombetta, 2007).

From a theoretical perspective, the association between disclosure and a firm's cost of capital is supported by two related streams of theoretical literature (see Botosan, 1997).

The main postulate of these streams of the literature is that firms which provide more information about their activities reduce information asymmetry in the capital markets.

The first stream suggests that better disclosure increases stock market liquidity, thereby reducing the cost of equity capital either through reduced transaction costs or increased demand for a firm's securities. This line is represented by Amihud and Mendelson (1986) and Diamond and Verrecchia (1991).

The second stream of research suggests that better disclosure may reduce cost of capital by reducing non-diversifiable risk estimate. This thrust is represented by Barry and Brown (1985), Handa and Linn (1993), Coles et al. (1995).

From an empirical perspective, a sizeable body of studies has investigated empirically the association between cost of equity capital disclosure and different disclosure types (aggregate disclosure, social, timely, intellectual capital disclosure…).

Botosan (1997) was the first to empirically explore the relationship between the cost of capital and aggregate disclosure.

Using annual report of 122 American firms operating in the machinery manufacturing industry within one year (1990), she documents a negative association between the cost of equity capital and voluntary disclosure level for firms with a low analyst following but finds no association between these variables for firms with a high analyst following.

Hail (2002) used a similar procedure and found in the examination of a sample of 73 Swiss firms a negative and highly significant association between voluntary disclosure and cost of capital.

In international setting, Francis et al. (2005) examine the same relation using a sample of firms from 34 countries. They also find that firms in industries with greater external financing needs have higher voluntary disclosure levels, and that an expanded disclosure policy for these firms leads to a lower cost of capital.

Richardson and Welker (2001) investigate the relation between two types of disclosure (social and financial disclosures) and the cost of capital for a sample of Canadian firms within three years 1990-1992. They find that the financial disclosure is negatively related to the cost of equity capital for firms with low analyst following. However, contrary to their expectations, they document a significant positive relation between social disclosures and the cost of equity.

In an extension of Botosan (1997), Botosan and Plumlee (2002) examine the association between the cost of equity capital and levels of annual report disclosures, timely disclosures (quarterly and other published reports), and investor relations activities. They find that the cost of equity capital decreases with increased annual financial disclosures level but increases with greater level of timely disclosures. They find also no association between the cost of equity capital and the level of investor relations activities.

Concerning the positive impact of timely disclosure which is contrary to theory, they suggest that is due to the increased stock price volatility because this type of disclosure attracts transient investors who trade aggressively on short-term earnings.

Gietzmann and Ireland (2005) criticize Botosan and Plumlee's (2002) study arguing that the positive relationship documented for timely disclosures may have arisen due to problems with the measurement of disclosure. In a UK context, they construct an innovative measure of timely disclosure that attempts to capture quality rather than quantity of strategic disclosures. They find that timely disclosures are negatively related to the cost of capital for firms with aggressive accounting policies than for those with conservative accounting policies.

Espinosa and Trombetta (2007) also document a negative relationship between disclosure and cost of capital for firms with aggressive accounting policy. Using a sample of Spanish firms quoted on the Spanish continuous market from 1999 to 2002, they confirm that the relationship between disclosure and cost of capital is affected by the choice of accounting policy. They find a negative relationship between disclosure and cost of capital for firms with aggressive accounting policy.

In the new knowledge economy, where intellectual capital plays a key role in the value-creating processes (Guthrie et al, 2012; OCDE, 2008; Zeghal & Maaloul, 2011), some studies focus on the voluntary information regarding this hide capital.

Singh and Van der Zahn (2007) examine empirically the association between underpricing and intellectual capital disclosures using a sample 334 Singapore IPO prospectuses between 1997 and 2004. Contrary to theoretical predictions, they find a positive association between underpricing and the extent of intellectual capital disclosure. However, this study uses under-pricing in IPOs rather than the cost of capital directly, and therefore, it is difficult to conclude that intellectual capital information influences the cost of capital.

Kristandl and Bontis (2007) investigate the effects of intellectual capital disclosure on the cost of capital of 95 listed companies in Austria, Germany, Sweden and Denmark. They classify voluntary disclosure into historical information and forward-looking information. An expected negative relationship is found between the level of forward-oriented information and COEC, and an unexpected positive relationship is found between the level of historical information and COEC.

This study employs only a limited number of intellectual capital information items. Additionally, the study does not consider the effects of the individual intellectual capital disclosure categories, on the cost of capital.

With focus on the intellectual capital disclosure, Orens et al (2009) examine empirically the impact of web-based intellectual capital (IC) reporting on firm's value and its cost of finance. A content-analysis of corporate web sites is conducted from four continental European countries (Belgium, France, Germany and The Netherlands) on the presence of IC information. The findings show that cross-sectional differences in the extent of IC disclosure are positively associated with firm value. Greater IC disclosure in continental Europe is associated with lower information asymmetry, lower implied cost of equity capital and lower rate of interest paid.

Recently, Mangena et al. (2010) investigate also the association between intellectual capital disclosure and the cost of equity capital of UK listed firms. This study uses data from a sample of 126 UK firms listed on the LSE. It reveals that intellectual capital disclosure across all categories is negatively associated with the cost of equity capital.

In the light of this theoretical and empirical literature, it is possible to formulate the following hypotheses:

H1: There is a negative association between the cost of equity capital and Intellectual capital disclosure level.

H2: There is a negative association between the cost of equity capital and each categories of Intellectual capital disclosure level.

   H2a: There is a negative association between the cost of equity capital and Human capital disclosure level.

   H2b: There is a negative association between the cost of equity capital and Structural capital disclosure level.

   H2c: There is a negative association between the cost of equity capital and Relational capital disclosure level.

3. Research design: Methodology

The main objective of this study is to examine the association between intellectual capital disclosure and the cost of equity capital. In this section, the research methods used to fulfill this objective are presented. First, the selection process of the sample of listed firms examined in the study is discussed, followed by a description of measurement of the different variables. This includes a discussion of how intellectual capital disclosure and the cost of equity capital measures are determined. Finally, the research model will be presented.

3.1. Data and sample selection

To test our hypotheses, we analyze the annual reports for the year 2009 of French companies in the SBF120 French index: they are companies having the most significant stock exchange capitalization. From among the companies which make up the SBF120 index, we eliminated the foreign companies as well as the companies for which required data was missing. This reduced our final sample to 102 French companies.

The data relating to the Intellectual capital disclosure data were collected from the annual reports (reference documents) of 2009 of the companies found on the SBF 120 index for the year 2009.

The reports were published either on the Website of the AMF (Autorité des Marchés Financiers): www.amf-france.org, or on the Websites of the companies themselves.

In addition, the stock exchange data related to the companies which make up the SBF 120 index (stock exchange, volatility of the output of the shares, etc.) were collected from the financial headings of the websites www.finance.yahoo.com and the Thomson Reuter database.

This study uses a sample which consists of several sectors. In fact, previous studies have shown that intellectual capital disclosure varies with industry (Abdelmohammadi, 2005; Bozzolan et al., 2005; Mangena et al., 2010; Sonnier, 2008). Considering the new economy literature, we chose in this study to divide our sample into two groups one presents the traditional industry and the other the high-tech industries which is intensive in intellectual capital. After a review of classification criteria of sectors used in the literature, we opted to follow the classification used by Bozzolan et al., 2006 (see also Mangena et al., 2010). According to this classification, Knowledge intensive

Table 1
Sample distribution by sector group

Sector Group	Companies	Percentage
High Tech industries	41	40.19
Traditional Industries	61	59.80
Total	102	100

industries include internet application provision, biotechnology, entertainment, IT, distribution, high tech manufacturing, media, retail, software, systems integration, telecommunications, and web services.

Traditional industries include sectors such as food, automobiles, chemicals, construction, electronics, manufacturing, oil, utilities, textile/clothing, and tourism/leisure.

Table 1 shows the sample distribution by sector group. The two groups, i.e. traditional industries and high-tech industries, respectively, represent 59.8 % and 40.19 %. per cent of the whole sample.

3.2. Definition of variables

3.2.1. Dependent variable (measurement of cost of equity capital)
The cost of equity capital is the minimum rate of return equity investors require for providing capital to the firm (Botosan, 2006).

There are a number of alternative methods that have been developed in the literature to estimate the cost of equity capital. Botosan (2006) classifies these into two classes. One class of methods, such as the Capital Asset Pricing Model (CAPM), uses predetermined priced risk factors to yield cost of equity capital estimates.

The second class of methods estimates the cost of equity capital by calculating the internal rate of return that equates the market's expectation of future cash flows to current stock price. The main methods in this class are: (1) the residual income (RIV) model (Gebhardt et al., 2001); (2) the abnormal earnings growth (AEG) model (Gode & Mohanram, 2003); and (3) the price-earnings growth (PEG) model (Easton, 2004).

All these methods make use of current share price and analysts' forecasts of earnings in estimating the cost of equity capital. This is because in making earnings forecasts, analysts use available information about the firm (Lee et al., 2006).

The choice of the method to use depends on the application (Lee et al., 2006) and data availability (Gietzmann & Ireland, 2005).

In the context of research on the impact of disclosure on cost of capital, Cooper (2006) argues that the method used should not have a significant impact on the results. He argues that it is the relative differences in the cost of capital estimates among firms, rather than the accuracy of the absolute measures of the cost of capital that matters.

In this study, we cannot use the methods of the second class which are very recommended by several researchers because the extensive level of accounting forecasts required. For our French sample, no data of this type could be collected and we thus turned to the CAPM model, according to which the cost of equity equals the risk-free rate plus a risk premium, i.e.:

$$k_i = r_f + \beta_i [E(R_m) - r_f]$$

with: k_i = cost of equity
r_f = risk-free rate
$E(Rm)$ = expected market return
$E(Rm) - rf$ = risk premium
β_i = coefficient of non-diversifiable risk for asset i.

The beta coefficient is derived from the YahooFinance website. The risk-free rate corresponds to the State borrowing rate (10-year Treasury bonds). Lastly, the risk premium introduced is the one forecasted by the 'Associe´s en Finance' equity valuation firm.

3.2.2. Independent variables

Measuring the level of disclosure

In this study, annual report is used as the main source of data in order to measure the level intellectual capital disclosure

It is the main channel by which firms communicate with investors and other stakeholders (Bozzolan et al., 2003) and firms use it as a public relations document (Guthrie et al., 2007).

Intellectual capital Disclosure is measured using a disclosure index developed from a content analysis of annual reports.

The approach applied in this study is essentially dichotomous in that an item scores one if disclosed and zero, if it is not.

The level of disclosure for each firm is then calculated as an index by dividing the sum of disclosures by the total number of items scored. In this study, the checklist of intellectual capital items used is developed by Li et al (2008). This list is considered as the most comprehensive list of intellectual capital information comprising 61 items from a review of several previous studies (such as Bozzolan et al., 2003; Guthrie and Petty, 2000) as well as statements of best practice.

In line with previous research (see Abeysekera, 2008; Li et al., 2008; Mangena et al., 2010; Sonnier, 2008) and the objective of this study, the intellectual capital disclosure items were divided into human intellectual capital, structural intellectual capital and relational intellectual capital.

3.2.3. Control variables
Some control variables were used in this study to control for their effect on cost of Equity Capital:

Size of the company (Size): measured by the natural log of book value of total assets (Riahi-Belkaoui, 2003). Previous studies (Botosan, 1997; Brown et al., 2004; Hail, 2002; Sengupta, 1998) find that cost of capital is negatively associated with size. Smaller firms are more difficult to monitor, resulting in a higher level of information asymmetry and a higher cost of capital.

Leverage (Lev): (financial risk), measured as total debt to total assets. We expect that the cost of capital is positively associated with leverage as it indicates higher risk (Cheng et al., 2006; Khurana & Raman, 2004; Orens et al., 2009).

Following Analyst, measured by the number of analysts following the firm. Analyst following is used as a proxy for the quality of a firm's information environment (Roulstone, 2003). Prior studies find that disclosure level is negatively associated with the cost of capital for firms with low analyst following (Botosan, 1997; Richardson & Welker, 2001). This implies that firms with more analysts following have richer information environment, and thus have lower cost of capital. Therefore, we predict a negative association between cost of capital and analyst following.

Market-to-book, measured as the ratio between market capitalization and book value of equity of a firm in 2010. Considering that lower market-to-book ratios reflect higher uncertainty about the firm's future growth opportunities, a negative association between this variable and the cost of equity capital is predicted (Cheng et al., 2006; Khurana & Raman, 2004; Orens et al., 2009).

Industry: Firms are classified according to traditional or knowledge intensive industry using a 0, 1 dummy.

3.3. Research models (empirical model)

In order to respond to our research objective, we propose to empirically test the following regression models:

Cost of Equity Capital = f (IC disclosure (HC, RC, SC), size, leverage, M/B, following analysts, industry)

$$COEC = \beta_0 + \beta_1 IC + \beta_2 SIZE + \beta_3 LEV + \beta_4 ANL + \beta_5 MB + \beta_6 IND + \varepsilon$$

$$COEC = \beta_0 + \beta_1 HC + \beta_2 SIZE + \beta_3 LEV + \beta_4 ANL + \beta_5 MB + \beta_6 IND + \varepsilon$$

$$COEC = \beta_0 + \beta_1 SC + \beta_2 SIZE + \beta_3 LEV + \beta_4 ANL + \beta_5 MB + \beta_6 IND + \varepsilon$$

$$COEC = \beta_0 + \beta_1 RC + \beta_2 SIZE + \beta_3 LEV + \beta_4 ANL + \beta_5 MB + \beta_6 IND + \varepsilon$$

where:
COEC: Cost of Equity Capital Estimated using the CAPM method
IC: Extent of IC information disclosed on the annual report site in 2009
HC: Extent of HC information disclosed on the annual report site in 2009
SC: Extent of SC information disclosed on the annual report site in 2009
RC: Extent of RC information disclosed on the annual report site in 2009
MB: Ratio of the total market capitalization (share price times number of outstanding common shares) to book value of net assets,
LEV: Leverage
ANL: Number of financial analysts following a firm in 2010
SIZE: measured by the natural log of book value of total Assets in 2009
IND: Industry (0; 1)

4. Research findings

The *descriptive statistics* and *empirical results* are discussed in this section.

4.1. Descriptive statistics

Table 2 provides information on descriptive statistics of all the variables for the full sample.

This table shows that French firms present a large level of IC information on their annual reports. This result is consistent when breaking down the IC aggregate score on the three information categories. This finding is also similar to results documented by Orens et al. (2009), in the case of IC information disclosed in firm's corporate website. They reveal that French firms present a larger amount of IC information on their corporate websites compared to other continental European firms.

The disclosure scores are analyzed at the overall and intellectual capital category disclosure levels according to industry. This is to help provide a better understanding of firms' disclosure.

The mean overall intellectual capital disclosure for intellectual capital intensive sectors is 85.68% which is higher than the 71.7% for non-intellectual capital intensive sectors.

Similarly, intellectual capital intensive sectors seem to provide higher disclosures in the three intellectual capital categories than do non-intellectual capital intensive sectors.

To compare between groups of sectors, a one-way ANOVA was conducted on the two groups. Results from this test are shown in Table 3. These results suggest that the group of high-tech disclose more information related to Intellectual capital than the traditional industries.

This difference in the extent of ICD between traditional and knowledge intensive firms is consistent with previous studies on ICD (Bozzolan et al., 2006) and is usually explained by the fact that knowledge based firms in most cases are characterized by new and more high risk business models and they are more likely to be deeply reliant on intellectual capital which constitutes a key driver in the value creation process (Amir and Lev, 1996; Barth et al., 2001; Bukh et al., 2005).

4.2. Linear multiple regression results

We now continue to test our hypotheses through the linear multiple regression Models.

Because we use multiple regression analysis, the data must meet certain assumptions.

We conducted tests for normality. The statistical analyses (Kolmogorov-Smirnov tests, Skewness and Kurtosis values) were used. The results indicated that our data were normally distributed. Therefore, the normality assumptions are not violated in the regression models. In addition, we also conducted test for multicollinearity. We examined the variance inflation factors (VIFs) for the predictors. Our VIFs ranged from a low value of 1.024 to a high value of 1.342. According to Myers (1990, p. 369), if any VIFs is less than 10 the effect of multicollinearity is not significant in a regression. Thus, we conclude that multicollinearity was not considered to pose a significant problem to the interpretation of our results.

The mentioned tests above were applied for the full sample and for each group of analysis.

Consequently, with respect to the above assumptions of the regression, we can analyze the outcomes of the regression.

We present the multivariate regression results of the association between firm's Cost of Equity Capital and the extent of IC disclosure in Table 4. This table shows the results of the regression coefficients for all explanatory variables, using Cost of Equity Capital as the dependent variable.

Table 2
Descriptive statistics for selected variables (N=102)

Variables	Mean	Median	SD	25th Quartile	75th Quartile
Size	8.96	8.78	1.99	7.604	10.034
Leverage	0.280	0.249	0.077	0.119	0.370
Market to Book	1.94	0.65	1.31	1	2.625
Analysts Following	9.775	9	5.313	5.75	12
IC	77.425	81	12.516	71.6	85.25
HC	80.777	85	12.672	76	90
SC	78.791	83	14.217	72	88
RC	73.022	77	15.652	63.45	86
COEC	9.364	9.23	1.959	8.155	10.855

COEC, Cost of Equity Capital; HC, Human capital; IC, intellectual capital; RC, Relational capital; SC, Structural capital; SD, standard deviation.

Table 3
Descriptive disclosure scores by industry

Analysis of disclosure scores by sector groupings				
Industry	Intellectual Capital %	Human Capital %	Structural Capital %	Relational Capital %
Non-intellectual capital intensive sectors (traditional) (N= 61)				
Mean	71,754	81,554	73.7295	65.596
Median	77	78.9	77	72
Std dev	12,645	11.927	15.479	14,514
25th Quartile	62	72.5	61	54
75th Quartile	82.45	84	88	77
Intellectual capital intensive sectors (High tech) (N= 41)				
Mean	85.868	82.061	86.322	84.07
Median	88	81.7	88	86
Std dev	5.796	9.846	7.33	9.665
25th Quartile	82.45	76	83	77
75th Quartile	90.5	87.4	94	90.45
T-statistic	6.682**	4.47	4.8**	7.148*

***Significant at 1%; **significant at 5% and *significant at 10%.

The analysis of our results will be interpreted for each group of sample. First, we divided our whole sample into companies' intensives on intellectual capital (High Tech) and traditional (Non intensive on intellectual capital) ones. Second we divided our sample into companies high followed by financial Analyst and other low followed by financial Analyst.

Concerning the total intellectual capital disclosure, the Panel A table 4 shows the results of the regression coefficients for the whole sample and for the two groups of sectors, respectively High tech and traditional one. The adjusted R^2 is 0.157 for the whole sample, 0.125 for the high-tech industry sub-sample, and 0.232 for the traditional industry sub-sample. These numbers indicate that the model is able to explain about 15.7 per cent of the variance in the dependent variable for the whole sample, 12.5 per cent for the high-tech industry sub-sample and 23.2 per cent for the traditional industry sub-sample.

Table 4 Panel (A) shows that the total intellectual capital disclosure coefficient (IC disclosure) has a significantly negative association with Cost of Equity Capital within the whole sample and within the traditional one. This result supports the H1 and confirms that IC plays a major role in reducing the cost of Equity Capital.

Moreover, this finding agrees with previous studies conducted by Mangena et al. (2010) and Orens et al. (2009) who found a negative effect of IC disclosure on Cost of equity Capital in different other contexts.

However, the same table shows that the association between IC disclosure and COEC within high-tech industry sectors is not significant. This finding may imply that high-tech companies' cost of equity capital is not mainly influenced by the extend of Intellectual capital disclosure in their annual reports.

Concerning the human capital disclosure, Panel B (Table 4) presents the results for the whole sample and for the two groups of sectors, respectively High tech and traditional one. The adjusted R^2 is 0.144 for the whole sample, which indicates that the model is able to explain nearly 14.4 per cent of the variance in the dependent variable. As for sector groups, Adjusted R^2 is 0.092 for the high-tech industry sub-sample and 0.228 for the traditional industry sub-sample. This indicates that the model is able to explain about 9.2 per cent of the variance in the dependent variable for the high-tech industry sub-sample and 22.8 per cent for the traditional industry sub-sample.

Panel B Table 4 shows that the Human capital disclosure coefficient (HC disclosure) has a significantly negative association with Cost of Equity Capital within the whole sample and within the traditional one. This result supports the H2a and confirms that HC plays a major role in reducing the cost of Equity Capital Cost.

Table 4
Linear multiple regression results (by sector)

	Whole sample		High Tech N=41		Traditional (N=61)	
	β	t	β	t	β	t
PANEL A: Total IC disclosure						
Intercept	N/A	10.541***	N/A	3.305***	N/A	9.871***
Total IC disc	-0.339	-2.825***	−0.224	-1.229	−0.251	−2.014**
Size	-0.102	−0.161	0.310	2.022*	−0.322	−2.659**
Lev	0.057	0.618	0.140	0.848	−0.019	−0.162
Analy	−0.003	−0.28	−0.64	0.350	0.059	0.507
M/B	−0.321	−3.445***	−0.328	−2.058**	−0.321	−2.693***
Ind	0.324	2.896***	–	–	–	–
Adj. R²	0.157		0.125		0.232	
F	4.143***		2.138*		4.628***	
PANEL B: Human Capital disclosure						
Intercept	N/A	10.396	N/A	2.940***	N/A	9.927***
HC discl	−0.271	−2.552**	−0.072	−0.462	−0.238	−1.936*
Size	−0.145	−1.403	0.286	1.849*	−0.331	−2.746***
Lev	0.043	0.461	0.081	0.505	−0.022	−0.185
Analy	−0.010	−0.110	−0.168	1.036	0.050	0.430
M/B	−0.308	−3.283***	−0.349	−2.162**	−0.307	−2.585**
Ind	0.259	2.461**	–	–	–	–
Adj. R²	0.144		0.092		0.228	
F	3.829***		1.814		4.546***	
PANEL C: Structural Capital disclosure						
Intercept	N/A	10.543***	N/A	3.905***	N/A	9.905***
SC discl	−0.240	−2.241**	−0.196	−1.193	−0.202	−1.694*
Size	−0.161	−1.565	0.318	2.055**	−0.361	−3.065***
Lev	0.037	0.390	0.116	0.725	−0.043	−0.366
Analy	−0.024	−0.258	−0.115	−0.689	0.042	0.366
M/B	−0.313	−3.314***	−0.324	−2.023*	−0.311	−2.590**
Ind	0.260	2.422**	–	–	–	–
Adj. R²	0.131		0.142		0.216	
F	3.540***		2.216*		4.313**	
PANEL D: Relational Capital disclosure						
Intercept	N/A	10.945***	N/A	4.110***	N/A	10.102***
RC discl	−0.255	−1.404	−0.154	−0.843	−0.178	−1.404
Size	−0.149	−1.407	0.303	1.953*	−0.350	−2.860***
Lev	0.054	0.564	0.116	0.702	−0.026	−0.218
Anal	−0.013	−0.130	−0.107	0.585	0.047	0.398
M/B	−0.323	−3.385***	−0.349	−2.178**	−0.318	−2.613**
Ind	0.259	2.537**	–	–	–	–
Adj. R²	0.124		0.105		0.204	
F	3.377***		1.938		4.076***	

HC, Human capital; IC, intellectual capital; N/A, not available; RC, Relational capital; SC, Structural capital.
***Significant at 1%; **significant at 5% and *significant at 10%.

Moreover, this finding agrees with previous studies conducted by Mangena et al. (2010) and Orens et al. (2009) who found a negative effect of HC disclosure on Cost of equity Capital different other contexts.

However, the association between Human capital disclosure and cost of equity capital within high tech industry sectors is not significant.

Concerning the structural capital disclosure, Panel C (Table 4) presents the results for the whole sample and for the two groups of sectors, respectively High tech and traditional one. The adjusted R^2 is 0.131 for the whole sample, 0.142 for the high-tech industry sub-sample, 0.216 and for the traditional industry sub-sample. These numbers indicate that the model is able to explain about 13.1 per cent of the variance in the dependent variable for the whole sample 14.2 per cent for the high-tech industry sub-sample and 21.6 per cent for the traditional industry sub-sample.

Panel C Table 4 shows that the Structural capital disclosure coefficient (SC disclosure) has a significantly negative association with Cost of Equity Capital within the whole sample and within the traditional one. This result supports the H2b and confirms that SC plays a major role in reducing the cost of Equity Capital Cost.

Moreover, this finding agrees with previous studies conducted by Mangena et al. (2010) and Orens et al. (2009) who found a negative effect of SC disclosure on Cost of equity Capital different other contexts.

However, the association between Intellectual capital disclosure and cost of equity capital within high tech industry sectors is not significant.

Concerning the relational capital disclosure, Panel D (Table 4) presents the results for the whole sample and for the two groups of sectors, respectively High tech and traditional one. The adjusted R^2 is 0.124 for the whole sample, 0.105 for the high-tech industry sub-sample, 0.204 and for the traditional industry sub-sample. These numbers indicate that the model is able to explain about 12.4 per cent of the variance in the dependent variable for the whole sample 10.5 per cent for the high-tech industry sub-sample and 20.4 per cent for the traditional industry sub-sample.

Panel D Table 5 shows that the Relational capital disclosure coefficient (RC disclosure) has a negative but not significant association with Cost of Equity Capital within the whole sample, the traditional and the high tech one. This result supports partially the H2c.

To summarize, the Table 5 (Panels A, B and C) exhibits that disclosure regarding total intellectual capital, human and structural capital has a significantly negative effect on Cost of equity capital within the full sample and traditional sub-sample, however the latter effect is negative but not significant within the high tech sub-sample.

Table 4 Panel D reveals that Relational capital disclosure has a negative but not significant effect on the cost of equity capital within the full sample, and within each sub sample of sector.

Additional analyses (low vs. high analyst following)

Following prior studies examining the relation between disclosure and the cost of capital (Botosan, 1997) we divide the sample into firms followed by less than the median number of analysts and those followed by more than the median number and estimating the association between cost of equity capital and disclosure level for the two resulting subsamples.

Splitting the sample into only two subsamples still ensures a reasonable number of observations in each subset. Each subsample includes 51 firms (High and Low analyst following).

The Table 5 shows the results of the regression coefficients for all explanatory variables for Low versus High analyst following.

Concerning the total Intellectual capital disclosure, Panel A (Table 5) presents the results for the two groups of firms, respectively Low Analysts Following and High Analysts following one. The adjusted R^2 is 0.256 for the Low Analyst following sub-sample, and 0.144 for the High Analyst following sub-sample. These numbers indicate that the model is able to explain about 25.6 per cent for the Low Analysts following sub-sample and 14.4 per cent for the High Analysts following sub-sample.

Panel A Table 5 shows that the total intellectual capital disclosure coefficient (IC disclosure) has a significantly negative association with Cost of Equity Capital within the Low Analysts following one.

However, the association between Intellectual capital disclosure and cost of equity capital within High Analyst following sub-group is not significant. This result may that the association between IC disclosure and the cost of equity capital may be diluted for firms with a large analyst following.

Concerning the Human capital disclosure, Panel B (Table 5) presents the results for the two groups of sectors, respectively Low Analyst Following and High Analyst following one. The adjusted R^2 is 0.271 for the Low Analyst following sub-sample, and 0.05 for the High Analyst following sub-sample. These numbers indicate that the model is able to explain about 27.1 per cent of the variance in the

Table 5
Linear multiple regression results for low vs high analyst following

	Low Analyst following (N=51)		High Analyst Following (N=51)	
	β	t	β	t
PANEL A: Total IC disclosure				
Intercept	NA	8.255***	NA	7.315***
Total IC disc	−0.506	−2.939***	−0.20	−1.259
Size	−0.367	−2.427**	0.045	0.309
Lev	0.233	1.817*	0.042	0.310
Analy	–	–	–	–
M/B	−0.373	−0.020***	−0.371	−2.731***
Ind	0.448	2.973***	0.273	1.683*
Adj. R^2	0.256		0.144	
F	4.436***		2.685**	
PANEL B: Human Capital disclosure				
Intercept	NA	8.855***	NA	5.713***
HC discl	−0.296	−1.824**	−0.223	−1.595
Size	−0.368	−2.522**	−0.005	−0.030
Lev	0.237	1.870*	0.004	0.031
Analy	–	–	–	–
M/B	−0.365	−2.879***	−0.321	−2.272**
Ind	0.427	3.044***	0.140	0.880
Adj. R^2	0.271		0.05	
F	4.716***		1.527	
PANEL C: Structural Capital disclosure				
Intercept	NA	8.674***	NA	7.009***
SC discl	−0.308	1.919*	−0.190	−1.351
Size	−0.391	−2.699**	−0.011	−0.073
Lev	0.232	1.819*	0.010	0.067
Analy	–	–	–	–
M/B	−0.373	−3.027***	−0.342	−2.399**
Ind	0.433	2.994***	0.137	0.871
Adj. R^2	0.26		0.057	
F	4.505***		1.604	
PANEL D: Relational Capital disclosure				
Intercept	NA	8.126***	NA	8.240***
RC discl	−0.427	−2.504**	−0.018	0.106
Size	−0.425	−2.708**	0.008	0.057
Lev	0.215	1.651	0.056	0.399
Anal	–	–	–	–
M/B	−0.389	−3.107***	−0.355	−2.448**
Ind	0.376	2.392**	0.236	1.435
Adj. R^2	0.23		0.105	
F	3.982***		2.169*	

HC, Human capital; IC, IC, intellectual capital; NA, not available; RC, Relational capital; SC, Structural capital.
***Significant at 1%; ** Significant at 5% and * Significant at 10%.

dependent variable for the Low Analyst following sub-sample and 5 per cent for the High Analyst following sub-sample.

Panel A Table 5 shows that the Human capital disclosure coefficient (HC disclosure) has a significantly negative association with Cost of Equity Capital within the Low Analyst following one.

However, the association between Human capital disclosure and cost of equity capital within High Analyst following sub-group is not significant.

Concerning the structural capital disclosure, Panel C (Table 5) presents the results for the two groups of firms, respectively Low Analyst Following and High Analyst following one. The adjusted R^2 is 0.26 for the Low Analyst following sub-sample and 0.057 for the High Analyst following sub-sample. These numbers indicate that the model is able to explain about 26 per cent of the variance in the dependent variable for the Low Analyst following sub-sample and 5.7 per cent for the High Analyst following sub-sample.

Panel A Table 5 shows that the total intellectual capital disclosure coefficient (IC disclosure) has a significantly negative association with Cost of Equity Capital within the Low Analyst following one.

However, the association between Intellectual capital disclosure and cost of equity capital within High Analyst following sub-group is not significant.

Concerning the relational capital disclosure, Panel C (Table 5) presents the results for the two groups of firms, respectively Low Analyst Following and High Analyst following one. The adjusted R^2 is 0.23 for the Low Analyst following sub-sample, and 0.105 for the High Analyst following sub-sample. These numbers indicate that the model is able to explain about 23 per cent of the variance in the dependent variable for the Low Analyst following sub-sample and 10.5 per cent for the High Analyst following sub-sample.

Panel C Table 5 shows that the relational capital disclosure coefficient (RC) has a significantly negative association with Cost of Equity Capital within the Low Analyst following sub-sample.

However, the association between relational capital disclosure and cost of equity capital within High Analyst following sub-group is not significant.

To summarize, the Table 5 (Panels A, B, C and D) reveals that disclosure regarding total intellectual capital, human, structural and relational capital has a significantly negative effect on Cost of equity capital within Low Analyst following sub-sample, however the latter effect is negative but not significant within High Analyst following sub-sample.

5. Conclusion

The objective of our study was to investigate the relationship between disclosure and cost of equity capital.

The results of this study indicate that there is extensive disclosure of intellectual capital information by the French firms. Overall, the results confirm our hypotheses that stipulate the existence of a significant and negative association between intellectual capital disclosure with its two components (human capital, structural) and the cost of equity. However, the negative impact of the relational capital disclosure is not validated. In addition, our results argue that the effect of disclosure on the rate of return required by shareholders depends on the industry to which the firm belongs, in fact, contrary to our expectations; this effect is more pronounced for firm's traditional sector than for high-tech companies. In addition, the impact of intellectual capital disclosure depends on the number of financial analysts following the company; in fact, the association is more significant for the group of companies heavily followed by financial analysts.

This study contributes to the literature in a number of ways. First, it provides the first evidence of the relationship between the cost of equity capital and intellectual capital disclosure in a French context. Second, unlike previous studies that tend to investigate aggregate annual report disclosures, this is the first study to focus on one type of disclosure which concerns the major source of value creating process "intellectual capital" and attempts to ascertain if there is a negative association between it and the how this type of disclosure is associated with the cost of equity capital.

The findings in this study are also of considerable importance to both policy makers and firms. First, the findings reveal that disclosure of intellectual capital information by French listed firms is extensive. Second, the results presented in this study exhibits that firms with greater disclosure of intellectual capital information benefit significantly more from a lower cost of capital than firms with lower disclosure intellectual capital disclosure. Thus, improved intellectual capital disclosure will also benefit market participants in terms of having more relevant information available, and therefore reducing the cost of gathering private information. This understanding is important because it helps policy makers in the evaluation of the costs and benefits of disclosure.

Third, the results of this study have some practical implications to management, thus, the findings in this study provide managers with insights into the effects of enhancing disclosure of intellectual capital information on their cost of equity capital. Furthermore, they can also have an idea into the intellectual capital disclosure categories that are more relevant to investors in valuing firms. Therefore, if managers realize the benefit of enhanced IC disclosure regarding the reduction in their cost of finance, they will be more motivated to disclose this type of information.

The results need to be regarded with caution; in fact, there are a number of limitations in this study.

The first limitation relates to measurement issues. Intellectual capital disclosure was measured using a dichotomous procedure and this does not make a distinction between firms on the basis of the detail provided for each item. With regard to the cost of equity measure, the study uses the CAPM model which is not recommended for investigating the relationship between disclosure and the cost of equity capital because they do not clearly provide for the role of information (Botosan, 2006). However, we used this measure because we don't dispose available data to use other models like the residual income (RIV) model (Gebhardt et al., 2001); (2) the abnormal earnings growth (AEG) model (Gode & Mohanram, 2003); and (3) the price-earnings growth (PEG) model (Easton, 2004).

The second limitation concerns the size of sample which is relatively small and the focus on one year so further research is needed in order to confirm the results. Future research could employ longitudinal field studies, to investigate more systematically the causal relationships implicit in our study.

At the end, our study opens a new avenue for IC research. First, this study can be reproduced using finer measures of intellectual capital disclosure. Rather than using a dichotomous procedure to measure intellectual capital disclosure, further research could consider the detail provided for each disclosure item. This can better make a distinction between low and high-disclosing firms and ameliorate the quality of the analysis of the effect of intellectual capital disclosure on the cost of Equity.

Second, this study focus on the cost of equity which presents only one component of cost of capital, so further research can extend our findings by adding a cost of debt.

Third, further research could focus on examining the impact of the interaction between Intellectual capital disclosure and the quality of result affecting the cost of capital.

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