Does graph disclosure bias reduce the cost of equity capital?*

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ABSTRACT

Research on disclosure and capital markets focuses primarily on the amount of information provided but pays little attention to the presentation format of this information. This paper examines the impact of graph utilization and graph quality (distortion) on the cost of equity capital, controlling for the interaction between disclosure and graph distortion. Despite the advantages of graphs in communicating information, our results show that graph utilization does not have a significant impact on users' decisions. However we observe a significant (negative) association between graph distortion and the cost of equity. Moreover, we find that disclosure and graph distortion interact so that the impact of disclosure on the cost of capital depends on graph integrity. A significant negative association was found between the amount of information provided by companies and its cost of capital but this relation holds only for those companies that did not distort the graphs included in their annual reports. Results suggest that, for these companies, disclosure helps in reducing information asymmetry and the risk premium required by investors. The sign of the relationship is the inverse for distorting companies. Distorted graphs usually portray a more favourable image of the company, biasing users' perceptions upwards so that they require a lower risk premium. As the level of information increases, users' perceptions are corrected downwards and the cost of capital increases.

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1 INTRODUCTION

This paper investigates the relationship between the format and distorsion of disclosure in annual reports and the cost of equity capital. Using data from the annual reports of a sample of companies quoted in the Spanish stock market, we find that the degree of usage of graphs as a disclosure format does not affect the cost of equity capital. However the degree of distortion of these graphs interacts with the overall level of disclosure in determining the cost of equity capital of a company. To the best of our knowledge this is the first attempt to look at the capital market effects of disclosure format in general and of graph distortion in particular.

An extensive line of theoretical and empirical accounting research is devoted to the analysis of the impact of corporate disclosure on the capital market[1]. Theoretical models predict that disclosure reduces information asymmetries in the capital market, increases liquidity and reduces the cost of capital (e.g. Verrecchia (2001), Dye (2001) or Easley and O'Hara (2004)). These predictions are supported by empirical evidence. As an example, Welker (1995) and Leuz and Verrechia (2000) document a negative association between corporate disclosure and bid-ask spreads. Botosan (1997), Botosan and Plumlee (2002), Espinosa and Trombetta (2006), Francis et al. (2005) or Gietzmann and Ireland (2005) provide empirical evidence supporting a negative association between disclosure and the cost of equity capital.

However the empirical studies primarily focus on the amount and/or on the quality of information provided, but disregard the presentation format. Nonetheless, research at the individual user level suggests that the presentation format has an impact on individual judgment accuracy (De Sanctis and Jarvenpaa, 1989). Moreover Beattie and Jones (2000) and Godfrey et al. (2003) show that by using a particular form of presenting information, such as graphs, management is often conveying a more favourable image of the company than that portrayed by accounting numbers.

Although figures vary between studies and countries, a growing body of research shows that an overwhelming majority of large companies include graphs in their annual reports (e.g. Steinbart (1989), Beattie and Jones (1992, 1997, 1999), The Canadian Institute of Certified Accountants (CICA, 1993) or Mather et al (1996)). A significant part of these studies (e.g. Beattie and Jones

[1] A reference to the theoretical models can be found in Verrecchia (2001) and Dye (2001), whereas Healy and Palepu (2001) provide a review of empirical studies.

(1992, 1999), Mather et al. (1996), Frownfelter and Fulkerson (1998)) also show that an important proportion of these graphs are materially distorted, that is, the physical measures in the surface of the graphic are not proportional to the numerical values being represented. Given that distortions tend to portray corporate performance more favourably, these researchers conclude that companies are using graphs to present a self-interested view of the company

Notwithstanding the popularity of graphs in corporate annual reports and the potential bias they introduce on users' decision making processes, the impact of graph distortion on users' decisions is still an unexplored topic. The purpose of this paper is to start filling this gap by studying the effects that graphs have on the cost of equity capital of a sample of Spanish firms.

First of all we focus on graph usage, as proxied by the number of graphs included in the annual report, and its relation to the cost of equity capital. The purpose is to shed some light on the usefulness of graphs as a communication tool and clarify the inconclusive findings of previous research. Graphs are expected to play a key role in the process of communicating information, by attracting the attention of the reader, facilitating the comprehension of the information and/or allowing an easy retrieve of previously processed information (Leivian, 1980). Therefore, the beneficial effects of corporate disclosure in the stock market could be enhanced by supplementing tables and narratives with graphs depicting key financial and non-financial variables.

Second, a measure of graph distortion is included in our study with the aim of providing evidence on the impact of graph quality on users' decisions in the capital market. Even assuming numerical and narrative information are unbiased, when distorted graphs are added to this set of information, users' perceptions regarding corporate performance are potentially biased. At the individual user level, previous research by Taylor and Anderson (1986) and Beattie and Jones (2000) documents the effect of graph distortion on users' perceptions. If accounting information is usually an imperfect lens through which users see reality, graph distortion adds a new imperfect lens that biases subjects' perceptions in such a manner that they see a more favourable reality. So graph distortion provides an excellent input to analyse the relation between the quality (bias) of the presentation format and the cost of equity capital, as an objective measure of graph integrity is easily obtained trough the calculation of graph distortion indexes.

Using a sample of Spanish quoted companies we show that the simple inclusion of graphs into the annual report does not affect the cost of equity capital. However we also show that a high level of graph distortion has a double effect on the cost of equity capital. On one hand it reduces the fixed component of this cost. On the other hand, however, it interacts with the overall level of disclosure so that firms that present distorted graphs will see their cost of equity capital increased as the amount of information provided in the annual report increases. Hence the overall effect of graph distortion on the cost of equity capital depends on the overall level of transparency of the company. For relatively opaque companies graph distortion reduces the cost of equity capital, whereas for relatively transparent companies graph distortion increases the cost of equity capital.

The structure of the paper is as follows. In the following section we review the relevant literature and develop our hypotheses. In section three we describe our sample and the variables used in the study. Section four presents the results. Finally, section five provides the conclusions.

2 BACKGROUND AND HYPOTHESES DEVELOPMENT

The power of graphics as a system of visual communication is widely recognised in the statistical literature (e.g. Schmid (1983), Kosslyn (1985)). When referring to corporate reports, Beattie and Jones (1993, p. 38) point out that "At each stage of the communication process, attention-getting, knowledge acquisition and recall, the visual nature of graphs is likely to prove beneficial". The advantages of graphics in each one of this stages is tightly related to the difficulties in processing information that users experience when they face the task of analysing the voluminous reports published nowadays by companies, specially large ones. Users may have neither the time nor the ability to process such a quantity of information and researchers point to the possibility that the increasing expansion of corporate reports gives rise to an information overload problem (e.g. Casey (1980), Stocks and Harrell (1995)).

Insofar as graphs facilitate both the acquisition and the processing of information, they are seen as a means of avoiding or at least reducing some of the detrimental effects of information overload (Courtis (1997), CICA (1993)). First, graphs can be used to direct the attention of the reader to the key aspects of the report (Gibson and Schroeder, 1990), so that the reader needs less time to get a general picture of the company[2]. Graphs communicate quickly and directly, saving time and allowing users to grasp the essence of a set of data at a glance (Schmid, 1983). Even when the user is analysing the information thoroughly, graphs can be helpful in alleviating the reading of numerical and narrative information by introducing a pause in such reading. Second, graphs make the information more understandable to users, insofar as they highlight facts that otherwise will be hidden (Schmid, 1983). As an example, the underlying trend of a variable is much easier to be appreciated when the variable is plotted in a graph than when the information is presented in a numerical table. Additionally, graphs help in identifying the relationship between different variables or in assessing the relative importance of each of them (Leivian, 1980). Cleveland (1994) contends

[2] Users are often more interested in grasping the message ("the big picture") than in too detailed information (CICA, 1993, 95).

that graphs are better than any other approach in revealing the structure of data; they allow users to see both overall patterns and detailed behaviour of the variables depicted. Besides that, graphs eliminate language barriers, so that they can be easily understood by accountants and non-accountants (Fulkerson et al., 1999) and even by users with a limited knowledge of the language employed in the annual report[3] (Beattie and Jones, 2001). Finally, graphs are also very helpful in recalling the information previously processed. The spatial aspect of the graph allows the visualization of the message to be communicated facilitating its recalling (Courtis, 1997).

Despite the important role attributed to graphs in the communication process, empirical evidence supporting their advantages is both scarce and inconclusive and was gathered at the individual user level. The effectiveness of graphical versus tabular forms of presenting information is analysed in studies like those by Miller (1986), Kaplan (1988) or Davis (1989), but significant differences on decision making processes are not observed between the two alternative forms of presentation. However De Sanctis and Jarvenpaa (1989) consider the combination of graphs and tables and show that decision accuracy is significantly higher when tabular information is accompanied by graphs. These results suggest that when graphs do not substitute for, but are added to tabular information (the usual case in corporate reports), they facilitate the utilization of information. By means of graphs, users seem to be able to process a higher number of cues of information and/or process them more accurately, so that their decision performance is improved. But if this is the case, then it can be argued that the addition of graphs to tabular information increases the precision and/or the amount of usable information for agents in the capital market.

Analytical models predict that an increase in the amount and/or in the precision of information disclosure reduces the risk faced by investors when forecasting future payoffs of their investment thereby reducing the cost of capital (e.g. Verrecchia (2001), Dye (2001), Easley and O'Hara (2004)). The existence of a negative relationship between disclosure and the cost of capital is supported by empirical evidence gathered in different countries: Botosan (1997) and Botosan and Plumlee (2002) in the U.S., Gietzmann and Ireland (2005) in the U.K., Espinosa and Trombetta (2006) in Spain and Francis, Khurana and Pereira (2005) in a cross-country study covering 34 countries. However none of these studies has included graph usage as a measure of disclosure. To test the effectiveness of graph disclosure as a means of financial communication in the capital market over and above other forms of disclosure we formulate our first hypothesis as follows.

H1: The number of graphs in corporate reports is negatively related to the cost of equity capital

[3] This is especially relevant in the international context where preparers and users of annual report may use different languages.

Tufte (1983) states that an essential principle in graph construction is that physical measures on the surface of the graph should be directly proportional to the numerical quantities represented. Violations of this principle are usually referred to as measurement distortion. For example, the use of no-zero axis, broken axis or non-arithmetic scales leads to graphs where equal distances along the axis do not represent equal amounts, that is, physical measures are not proportional to the underlying numerical values.

Evidence of material distortion of an important proportion of graphs included by companies in their annual reports is provided in a number of studies (e.g. Steinbart (1989), Beattie and Jones (1992, 1999), Mather et al. (1996), Courtis (1997), Frownfelter and Fulkerson (1998)). As an example, Beattie and Jones (1997), when analysing the annual reports of 85 US and 91 UK companies, observe that, in both cases, 24% of the graphs analysed are materially distorted. Mean level of measurement distortion across four key financial graphs is +16% for the US and + 7% for the UK. Along the same line, Frownfelter and Fulkerson (1998) observe that 43% of the graphs analysed for a sample of 74 companies covering 12 countries are materially distorted.

Existing empirical research also shows that distortion tend to portray corporate performance more favourably (e.g. Steinbart (1989), Beattie and Jones (1992, 1999, 2000), Mather et al. (1996)). As an example, Beattie and Jones (1992) observe that favourable distortions to the company are three times more likely than unfavourable ones. Similarly, in a later study, Beattie and Jones (1999) find that 21 per cent of the graphs are distorted to portray corporate performance more favourably, while 13 per cent present corporate performance more unfavourably. Mather et al. (1996) also observe that distorted graphs are significantly more likely to present corporate performance favourably than unfavourably. On the basis of these results, Beattie and Jones (2000) suggest that graphs are being used by management to present a self-interested view of corporate performance (presentation management).

Beattie and Jones (2002) provide experimental evidence that distortions in excess of 10 per cent have an impact on users' perceptions and that users analysing favourably distorted graphs get a more favourable impression of corporate performance than users employing properly constructed graphs. In a similar vein, Taylor and Anderson (1986) observe that users' perceptions are far more favourable when they are based on graphs favourably distorted than when they rely on undistorted graphs. Hence, results of previous empirical and experimental research suggest that by means of distorted graphs included by companies in their annual reports, users perceive a more favourable image of corporate performance than warranted.

The beneficial effect of favourably portraying news about the firm in a capital market context is also supported by the analytical model presented by Shin (1994). In his model firms are allowed to bias the disclosure of information both favourably and unfavourably. Shin proves that to bias disclosure favourably can be part of an equilibrium strategy, whereas to bias disclosure unfavourably is never part of an equilibrium strategy.

On the basis of these previous results we state the following hypothesis:

H2: Favourable graph distortion is negatively related to the cost of equity capital

As explained before, graphs are more friendly forms of presentation than tables or descriptions and they allow users to get easily a general picture of the company. Hence, it is not surprising that even sophisticated users turn to graphs as an additional tool in their analysis. However the information contained in graphs can be checked by referring to the information contained in other parts of the annual report (quite often the compulsory financial statements). So a higher level of overall transparency of the annual report could facilitate the detection of graph distortion. In such a case, users would ignore graphical information and would rely on the quantitative and narrative information to make their decisions. But the detection of the distortion of the graphs could have an impact on users' decisions because of the impairment in corporate disclosure credibility. As stated by Schmid (1992), graph distortion threatens the credibility of the entire report containing such a graphic. Therefore if this distortion is detected, users may perceive a higher risk associated to their decisions. Theoretical studies by Easley and O'Hara (2004) and Leuz and Verrechia (2005) predict the existence of a negative relationship between the quality of information and the risk premium required by investors. Easley and O'Hara (2004) show that information precision reduces the information-based systematic risk of shares to uninformed investors thereby reducing the cost of capital. Leuz and Verrechia (2005) take a different approach and show that information quality increases expected cash-flows and, as a consequence, reduces the firms' cost of capital. Francis et al. (2004) and Francis et al. (2005) provide empirical evidence supporting these predictions. They find that accrual quality and a number of earnings attributes are significantly related to the cost of capital. Therefore, by reducing the credibility of the annual report, the inclusion of distorted graphs, if detected, is expected to increase the information risk and, as a consequence, the risk premium demanded by investors. So, we will test the following hypothesis:

H3: The effect of annual report disclosures on the cost of equity capital is affected by graph distortion

3 RESEARCH DESIGN AND VARIABLE DEFINITIONS

3.1 THE SAMPLE

For our sample we collect information on companies listed on the continuous (electronic) market in the Madrid Stock Exchange for the period 1996 trough 2002. Information on the graphs and their characteristics is gathered from corporate annual reports. Data on the information disclosed by the company (disclosure index) is obtained from the rankings produced by a pool of analysts and published annually by the business magazine "Actualidad Económica". Analysts' forecasts and market data used to calculate the cost of equity capital measures are obtained from the JCF database. Finally, financial data are collected from the OSIRIS database. Companies were removed from our study when the necessary information was not available at least for two consecutive years. Our final sample comprises 264 firm-year observations from 65 companies during 1996-2002.

3.2 DEFINITION OF VARIABLES

Cost of capital ($R_{PEGPREM}$)

The question of which is the best proxy for the ex-ante cost of equity capital of a company has received a great deal of attention in the recent literature[4]. To produce a comprehensive review of this literature is beyond the scope of this study. However one of the common results of these studies is that all the measures proposed in the literature are highly correlated among each other. Consequently, the choice of a particular proxy instead of another should not have a major effect on the overall results of the study. A recent paper by Botosan and Plumlee (2005) assesses the relative merits of five alternative proxies in terms of their association with credible risk proxies. They find that the measure proposed by Easton (2004) is one of the two measures that clearly dominate the other three. They observe that it correlates with a number of risk indicators in the expected direction. This result, combined with the relative simplicity of this measure, made us decide to use this as our proxy for the cost of equity capital. So, following Easton (2004) we calculate the cost of equity capital for year *t* as[5]

$$r_{peg} = \sqrt{\frac{eps_2 - eps_1}{P_0}}$$

where

[4] See, for example, Trombetta (2004)
[5] For the exact derivation of the formula the reader can refer to Easton (2004)

P_0 = price of the stock of the company at the 30th of June of year *t+1*

eps_1 = one year ahead consensus forecast of earnings per share at the 30th of June of year *t+1*

eps_2 = two years ahead consensus forecast of earnings per share at the 30th of June of year *t+1*

Following Botosan and Plumlee (2005) we then calculate the equity risk premium ($R_{PEGPREM}$) by subtracting from the cost of equity capital the risk free rate, proxied by the interest rate on five-year Spanish Treasury bills. $R_{PEGPREM}$ is winsorized at the 3 and 97 percentiles of its distribution.

Disclosure (RINDEX)

As an indicator of the information provided by the company we use the disclosure index prepared by a pool of analysts and published annually by the business magazine "Actualidad Económica". The index is based on the information published by companies in their annual reports. These reports are reviewed by the panel of experts who assign a score to a list of information items. For each company, the scores for each item are then added up to get a global score intended to represent the disclosure policy of the entity. Finally the disclosure index is calculated as the ratio between the actual score of the company and the maximum possible score. Moreover, given that one of the items used to calculate the index explicitly refers to graph usage, we have recalculated the index after removing this item.

In the same way as Botosan and Plumlee (2002) or Nikolaev and Van Lent (2005), we use fractional ranks of the annual report indexes. Firms are ranked from 1 to N for each year and then the rank of each firm is divided by the total number of firms in this year to obtain the fractional ranks.

Graph utilization (GR_PAGE)

Graph utilization was measured by the total number of graphs included by companies in their annual reports scaled by the total number of pages in the annual report. This measure gives us an indication of graph usage intensity in the annual report. Insofar as graphs depicting financial variables may have a stronger effect on users' perceptions and decisions than non-financial graphs, we have also employed two additional variables, accounting for the number of financial and non-financial graphs, respectively.

Graph distortion (GDI) (RGD)

The traditional measure for graph distortion used in previous studies is the Graph Discrepancy Index (GDI). This measure originates from the Lie Factor proposed by Tufte (1983) in the statistical field. The lie factor was first adapted for financial reporting by Taylor and Anderson (1986) and then by Steinbart (1989), who developed the Graph Discrepancy Index.

Graph Discrepancy Index = $\left(\frac{a}{b}-1\right)\times 100$

Where

a = percentage of change in centimeters depicted in graph

b = percentage of change in data

In the absence of distortion, the index takes the value of zero (0), that is, the change portrayed in the graph is the same as that observed in the data. The index would take positive values whenever the trend in the data has been exaggerated and negative values when the trend has been understated. In both cases, the higher the value of the index, the larger the exaggeration or understatement.

This measure has recently been put into question by Mather et al. (2005), who notice that the GDI is not defined when there is no change in data (b = 0) and always takes the value of 100% when the change depicted in the graph is zero (a=0), disregarding the change in data. Additionally, the GDI is highly sensitive to the level of change so that when the data has changed slightly, even a small distortion in the graph leads to a high value for the GDI. In an attempt to overcome some of these limitations, these authors develop a new measure, the Relative Graph Discrepancy index, defined as:

$$RDG = \frac{g_2 - g_3}{g_3}$$

where

$$g_3 = \frac{g_1}{d_1} d_2$$

d_1 = value of first data point (first column)

d_2 = value of last data point (last column)

g_1 = height of first column

g_2 = height of last column.

Both the GDI and the RGD are employed in our study. We calculate mean distortion index for each company by adding the absolute value[6] of the GDI (RGD) corresponding to each individual graph and dividing by the total number of graphs in the annual report. To test our hypotheses we need to isolate those distortions that are favourable to the company. This is done by dividing our distortion measures in two categories: favourable and unfavourable. An example of favourable distortion is the magnification of a positive trend in sales growth. The smoothing of the same positive trend in this variable is an example of unfavourable distortion. Mean favourable GDI (RGD) is calculated by adding the absolute value of each individual graph that is favourably distorted and dividing by the total number of graphs in the annual report. Mean unfavourable GDI (RGD) is calculated in the same way but is based on unfavourable distorted graphs. Finally, we also calculate mean favourable GDI (RGD) for financial and non-financial graphs.

While the GDI accounts for differences between the trend in the data and that depicted in the graph, the RGD is focused on the height of the last data point depicted in the graph and the true height according to the data. The largest differences between the two measures occur at low levels of the RGD. As explained before this measure was designed to overcome the sensitiveness of the GDI to changes in the data. Therefore, in cases where data have changed slightly, even a small distortion in the graph will lead to a high value for the GDI, while the RGD will take a low value. These differences make it difficult the use of similar cut-off points to identify materially distorted graphs. Hence, we decided to use different cut-off points. As for the GDI, Beattie and Jones (1992) observe that distortions of 10% or more (GDI $\geq$10) have a significant impact on users' decisions. Hence, this is one of the cut-off points used in our study. Mather et al. (2005) conclude that an RGD = 0.025 would be similar to a GDI = 5, the cut-off point suggested by Tufte (1983) and used in previous studies. Therefore, we also use the cut-off point suggested by Mather et al. (2005) in our study.

Control variables

i) Beta (BETA)

The Capital Asset Pricing Model (CAPM) predicts a positive association between a stock's market beta and its cost of capital. However, previous studies do not consistently show such an expected

[6] As we are interested in getting an indicator of the level of distortion, absolute values were used in order to avoid offsetting of positive and negative values of the individual GDI's (RGD's).

relationship. While Botosan (1997) or Hail (2002) confirm the expected positive sign for the US and Swiss market, respectively, Gebhardt *et al.* (2001) observe the expected sign but beta loses its significance when they add their industry measure.

We obtain beta of each stock using a Market Model for the 60 months prior to June of t+1, requiring, at least, 12 monthly return observations.

ii) Size (LMKVL)

Firm size is often used as a proxy for availability of information, given that bigger firms are expected to provide more information than smaller ones. For this reason future earnings are perceived by investors to have lower risk, and this implies a lower cost of capital. We expect this effect to be even stronger in a developing market such as the Spanish stock market. Therefore, we expect a lower cost of capital for larger firms than for smaller ones. As a proxy for size we use the natural logarithm of the market value of equity at the 31^{st} of December of year *t*.

iii) Leverage (LEV)

We measure leverage as the ration between long term debt and the market value of equity at the 31^{st} of December of year *t*. Modigliani and Miller (1958) predict that the cost of equity should be increasing in the amount of debt in the financial structure of the company. This prediction is supported by results of studies such as those by Gebhardt et al. (2001) or Botosan and Plumlee (2005). In line with previous literature we expect to find a negative relationship between leverage and the cost of equity capital.

iv) Book-to-price ratio (BP)

This is the ratio between book value of equity and market value of equity at the 31^{st} of December of year *t*. Prior research documents a positive association between the book-to-price ratio and average realized returns (e.g. Fama and French (1993), Davis et al. (2000)) as well as different *ex-ante* measures of the cost of equity (e.g. Gebhardt et al. (2001), Botosan and Plumlee (2005)). These results are interpreted as evidence that the book-to-price proxies for risk.

v) Volatility of Profitability (V_NI)

Based on practitioners' consideration of the variability of earnings, Gebhardt et al. (2001) argue that it can be regarded as a source of risk. In our study, the volatility of the profitability of the firm is calculated as the standard deviation of net income scaled by mean of net income over a period of five years ending at December of year t.

4 RESULTS

Descriptive statistics are presented in Table 1, where it can be seen that graphs are widely used in their annual reports by firms included in our sample. Mean number of graphs per annual report is 16, although a high variability is observed; while some companies do not make use graphs (8% of those in our sample), others include up to 84 in their annual report. A large proportion of these graphs are materially distorted, being most of them distorted to portray a more favourable image of the company. Mean favourable RGD (GDI) is higher than 0.025 (10%) for 38% (35%) of the companies included in our study; that is, more than one third of the companies in our sample have favourably and materially distorted the graphs included in their annual reports. Although unfavourable distortions are less frequent, mean unfavourable RGD (GDI) is higher than 0.025 (10%) for 11% (12%) of the companies in our sample.

[Insert Table 1 around here]

The correlation matrix presented in Table 2 shows that our measure of the cost of equity is significantly correlated with all the risk proxies included in our study. As expected, the cost of equity is positively related to beta, book-to-price ratio, leverage and earnings variability and negatively related to corporate size. Table 2 also shows a significant negative correlation between the cost of equity and our indicators of disclosure and graph distortion. Finally, positive significant correlations are observed between disclosure, graph usage and graph distortion. These correlations suggest that those companies that show more concern for transparency (i.e. those that disclose more voluntary information) made a wider use of graphs in their annual reports and distort them significantly more.

[Insert Table 2 around here]

To asses the validity of our measure of the cost of capital, we start our analysis by estimating a model similar to that developed by Botosan and Plumlee (2005) and used to test the relation between the cost of capital and a number of indicators of firm risk. We estimate the following equation:

$R_{PEGPREM\ i(t+1)}$ = intercept + β_1LMKVL$_{it}$ + β_2BETA$_{it}$ + β_3BP$_{it}$ + β_4 LEV$_{it}$ + β_5 V_NI$_{it}$ + ε_{it}, (1)

Where:

$R_{PEGPREM}$ = Proxy for the risk premium.

LMKVL = Natural logarithm of market value of equity on December 31st of the year t.

BETA = CAPM beta over the 60 months prior to June of year t+1.

BP = book value of equity scaled by market value of equity on December 31st of the year t.

LEV = Long term debt scaled by market value of equity on December 31st of the year t.

V_NI = standard deviation of net income scaled by mean of net income over a period of five years ending at December of year t.

We estimate all our models using the fixed effects technique. The importance to use proper panel data estimation techniques when dealing with financial pooled data has been stressed by two recent papers by Nikolaev and Van Lent (2005) and Petersen (2005). If simple OLS are used to compute the estimated coefficients, their significance is very likely to be overstated. A traditional way to correct for this problem is to estimate yearly regressions and then take the average of the estimated coefficients, evaluating the statistical significance of these estimates by using the Fama-Macbeth t-statistic. This corrects for cross-sectional dependence, but not for time dependence. Nikolaev and Van Lent (2005) show how important firm effects can be when studying cost of capital determinants for pooled sample of companies. This is the reason why we decided to estimate our model by using the fixed effects technique.

Results of estimating equation (1) are presented in Table 3, Panel A. The coefficient of leverage and variability of profitability have the expected sign and are statistically significant. The fact that the coefficients of beta, size and the book-to-price ratio are not statistically significantly different from zero could be due to the use of the fixed effect estimation technique. Beta and the book-to-price are risk factors that are specific for each company. Given that with the adopted estimation technique a specific intercept is estimated for each company, it is highly likely that the effect of these variables is already captured by these constants. Overall our results confirm those already obtained for the Spanish market by Espinosa and Trombetta (2005) and support the validity of the cost of equity capital measure.

[Insert Table 3 around here]

We now move to the main part of our empirical study and insert in our specification the variables related to the presentation of graphs in the annual report. First of all, we add the index of disclosure and an indicator of graph usage (i.e. number of graphs scaled by the number of pages in the annual report). We also add an indicator of both favourable and unfavourable graph distortion, i.e. the mean favourable and unfavourable RGD index for the graphs included by companies in their annual reports. Finally, because of the nature of the information provided in the distorted graphs (information that is usually included in the financial statements or other parts of the annual report) an interaction between the information provided and its distortion could be expected. Therefore, we include an interaction term and we estimated the following equation:

$$R_{PEGPREM\ it+1} = \text{intercept} + \beta_1\ LMKVL_{it} + \beta_2\ BETA_{it} + \beta_3\ BP_{it} + \beta_4\ LEV_{it} + + \beta_5\ V\_NI_{it} + \\ +\beta_6\ RINDEX\_G_{it} + \beta_7\ GR\_PAGE_{it} + \beta_8\ RGDFAV\_D_{it} + \beta_9\ RGDFAV\_D_{it}{*}RINDEX_{it} + \\ +\beta_{10}\ RGDUNF\_D_{it} + \beta_{11}\ RGDUNF\_D_{it}{*}RINDEX_{it} + \varepsilon_{it} \quad (2)$$

Where all the variables are defined as before with the exception of:

RINDEX = Fractional rank of the disclosure index prepared by Actualidad Económica for year t, adjusted by eliminating an item referred to the utilization of graphs in corporate annual reports.

GR_PAGE= Total number of graphs scaled by total number of pages in the annual report of year t.

RGDFAV_D = a dichotomy variable which takes the value of one when mean favourable graph distortion in the annual report (year t), measured by the RGD index, is higher that 0.025 and the value of zero otherwise.

RGDUNF_D = a dichotomy variable which takes the value of one when mean unfavourable graph distortion in the annual report (year t), measured by the RGD index, is higher that 0.025 and the value of zero otherwise.

The results presented in Table 3 (Panel B) show that while graph usage does not have an impact on users' perceptions, graph distortion plays a crucial role in determining the cost of equity capital. Despite the advantages attributed to graphs in communicating information, our results suggest that users' perceptions of corporate performance are not affected by the inclusion of graphs in corporate annual reports[7]. Therefore, hypothesis H1 is rejected. This does not mean that graphs are ignored by

[7] Equation (2) was also estimated by including the number of financial graphs, instead of the total number of graphs, and the proportion of financial graphs (total number of financial graphs scaled by total number of graphs). Results (unreported) remain almost invariable. Lack of significance of our measure of graph usage might be explained by its correlation with the disclosure index. Therefore, we estimate equation (2) after eliminating the disclosure index and the

users, but that users get the same information about the company whether graphs are or are not provided in the annual report. This is not a surprising result bearing in mind that our measure of the cost of equity is based on the estimation made by analysts, that is, by highly sophisticated users of financial information. Although users with a lower level of expertise may obtain information from graphs that they would not be able to extract from financial statements, it is unlikely that this happens to sophisticated users.

Nonetheless, results presented in Table 3 show that perceptions of sophisticated users, such as analysts, are significantly affected by graph distortion. Companies presenting favourably distorted graphs (RGDFAV_D = 1) get a fixed reduction in their cost of capital because of the distortion. This result confirms our hypothesis H2. As suggested by the previous literature, by means of distorted graphs users seem to perceive a better image of corporate performance than warranted.

However, for the same firms, the coefficient of the interaction term is positive and statistically significant. This result confirms our hypothesis H3 stating that the effect of disclosure on the cost of equity is affected by graph distortion. In particular when graphs are favourably distorted, an increased level of disclosure raises the cost of equity. That is, the provision of information helps reducing the cost of equity only when companies provide fairly constructed graphs[8].

We interpret these results as evidence that the provision of additional information allow users to detect graph distortion. If graphs are found to be favourably distorted, the credibility of the information is undermined and the cost of equity capital is raised. When graphs are distorted in an unfavourable way for the company (RGDUNF_D = 1), the distortion does not affect the cost of equity capital.

Because of the nature of the information represented, the distortion of graphs depicting financial variables is expected to have a higher impact on users' perceptions of corporate performance than the distortion of non-financial graphs. Therefore, we re-estimated equation (3) replacing the RGDFAV dichotomy variable by two dichotomous variables accounting for distortion of financial and non-financial graphs respectively. The following equation is estimated:

$$R_{PEGPREM\ it+1} = \text{intercept} + \beta_1\ LMKVL_{it} + \beta_2\ BETA_{it} + \beta_3\ BP_{it} + \beta_4\ LEV_{it} + + \beta_5\ V\_NI_{it} + $$
$$+\beta_6\ RINDEX_{it} + \beta_7\ GR\_PAGE_{it} + \beta_8\ RGDFFAV\_D_{it} + \beta_9\ RGDFFAV\_D_{it}*RINDEX_{it} +$$
$$+\beta_{10} RGDRFAV\_D_{it} + \beta_{11}\ RGDRFAV\_D_{it}*RINDEX_{it} + \varepsilon_{it,} \qquad (3)$$

indicators of graph distortion as well as the interaction terms. Results (unreported) show that graph usage does not have an impact on the cost of equity.

[8] Similar results (unreported) are obtained when we use the original variables, instead of the dummies, in estimating equation (2).

Where all the variables are defined as before with the exception of:

RGDFFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of financial graphs in the annual report (year t), measure by the RGD index is higher that 0.025 and the value of zero otherwise.

RGDRFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of non- financial graphs in the annual report (year t), measure by the RGD index is higher that 0.025 and the value of zero otherwise.

Results are presented in table 3, Panel C. It can be observed that the relationship between graph distortion, disclosure and the cost of equity is driven by distortion of financial graphs. Neither distortion of non-financial graphs nor its interaction with corporate disclosure has a significant effect on the cost of equity. Although a significant proportion of graphs included by companies in their annual reports depict non-financial variables (30% in our study), results show that it is the distortion of financial graphs what has an impact on users' perceptions of corporate performance.

In order to understand better the relation between disclosure, graph distortion and the cost of equity it is useful to represent it in a graph. This is done in figure 1. The two lines represent the relationship between the cost of equity capital and the level of disclosure for companies with distorted graphs and companies with non-distorted graphs. The figure is constructed assuming a fixed level of the other control variables.

[Insert Figure 1 around here]

For those companies that did not distort graphs, the coefficient on RINDEX is negative. For those entities that present distorted graphs the coefficient of RINDEX is given by the sum of β_6 and β_9 and is positive. According to our results these two lines must cross at RINDEX* and divide the plane in two regions.

For high levels of disclosure (RINDEX > RINDEX*) companies that did not distort graphs get a lower cost of equity than those distorting graphs.

For low levels of disclosure (RINDEX < RINDEX*) companies distorting graphs get a lower cost of equity than their counterparts.

These results suggest that at low levels of disclosure users are deceived by distorted graphs and get a more favourable perception of corporate performance, which obviously reduces the risk premium they require on their investments. Nonetheless, as the level of disclosure increases, information seems to be offsetting the bias introduced by distorted graphs. This explains the positive association between disclosure and the cost of equity for these companies. At low levels of disclosure users' perceptions seem to be heavily influenced by distorted graphs but, as the level of information provided increases, perceptions are corrected downward and approximate the image portrayed in corporate financial statements. The fact that at high levels of disclosure distorting companies face a higher cost of equity suggests that at this level of disclosure distortion was detected by users who penalise the company for distortion and require a higher risk premium. As suggested by Schmid (1992) distorted graphs threaten the credibility of the entire report containing such graphs. Hence, once distortion is detected, users would perceive a higher risk associated to their investments and would require a higher premium.

According to our results, the interaction between transparency and distortion defines the four disclosure strategies depicted in Figure 2:

[Insert Figure 2 around here]

While transparent companies benefit from graph integrity, opaque entities take advantage of graph distortion by deceiving annual reports' users.

For our sample of companies RINDEX*=0.77. If we classify our firm-year observations according to their disclosure strategy, we observe an important proportion (14%) of observations in the top right corner of the matrix, i.e. with a high level of disclosure and materially distorted graphs included in their annual reports. Involuntary distortion may be the reason for this apparently irrational behaviour. In fact, out of the 264 companies in our study, 17 included both favourable and unfavourable distorted graphs in the same annual report and 12 companies have only unfavourable distorted graphs. These figures suggest that graph distortion had not always been intentional.

Sensitivity Analysis.

Prior literature documents a positive association between corporate performance and graph distortion. Therefore, the effect of graph distortion on the cost of equity that we have observed in this study could be driven by the fact that distorting companies are also those with the highest performance. To test for the robustness of our results, we re-estimate equations (2) and (3) after adding a measure of corporate performance (i.e. ROA). Results, presented in Table 4 (panels A and

B), show that although corporate performance is a highly significant variable in explaining the cost of equity, its inclusion in the model does not change qualitatively our results. That is, the effect of graph distortion on the cost of equity remains after controlling for corporate performance[9].

Previous research also shows the existence of a positive relationship between the cost of equity capital and the quality of accruals. Hence, the effect of graph distortion on the cost of equity observed in this study could be reflecting this association. Therefore, we test for the robustness of our results by adding a measure of accruals quality (i.e. discretionary accruals) to our model. To obtain our measure of discretionary accruals we use the model developed by Dechow and Dichev (2002) and modified by McNichols (2002). We estimate the following equation for each industry and year[10]:

$$TCA_{it} = b_0 + b_1\, CFO_{it-1} + b_2\, CFO_{it} + b_3\, CFO_{it+1} + b_4\, \Delta REV_{it} + b_5\, PPE_{it} + \varepsilon_{it} \qquad (4)$$

Where,

$TCA_{it} = (\Delta CA_{it} - \Delta Cash_{it}) - (\Delta CL_{it} - \Delta STDEBT_{it})$

ΔCA_{it} = change in current assets between year t-1 and year t

$\Delta Cash_{it}$= change in cash between year t-1 and year t

ΔCL_{it}= change in current liabilities between year t-1 and year t

$\Delta STDEBT_{it}$= change in the current portion of long term debt between year t-1 and year t

$CFO_{iit} = NIBE_{it} - TA_{it}$

$NIBE_{it}$ = Net income before extraordinary items

$TA_{it} = (\Delta CA_{it} - \Delta Cash_{it}) - (\Delta CL_{it} - \Delta STDEBT_{it}) - DEPN_{it}$

$DEPN_{it}$ = Depreciation

$\Delta REV_{it=}$ change in revenue between year t-1 and year t

$PPE_{it=}$ gross value of tangible fixed assets

Discretionary current accruals (DCA) are the residuals of these regressions. We re-estimate equations (2) and (3) after adding this measure of accruals quality. Results, presented in Table (5, panels C and D), remain qualitatively invariable. Our measure of discretionary current accruals, as expected, has a positive impact on the cost of equity, i.e., investors require a higher risk premium to those companies with higher (positive) discretionary accruals. Nonetheless, the inclusion of this

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[9] Results remain almost invariable when we use ROE instead of ROA in estimating equations (2) and (3).
[10] All variables are scaled by average assets

measure does not remove the effects of graph distortion or the interaction between disclosure and graph distortion on the cost of equity[11].

Finally, our results could be sensitive to the measure of graph distortion used in our analysis. As explained in Section 2.3, the Relative Graph Discrepancy index (RGD) is a measure recently developed by Mather et al. (2005), but previous researchers relied on another measure of graph distortion, the Graph Discrepancy Index (GDI). Therefore, we decided to estimate equation (2) and (3) using the GDI as a measure of graph distortion and relying on two different cut-off points (GDI = 5 and GDI = 10) to distinguish between distorting and non-distorting companies. Results, presented in the table 4, show that the relationship between disclosure, graph distortion and the cost of equity in our sample is not dependent on the measure of graph distortion used or the cut-off point chosen to distinguish between distorting and non-distorting companies.

5 CONCLUSIONS

In this study we have examined the relation between disclosure and the cost of equity capital, taking into account graph utilization and graph distortion in corporate annual reports as possible conditioning factors. Results show that it is favourable graph distortion rather than the inclusion of graphs in annual reports that has a significant impact on users' decision making processes. It is not the strength of graphs in facilitating the use and comprehension of information what makes them valuable to the disclosing company, but its ability to attract and focus users' attention on those issues that the company wants to highlight. We have to add that graphs can be easily distorted to portray a more favourable image of the company and, as they are not reviewed by auditors, the risk that users detect such distortion is low.

We have also observed that the impact of distortion on the cost of capital depends on the level of information provided and the effect of information on the cost of equity depends on the integrity of the graphs included in the annual report. Therefore, information and graph integrity interact. Our results extend previous research on the relation between disclosure and the cost of equity by showing that users' decisions on the capital market are not only influenced by the amount of information provided by companies but also by the reliability of the format used to present that information. Accordingly, some doubts arise regarding the usefulness of disclosure indexes in measuring the disclosure policy of the entity insofar as aspects related to the reliability of the information disclosed are not accounted for by the index but have a significant impact on users' decision making processes.

[11] The effect of these variables remains (results unreported) when equations (2) and (3) are re-estimated after including a measure of total discretionary accruals obtained by using the Jones model and the modified version of the Jones model.

The results of our study suggest that graphs are being used by investors in their decision making processes. If this was not the case, then the cost of capital would not be significantly different between those companies that have distorted their graphs and those that presented graphs fairly constructed. At low levels of disclosure, users do not seem to be detecting the distortion insofar as their perceptions regarding financial/economic position of the company are influenced by distorted graphs. We have to bear in mind that the vast majority of distorted graphs exaggerate the trend in the variable depicted. Therefore, it is difficult to realise the graph has been distorted when the variation depicted is in the expected direction according to the numerical data. Moreover, it is even possible that, in some cases, those charged with the task of preparing the graphs to be included in the annual report do not realise that graphs are distorted. Nonetheless, intentionally or unintentionally, by means of graphs companies are influencing users' perceptions regarding their economic and financial position and getting a reduction in their cost of capital. Therefore, the utilization of graphs in corporate annual reports along with its distortion goes further than the achievement of visually appealing corporate reports and has important economic consequences. Accordingly, regulators and auditors should be as concerned about the reliability of graphical information as they are about the numerical data. Although in other areas of financial reporting we can expect that market pressures lead to higher disclosure level, without the intervention of regulators[12], in the case of graph reliability users do not seem to be detecting distortion, at least at low levels of disclosure; instead of penalising it, their decisions constitute an incentive to further distortions of financial graphs. Hence, regulation and the involvement of auditors seem to be necessary to eliminate graph distortion, an idea already pointed by Steinbart (1989) and Beattie and Jones (2002) almost two decades ago.

[12] Research has shown the existence of a positive association between disclosure and U.S. listing for European and Asian- Pacific companies (Khanna et al., 2004), suggesting that companies respond to U.S. market pressures by increasing disclosure.

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Table 1: Descriptive Statistics

	Mean	*Std. Dev.*	*Minimum*	*Maximum*	*25th perce.*	*50th perc.*	*75th perc.*
$R_{PEGPREM}$	5.829	3.889	0	16.05	3.134	5.128	7.682
LMKVL	13.900	1.751	9.519	18.209	12.682	13.917	14.829
BETA	1.125	0.549	0.034	4.594	0.773	1.038	1.348
BP	0.637	0.403	0.049	3.018	0.362	0.558	0.818
LEV	0.398	0.603	0	6.315	0.065	0.221	0.469
V_NI	0.579	1.646	-2.670	19.930	0.180	0.320	0.558
GRAPH	16.087	15.461	0	84	4.25	12	23
GR_PAGE	0.117	0.097	0	0.438	0.046	0.093	0.157
RINDEX	0.514	0.289	0.015	1	0.253	0.500	0.759
RGDFAV	0.106	0.307	0	3.685	0	0	0.095
RGDUNF	0.012	0.062	0	0.878	0	0	0
RGDFFAV	0.108	0.326	0	3.685	0	0	0.068
RGDRFAV	0.043	0.151	0	1.5	0	0	0

$R_{PEGPREM}$ = Estimated risk premium = $R_{PEG} - r_f$
LMKVL = Natural logarithm of market value of equity on December 31st of year t.
BETA = Capital market beta estimated via the market model with a minimum of 12 monthly returns over the 60 months prior to June of year t+1.
LEV = Long term debt scaled by market value of equity on December 31st of year t.
BP = Book value of equity scaled by market value of equity on December 31st of year t.
V_NI = standard deviation of net income scaled by mean of net income over a period of five years ending at December of year t.
RINDEX = Fractional rank of the disclosure index prepared by Actualidad Económica for year t, adjusted by eliminating an item referred to the utilization of graphs in corporate annual reports.
GRAPH= Total number of graphs in the annual report of year t.
GR_PAGE = Total number of graphs scaled by total number of pages in the annual report of year t.
RGDFAV = Mean Relative Graph Discrepancy index of graphs which distortion is favourable to the company. This index measures graph distortion and (0) means no distortion or distortion unfavourable to the company.
RGDUNF = Mean Relative Graph Discrepancy index of graphs which distortion is unfavourable to the company. This index measures graph distortion and (0) means no distortion or distortion favourable to the company.
RGDFFAV = Mean Relative Graph Discrepancy index of favourable distorted financial graphs.
RGDRFAV= Mean Relative Graph Discrepancy index of favourable distorted non-financial graphs.

Table 2: Correlation Matrix

	$R_{PEGPREM}$	LMKVL	BETA	BP	LEV	V_NI	GR_PAGE	RINDEX	RGDFAV	RGDUNF	RGDFFAV
LMKVL	-0.269										
	(0.000)										
BETA	0.228	-0.260									
	(0.000)	(0.000)									
BP	0.363	-0.447	0.091								
	(0.000)	(0.000)	(0.142)								
LEV	0.192	0.178	0.034	0.397							
	(0.002)	(0.004)	(0.583)	(0.000)							
V_NI	0.174	-0.148	0.141	0.099	-0.024						
	(0.004)	(0.016)	(0.021)	(0.110)	(0.701)						
GR_PAGE	0.048	0.320	-0.102	0.095	0.187	-0.002					
	(0.442)	(0.000)	(0.098)	(0.124)	(0.002)	(0.968)					
RINDEX	-0.214	0.487	0.001	-0.051	0.246	-0.046	0.395				
	(0.000)	(0.000)	(0.983)	(0.408)	(0.000)	(0.460)	(0.000)				
RGDFAV	-0.173	0.211	0.046	-0.031	0.071	-0.102	0.247	0.207			
	(0.005)	(0.001)	(0.459)	(0.618)	(0.251)	(0.097)	(0.000)	(0.001)			
RGDUNF	-0.077	0.260	-0.020	-0.067	0.094	-0.030	0.315	0.237	0.334		
	(0.215)	(0.000)	(0.745)	(0.278)	(0.128)	(0.628)	(0.000)	(0.000)	(0.000)		
RGDFFAV	-0.200	0.165	0.042	-0.044	0.026	-0.094	0.181	0.167	0.874	0.270	
	(0.001)	(0.007)	(0.493)	(0.477)	(0.680)	(0.126)	(0.003)	(0.007)	(0.000)	(0.000)	
RGDRFAV	-0.106	0.255	-0.001	-0.016	0.119	-0.057	0.331	0.271	0.595	0.309	0.304
	(0.086)	(0.000)	(0.985)	(0.799)	(0.054)	(0.353)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 2 (continued)

Table reports Spearman correlations. Significance levels are shown in brackets.
$R_{PEGPREM}$ = Estimated risk premium = $R_{PEG} - r_f$
LMKVL = Natural logarithm of market value of equity on December 31st of year t.
BETA = Capital market beta estimated via the market model with a minimum of 12 monthly returns over the 60 months prior to June of year t+1.
LEV = Long term debt scaled by market value of equity on December 31st of year t.
BP = Book value of equity scaled by market value of equity on December 31st of year t.
V_NI = standard deviation of net income scaled by mean of net income over a period of five years ending at December of year t.
RINDEX = Fractional rank of the disclosure index prepared by Actualidad Económica for year t, adjusted by eliminating an item referred to the utilization of graphs in corporate annual reports.
GR_PAGE = Total number of graphs scaled by total number of pages in the annual report of year t.
RGDFAV = Mean Relative Graph Discrepancy index of graphs which distortion is favourable to the company. This index measures graph distortion and (0) means no distortion or unfavourable distortion to the company.
RGDUNF = Mean Relative Graph Discrepancy index of graphs which distortion is unfavourable to the company. This index measures graph distortion and (0) means no distortion or favourable distortion to the company.
RGDFFAV = Mean Relative Graph Discrepancy index of favourable distorted financial graphs.
RGDRFAV= Mean Relative Graph Discrepancy index of favourable distorted non-financial graphs.

Table 3: Regression of the cost of equity ($R_{PEGPREM}$) on risk proxies, disclosure, graphs and graph distortion using fixed effects

Panel A: $R_{PEGPREM\ it+1}$ = intercept + β_1LMKVL$_{it}$ + β_2BETA$_{it}$ + β_3BP$_{it}$ + β_4 LEV$_{it}$ + β_5 V_NI$_{it}$ + ε_{it},

Panel B: $R_{PEGPREM\ it+1}$ = intercept + β_1LMKVL$_{it}$ + β_2 BETA$_{it}$ + β_3 BP$_{it}$ + β_4 LEV$_{it}$ + + β_5 V_NI$_{it}$ + β_6 RINDEX$_{it}$+β_7 GR_PAGE$_{it}$ + β_8 RGDFAV_D$_{it}$ + β_9 RGDFAV_D$_{it}$*RINDEX$_{it}$+ β_{10} RGDUNF_D$_{it}$ + β_{11} RGDUNF_D$_{it}$*RINDEX$_{it}$ + $\varepsilon_{it,}$

Panel C: $R_{PEGPREM\ it+1}$ = intercept + β_1 LMKVL$_{it}$ + β_2 BETA$_{it}$ + β_3 BP$_{it}$ + β_4 LEV$_{it}$ + + β_5 V_NI$_{it}$ + β_6 RINDEX$_{it}$ + β_7 GR_PAGE$_{it}$ + β_8 RGDFFAV_D$_{it}$ + β_9 RGDFFAV_D$_{it}$*RINDEX$_{it}$+ β_{10}RGDRFAV_D$_{it}$ + β_{11} RGDRFAV_D$_{it}$*RINDEX$_{it}$ + $\varepsilon_{it,}$

	Panel A		*Panel B*		*Panel C*	
Variable	***Coeff.***	***P-val***	***Coeff.***	***P-val***	***Coeff.***	***P-val***
LMKVL	0.632	0.382	0.327	0.650	0.386	0.590
BETA	-0.180	0.724	-0.163	0.752	-0.088	0.864
BP	0.543	0.541	0.056	0.946	0.013	0.987
LEV	2.263	0.000	2.156	0.000	2.146	0.000
V_NI	0.231	0.047	0.263	0.018	0.269	0.017
RINDEX			-2.376	0.064	-2.277	0.065
GR_PAGE			0.605	0.831	1.067	0.689
RGDFAV_D			-3.500	0.000		
RGDFAV_D*RINDEX			4.540	0.002		
RGDUNF_D			1.722	0.263		
RGDUNF_D*RINDEX			-2.843	0.191		
RGDFFAV_D					-3.507	0.001
RGDFFAV_D*RINDEX					3.544	0.016
RGDRFAV_D					-1.822	0.176
RGDRFAV_D*RINDEX					2.364	0.189
Adj. R^2	0.508		0.522		0.533	

$R_{PEGPREM}$ = Estimated risk premium = $R_{PEG} - r_f$
LMKVL = Natural logarithm of market value of equity on December 31[st] of year t.
BETA = Capital market beta estimated via the market model with a minimum of 12 monthly returns over the 60 months prior to June of year t+1.
LEV = Long term debt scaled by market value of equity on December 31[st] of year t.
BP = Book value of equity scaled by market value of equity on December 31[st] of year t.
V_NI = standard deviation of net income scaled by mean of net income over a period of five years ending at December of year t.
RINDEX = Fractional rank of the disclosure index prepared by Actualidad Económica for year t, adjusted by eliminating an item referred to the utilization of graphs in corporate annual reports.
GR_PAGE= Total number of graphs scaled by total number of pages in the annual report of year t.
RGDFAV_D = a dichotomy variable which takes the value of one when mean favourable graph distortion in the annual report (year t), measured by the RGD index, is higher that 0.025 and the value of zero otherwise.
RGDUNF_D = a dichotomy variable which takes the value of one when mean unfavourable graph distortion in the annual report (year t), measured by the RGD index, is higher that 0.025 and the value of zero otherwise.
RGDFFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of financial graphs in the annual report (year t), measure by the RGD index is higher that 0.025 and the value of zero otherwise.
RGDRFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of non- financial graphs in the annual report (year t), measure by the RGD index is higher that 0.025 and the value of zero otherwise.

Table 4: Regression of the cost of equity ($R_{PEGPREM}$) on risk proxies, disclosure, and graph distortion controlling for corporate performance and accruals quality

Panel A: $R_{PEGPREM\ it+1}$ = intercept + β_1LMKVL$_{it}$ + β_2 BETA$_{it}$ + β_3 BP$_{it}$ + β_4 LEV$_{it}$ + + β_5 V_NI$_{it}$ + β_6 RINDEX$_{it}$+β_7 GR_PAGE$_{it}$ + β_8 RGDFAV_D$_{it}$ + β_9 RGDFAV_D$_{it}$*RINDEX$_{it}$+ β_{10} RGDUNF_D$_{it}$ + β_{11} RGDUNF_D$_{it}$*RINDEX$_{it}$ + β_{12} ROA$_{it}$ + $\varepsilon_{it,}$

Panel B: $R_{PEGPREM\ it+1}$ = intercept + β_1 LMKVL$_{it}$ + β_2 BETA$_{it}$ + β_3 BP$_{it}$ + β_4 LEV$_{it}$ + + β_5 V_NI$_{it}$ + β_6 RINDEX$_{it}$ + β_7 GR_PAGE$_{it}$ + β_8 RGDFFAV_D$_{it}$ + β_9 RGDFFAV_D$_{it}$*RINDEX$_{it}$+ β_{10}RGDRFAV_D$_{it}$ + β_{11} RGDRFAV_D$_{it}$*RINDEX$_{it +}$ β_{12} ROA$_{it}$ + $\varepsilon_{it,}$

Panel C: $R_{PEGPREM\ it+1}$ = intercept + β_1LMKVL$_{it}$ + β_2 BETA$_{it}$ + β_3 BP$_{it}$ + β_4 LEV$_{it}$ + + β_5 V_NI$_{it}$ + β_6 RINDEX$_{it}$+β_7 GR_PAGE$_{it}$ + β_8 RGDFAV_D$_{it}$ + β_9 RGDFAV_D$_{it}$*RINDEX$_{it}$+ β_{10} RGDUNF_D$_{it}$ + β_{11} RGDUNF_D$_{it}$*RINDEX$_{it}$ + β_{12} ROA$_{it}$ + β_{13} CDA$_{it}$ + $\varepsilon_{it,}$

Panel D: $R_{PEGPREM\ it+1}$ = intercept + β_1 LMKVL$_{it}$ + β_2 BETA$_{it}$ + β_3 BP$_{it}$ + β_4 LEV$_{it}$ + + β_5 V_NI$_{it}$ + β_6 RINDEX$_{it}$ + β_7 GR_PAGE$_{it}$ + β_8 RGDFFAV_D$_{it}$ + β_9 RGDFFAV_D$_{it}$*RINDEX$_{it}$+ β_{10}RGDRFAV_D$_{it}$ + β_{11} RGDRFAV_D$_{it}$*RINDEX$_{it +}$ β_{12} ROA$_{it}$ + β_{13} CDA$_{it}$ + $\varepsilon_{it,}$

	Panel A		***Panel B***		***Panel C***		***Panel D***	
Variable	***Coeff.***	***P-val***	***Coeff.***	***P-val***	***Coeff.***	***P-val***	***Coeff.***	***P-val***
LMKVL	0.730	0.275	0.754	0.261	0.784	0.272	0.906	0.207
BETA	-0.169	0.726	-0.114	0.814	-0.361	0.447	-0.275	0.562
BP	0.415	0.586	0.346	0.652	0.779	0.513	0.858	0.485
LEV	1.583	0.003	1.600	0.003	1.520	0.008	1.574	0.006
V_NI	0.180	0.194	0.190	0.163	0.162	0.260	0.174	0.219
RINDEX	-2.339	0.061	-2.193	0.070	-2.351	0.073	-2.248	0.077
GR_PAGE	2.214	0.391	2.355	0.348	1.525	0.592	1.899	0.496
RGDFAV_D	-3.266	0.000			-3.388	0.000		
RGDFAV_D*RINDEX	4.302	0.002			4.624	0.001		
RGDUNF_D	1.358	0.391			1.853	0.254		
RGDUNF_D*RINDEX	-2.203	0.332			-3.237	0.188		
RGDFFAV_D			-2.953	0.003			-3.113	0.003
RGDFFAV_D*RINDEX			3.011	0.038			3.346	0.049
RGDRFAV_D			-1.829	0.156			-1.628	0.273
RGDRFAV_D*RINDEX			2.551	0.145			2.609	0.239
ROA	-0.252	0.000	-0.239	0.000	-0.274	0.000	-0.260	0.000
CDA					5.176	0.033	4.230	0.078
Adj. R^2	0.567		0.574		0.589		0.592	

$R_{PEGPREM}$ = Estimated risk premium = $R_{PEG} - r_f$
LMKVL = Natural logarithm of market value of equity on December 31st of year t.
BETA = Capital market beta estimated via the market model with a minimum of 12 monthly returns over the 60 months prior to June of year t+1.
LEV = Long term debt scaled by market value of equity on December 31st of year t.
BP = Book value of equity scaled by market value of equity on December 31st of year t.
V_NI = standard deviation of net income scaled by mean of net income over a period of five years ending at December of year t.
RINDEX = Fractional rank of the disclosure index prepared by Actualidad Económica for year t, adjusted by eliminating an item referred to the utilization of graphs in corporate annual reports.
GR_PAGE= Total number of graphs scaled by total number of pages in the annual report of year t.
RGDFAV_D = a dichotomy variable which takes the value of one when mean favourable graph distortion in the annual report (year t), measured by the RGD index, is higher that 0.025 and the value of zero otherwise.
RGDUNF_D = a dichotomy variable which takes the value of one when mean unfavourable graph distortion in the annual report (year t), measured by the RGD index, is higher that 0.025 and the value of zero otherwise.

RGDFFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of financial graphs in the annual report (year t), measure by the RGD index is higher that 0.025 and the value of zero otherwise.
RGDRFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of non- financial graphs in the annual report (year t), measure by the RGD index is higher that 0.025 and the value of zero otherwise.
ROA = Return on total assets on December 31st of year t
CDA = Current discretionary accruals estimated by using the model developed by Dechow and Dichev (2002) as modified by McNichols (2002)

Table 5: Regression of the cost of equity ($R_{PEGPREM}$) on risk proxies, disclosure, graphs and graph distortion (measured by GDI) using fixed effects

Panel A: $R_{PEGPREM\ it+1}$ = intercept + β_1 $LMKVL_{it}$ + β_2 $BETA_{it}$ + β_3 BP_{it} + β_4 LEV_{it} + + β_5 V_NI_{it} + β_6 $RINDEX_{it}$ + $\beta_7$$GR_PAGE_{it}$ + β_8 $GDIFAV\_D_{it}$ + β_9 $GDIFAV\_D_{it}$*$RINDEX_{it}$+ β_{10} $GDIUNF\_D_{it}$ + β_{11} $GDIUNF\_D_{it}$*$RINDEX_{it}$ + $\varepsilon_{it,}$

Panel B: $R_{PEGPREM\ it+1}$ = intercept + β_1 $LMKVL_{it}$ + β_2 $BETA_{it}$ + β_3 BP_{it} + β_4 LEV_{it} + + $\beta_5$$V_NI_{it}$ + β_6 $RINDEX_{it}$+ β_7 GR_PAGE_{it} + β_8 $GDIFFAV\_D_{it}$ + β_9 $GDIFFAV\_D_{it}$*$RINDEX_{it}$+ $\beta_{10}$$GDIRFAV_D_{it}$ + β_{11} $GDIRFAV\_D_{it}$*$RINDEX_{it}$ + $\varepsilon_{it,}$

	Panel A				***Panel B***			
	Cut-off point: GDI = 5		***Cut-off point: GDI = 10***		***Cut-off point: GDI = 5***		***Cut-off point: GDI = 10***	
Variable	***Coeff.***	***P-val***	***Coeff.***	***P-val***	***Coeff.***	***P-val***	***Coeff.***	***P-val***
LMKVL	0.318	0.659	0.411	0.568	0.360	0.616	0.315	0.661
BETA	-0.180	0.728	-0.154	0.763	-0.111	0.828	-0.074	0.887
BP	0.113	0.889	0.179	0.827	0.068	0.934	-0.049	0.952
LEV	2.158	0.000	2.187	0.000	2.145	0.000	2.125	0.000
V_NI	0.263	0.023	0.257	0.028	0.258	0.026	0.257	0.024
RINDEX	-2.700	0.065	-3.050	0.021	-2.651	0.053	-2.163	0.094
GR_PAGE	0.125	0.965	0.727	0.792	0.958	0.722	0.858	0.746
GDIFAV_D	-3.490	0.000	-4.132	0.000				
GDIFAV_D*RINDEX	4.960	0.001	5.658	0.000				
GDIUNF_D	1.548	0.287	-0.186	0.898				
GDIUNF_D*RINDEX	-2.551	0.182	0.147	0.941				
GDIFFAV_D					-3.350	0.001	-4.239	0.000
GDIFFAV_D*RINDEX					3.924	0.008	4.560	0.000
GDIRFAV_D					-1.698	0.191	-1.202	0.249
GDIRFAV_D*RINDEX					1.833	0.291	1.187	0.402
Adj. R^2	0.520		0.529		0.528		0.544	

$R_{PEGPREM}$ = Estimated risk premium = $R_{PEG} - r_f$
LMKVL = Natural logarithm of market value of equity on December 31st of year t.
BETA = Capital market beta estimated via the market model with a minimum of 12 monthly returns over the 60 months prior to June of year t+1.
LEV = Long term debt scaled by market value of equity on December 31st of year t.
BP = Book value of equity scaled by market value of equity on December 31st of year t.
V_NI = standard deviation of net income scaled by mean of net income over a period of five years ending at December of year t.
RINDEX = Fractional rank of the disclosure index prepared by Actualidad Económica for year t, adjusted by eliminating an item referred to the utilization of graphs in corporate annual reports.
GR_PAGE= Total number of graphs scaled by total number of pages in the annual report of year t.
GDIFAV_D = a dichotomy variable which takes the value of one when mean favourable graph distortion in the annual report (year t), measured by the GDI index is higher that 5 (10) and the value of zero otherwise.
GDIUNF_D = a dichotomy variable which takes the value of one when mean unfavourable graph distortion in the annual report (year t), measured by the GDI index is higher that 5 (10) and the value of zero otherwise.
GDIFFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of financial graphs in the annual report (year t), measure by the GDI index is higher that 5 (10) and the value of zero otherwise.
GDIRFAV_D = a dichotomy variable which takes the value of one when mean favourable distortion of non- financial graphs in the annual report (year t), measure by the GDI index is higher that 5 (10) and the value of zero otherwise.

Figure 1: Relationship between disclosure level and the cost of equity for different levels of graph distortion

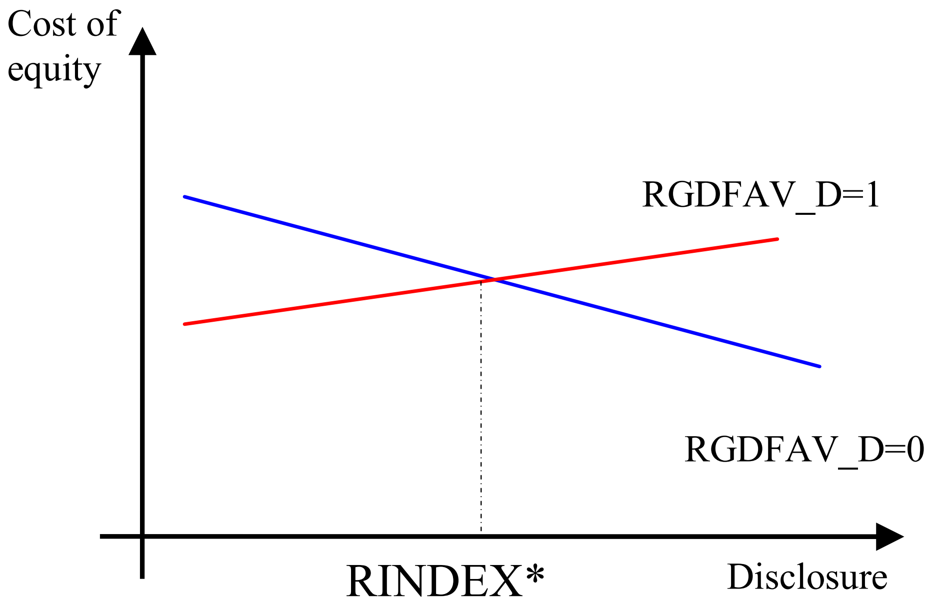

Figure 2: Corporate disclosure strategies