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## DOES GRAPH DISCLOSURE BIAS REDUCE THE COST OF EQUITY?\*

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### Abstract

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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 ex-ante cost of equity. This effect though, disappears if we use realised returns as a measure of ex-post 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. For low level of overall disclosure, graph distortion reduces the ex-ante cost of equity. However for high level of disclosure graph distortion increases the ex-ante cost of equity.

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**Keywords:** disclosure, cost of equity capital, graphs

**JEL Classification:** M41, G14

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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 ex-ante cost of equity. This effect though, disappears if we use realised returns as a measure of ex-post 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. For low level of overall disclosure, graph distortion reduces the ex-ante cost of equity. However for high level of disclosure graph distortion increases the ex-ante cost of equity.

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## 1 INTRODUCTION

This paper investigates the relationship between the format and distortion 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 affects measures of the cost of equity capital based on analysts earnings forecasts. On the contrary, when we use a measure based on realised returns, then the effect of graph distortion disappears. To the best of our knowledge this is the first attempt to look at the capital market effects of graph usage and distortion.

An extensive line of theoretical and empirical accounting research is devoted to the analysis of the impact of corporate disclosure on the capital market<sup>1</sup>. 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 Verrecchia (2000) document a negative association between corporate disclosure and bid-ask spreads. Botosan (1997), Botosan and Plumlee (2002), Francis et al. (2005), Gietzmann and Ireland (2005) or Espinosa and Trombetta (2007), 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

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<sup>1</sup> 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.

(CICA, 1993), Mather et al (1996) or Frownfelter and Fulkerson (1998)). A significant part of these studies (e.g. Beattie and Jones (1992, 1999), Mather et al. (1996), Frownfelter and Fulkerson (1998)) also show that an important proportion of 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. 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. 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 through 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. The effects of graph distortion are more complex.

When we use measures of the cost of equity capital based on analysts' earnings forecasts, we observe that a high level of graph distortion has a double effect on the cost of equity capital. On one hand it directly reduces it. On the other hand, however, it interacts with the overall level of disclosure so that firms that present highly 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 ex-ante 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 can increase the cost of equity capital.

Nonetheless, when we use an ex-post measure of the cost of equity capital based on realised returns, the effect of graph distortion disappears. Results indicate that, even though individuals' perceptions can be biased because of distorted graphs, at the aggregate (market) level users' decisions are not affected by graph distortion.

The structure of the paper is as follows. In the next section we revise the previous literature and we formulate our hypothesis. In section three we describe our sample and the variables that we use in our empirical exercise. Section 4 contains the main results of our analysis. Section five provides some 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 (1992), Kosslyn (1985)). When referring to corporate reports, Beattie and Jones (1993: 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 these 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, so that the reader needs less time to get a general picture of the company<sup>2</sup>. Graphs communicate quickly and directly, saving time and allowing users to grasp the essence of a set of data at a glance (Schmid, 1992). 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, 1992). 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. Cleveland (1994) contends 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 and even by users with a limited knowledge of the language employed in the annual report<sup>3</sup> (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

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<sup>2</sup> Users are often more interested in grasping the message ('the big picture') than in too detailed information (CICA, 1993, 95).

<sup>3</sup> This is especially relevant in the international context where preparers and users of annual report may use different languages.

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 (2007) in Spain and Francis, et al. (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*

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), Curtis (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 68% 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 showing 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.

Inasmuch as graphs depict information usually included in the financial statements or other sections of the annual report, users' misperceptions caused by distorted graphs might be corrected once users analyse the financial statements or the whole content of the report. Nonetheless, we argue that misperceptions can persist because of the individuals' use of heuristics when making judgments and predictions. Prior research in the accounting field provides evidence showing that individuals do not always follow the Bayes theorem when making estimations; instead, they use different heuristics (e.g. representativeness, anchoring and adjustment or availability) to simplify the complex process of estimating and revising probabilities (e.g. Sweringa et al. (1976), Joyce and Biddle (1981), Kinney and Uecker (1982), Johnson (1983) or Moser (1989)). The anchoring and adjustment heuristic and the biases that result from its use are of particular interest to our study. Researchers have turned to this heuristic to explain 'why judgments tend to be excessively influenced by an initial impression, perspective or value' (Epley and Gilovich, 2006). When decision makers employ this heuristic, they anchor on information that readily comes to their mind and then adjust this value as they receive new information. Although the adjustment process uses to follow the right direction, it is generally insufficient, so that the final estimation is usually biased towards the anchor<sup>4</sup> (Tversky and Kahneman (1974)).

The favourable impression that users get from a distorted graph included in the front part (or even the front page) of the annual report may well be used as an anchor when making estimations. After examining and analysing the financial statements and the rest of the content of the annual report, users will adjust their initial estimations. According to the results of previous research, the adjustment will probably be insufficient and the final estimation will be biased toward the anchor

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<sup>4</sup> A typical example of an experiment designed to test the use of the anchoring and adjustment heuristic is that performed by Tversky and Kahneman (1974). They asked participants to estimate quantities such as the percentage of African countries in the United Nations. Subjects were asked to estimate, first, whether the number was higher or lower than the reference point provided to them. The reference point was a number between 0 and 100 determined by spinning a wheel of fortune in the participants' presence. Subjects were, then, asked to estimate the value of the quantity. Different groups were given different reference points and these arbitrary numbers were found to have a significant effect on subjects' estimates.



(i.e. the favourable impression delivered by a distorted graph). That is, favourable distorted graphs may be biasing upwards users' estimations of corporate performance. Accounting literature provides evidence showing that even experts, such as senior auditors, employ the anchoring and adjustment heuristic when making predictions (e.g. Buttler (1986), Joyce and Biddle (1981) or Kinney and Uecker (1982)). Consequently, we could expect that estimations of future corporate performance, even when they are made by experts, could be biased upwards when the annual report contains favourably distorted graphs.

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. Moreover, this favourable distortion of the news communicated by the company has a positive effect on valuation.

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*

Distorted graphs overstate (or smooth) the trend shown by data, thereby highlighting (smoothing) an increasing (decreasing) trend in the plotted variable. Insofar as the sign of the trend shown in the graph is the same as that reflected in the financial statements, unless the exaggeration (smoothing) is extremely large, users, even experts, would find it hard to realise that the trend was distorted. Difficulties in identifying distorted graphs are even more acute when the axes and the scale are eliminated from the graph, a common practice in graph design in corporate annual reports. In such a situation, the rest of the information contained in the annual report can help users in unveiling graph distortion. Voluntary information in the annual report provides users with additional data that may turn to be important clues in identifying distorted graphs. As an example, operating data may unveil the overstatement of an increasing trend in net sales.

If distortion is detected, users would ignore graphical information and would rely on the quantitative and narrative information to make their decisions. But the detection of graph distortion 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 through 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 259 firm-year observations from 68 companies during 1996-2002.

#### ***3.2 DEFINITION OF VARIABLES***

##### **3.2.1 Dependent variables**

###### **(i) Ex- ante measure of the cost of capital ( $R_{PEG\_PREM}$ )**

An ex-ante measure of cost of equity capital is a measure based on some valuation model and it infers the discount rate that it should have been used to calculate the observed price of the stock if that particular valuation model had been used.

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. 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 measure as our primary proxy for the ex-ante cost of equity capital<sup>5</sup>. So, following Easton (2004) we calculate the ex-ante cost of equity capital for year  $t$  as<sup>6</sup>

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

where

$P_0$  = price of the stock of the company at the 30<sup>th</sup> of June of year  $t+1$

$eps_1$  = one year ahead consensus forecast of earnings per share at the 30<sup>th</sup> of June of year  $t+1$

$eps_2$  = two years ahead consensus forecast of earnings per share at the 30<sup>th</sup> of June of year  $t+1$

Following Botosan and Plumlee (2005) we then calculate the equity risk premium ( $R_{PEG\_PREM}$ ) by subtracting from the cost of equity capital the risk free rate, proxied by the interest rate on five-year Spanish Treasury bills.  $R_{PEG\_PREM}$  is then winsorized at the 1 and 99 percentiles of its distribution.

#### (ii) Ex- post measure of the cost of capital (Stock returns)

Besides the ex-ante measure of the cost of equity, we decided to use also the one-factor asset-pricing model to assess the actual effect of graphs on the decisions adopted in the capital market. To test the effects of graph usage and graph distortion on stock returns we follow an approach similar to that employed by Fama and French (1993) in constructing their mimicking portfolios for size and book-to-market. This approach is employed in an accounting context by Francis et al. (2005) when analysing the effect of accruals quality on stock returns. In a similar way, we construct two

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<sup>5</sup> We will use alternative proxies in the sensitivity analysis.

<sup>6</sup> For the exact derivation of the formula the reader can refer to Easton (2004)

portfolios related to graph usage (high and low graph users) and two portfolios related to favourable graph distortion (distorting and non-distorting companies). To obtain the portfolios related to graph usage, in June of each year  $t+1$  from 1996 to 2002 we rank all stocks in our sample according to graph usage (total number of graphs). Then, the median of the total number of graphs is used to split the stocks in two groups: high and low users of graphs. Monthly excess returns are calculated from June of year  $t+1$  to May of year  $t+2$ <sup>7</sup>. Finally, we obtain a GRAPH factor mimicking portfolio that equals mean monthly excess return for high graph users portfolio less mean monthly excess return for low graph users portfolio.

We proceed in the same way to obtain a portfolio aimed at representing favourable graph distortion (RGDFAV factor). Stocks are split in two groups: distorting and non-distorting companies<sup>8</sup>. Distorting companies are those that include in their annual report at least one graph that has been materially distorted to portray a more favourable view of the company. Non-distorting companies are those that present fairly constructed graphs or distorted graphs presenting a more unfavourable view of the company. We calculate monthly excess returns for companies in each group from June of year  $t+1$  to May of year  $t+2$  and the RGDFAV mimicking portfolio equals mean monthly excess return for distorting companies portfolio less mean monthly excess return for non-distorting companies portfolio.

### 3.2.2 Independent variables

#### (i) Graph utilization (GRAPH)

Graph utilization is measured by the total number of graphs included by companies in their annual reports. 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. Fractional ranks of these variables are employed in our analyses.

#### (ii) Graph distortion (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.

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<sup>7</sup> We calculate returns beginning in June of year  $t+1$  to be sure that the annual report has already been released.

<sup>8</sup> Distortion refers to favourable distortion. 52% of the annual reports presented by companies in our sample do not include any favourable distorted graph.

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

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<sup>9</sup>.

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. It is 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.

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<sup>9</sup> An example of a distorted graph can be found in Figure 1

We decided to use the RGD index as our measure of graph distortion<sup>10</sup>. We calculate mean distortion index for each company by adding the absolute value<sup>11</sup> of the 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 RGDFAV is calculated by adding the absolute value of the distortion index of each individual graph that is favourably distorted and dividing by the total number of graphs in the annual report. Mean unfavourable RGDUNF is calculated in the same way but it is based on unfavourable distorted graphs. Fractional ranks of these variables are employed in our study. Finally, we also calculate mean favourable RGD for financial RGDFFAV and non-financial graphs RGDRFAV.

In order to distinguish between materially distorted graphs and non-materially distorted graphs we have to choose a cut-off point for the RGD measure. 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 use the cut-off point suggested by Mather et al. (2005) in our study.

### 3.2.3 Control variables

#### (i) Number of Estimates (NEST)

In order to proxy for the level of attention received by a company we use the number of analysts' estimations of one-year-ahead EPS. This is a standard control variable used in disclosure related studies. Starting from the seminal work by Botosan (1997), the previous literature has documented a strong influence of the level of analysts' attention on the relationship between disclosure and cost of equity capital.

#### (ii) 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 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. Finally, Francis et al. (2005) observe a negative relationship between beta and their measure of the cost of equity.

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<sup>10</sup> Nevertheless, we have also repeated our analysis using the GDI and the results do not vary.

<sup>11</sup> As we are interested in getting an indicator of the level of distortion, absolute values are used in order to avoid offsetting of positive and negative values of the individual RGD's.

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.

#### (iii) Leverage (LEV)

We measure leverage as the ratio between long term debt and the market value of equity at the 31<sup>st</sup> 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<sup>st</sup> 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  $t$ .

#### (vi) Growth (GROWTH)

Following Francis et al. (2005) we control for the recent growth experienced by the company measured as the log of 1 plus the percentage change in the book value of equity along year  $t$ .

#### (vii) 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. 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.

## 4 RESULTS

### 4.1 *Descriptive statistics*

Descriptive statistics are presented in Table 1, where it can be seen that companies in our sample make a wide use of graphs in their annual reports. 92 per cent of companies include at least one graph and the mean number of graphs per annual report is 16. These figures are similar to those observed for other countries (e.g. Beattie and Jones, 2001). A large proportion of these graphs are materially distorted, being most of them distorted to portray a more favourable image of the company. We provide GDI measures because these measures are easily interpreted and give us a feeling of the magnitude of graph distortion. As an example, mean GDIFAV (favourable distortion) across all companies in our sample is 56, which means that the average favourable distortion of the graphs presented by a single company is 56%. That is to say, graphs presenting a rising trend that is favourable to the company are distorted to exaggerate this trend by more than 50% on average. Mean GDIUNF (unfavourable distortion) is much lower (5); on average, trends shown by graphs are unfavourable distorted by 5%. Although not reported in Table 1, mean RGDFAV (GDIFAV) 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 distorted the graphs included in their annual reports above the cut-off point chosen as an indication of material distortion. Unfavourable distortions are less frequent and mean unfavourable RGDUNF (GDIUNF) 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 *ex-ante* 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 growth and the number of estimates that act also as a proxy for 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) make a wider use of graphs in their annual reports and distort them significantly more.

[Insert Table 2 around here]

## 4.2 Multivariate analysis

### 4.2.1 Ex-ante measure of the cost of equity ( $R_{PEG\_PREM}$ )

This section presents the results obtained for the ex-ante measure of the cost of equity (i.e. the  $R_{PEG}$  measure as developed by Easton (2004)). To assess the validity of this 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:

$$R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \varepsilon_{it}, \quad (1)$$

Where:

$R_{PREM}$  = Proxy for the equity risk premium =  $R_{PEG} - R_f$

$R_f$  = the risk free rate, proxied by the interest rate on five-year Spanish Treasury bills.

$NEST$  = Number of analysts' estimations of one-year-ahead EPS in June of year t+1

$LEV$  = Long term debt scaled by market value of equity on December 31<sup>st</sup> 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.

$BETA$  = 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 31<sup>st</sup> of the year t.

$GROWTH$  = Log of 1 plus the percentage change in the book value of equity along 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<sup>12</sup>.

Results of estimating equation (1) are presented in Table 3, Panel B (Model 1). The coefficients of the number of estimates, leverage and variability of profitability have the expected sign and are statistically significant. The fact that the coefficients of beta, 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 (2007) and support the validity of the cost of equity capital measure.

[Insert Table 3 around here]

We now move on 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 an indicator of graph usage (i.e. total number of graphs included in the annual report). Specifically, we estimate the following equation:

$$R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_7 RGRAPH_{it} + \varepsilon_{it} \quad (2)$$

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

*RGRAPH*= Fractional rank of the total number of graphs included in the annual report of year t.

The results of these estimations are presented in Table 3 (Panel B, Model 2). It can be observed that graph usage is not significantly related to our ex-ante measure of the cost of equity. Although the sign of the coefficient is negative, the *R<sub>PREM</sub>* is not significantly affected by the number of graphs

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<sup>12</sup> However, at least for our main analysis, we also provide the results obtained by running an OLS regression on the pooled sample. These results can be found in Table 3, Panel A.

included in the annual report<sup>13</sup>. These results reject our hypothesis H1 and suggest that users' perceptions of corporate performance are not affected by simple inclusion of graphs in corporate annual reports.

Then, we substitute the original simple measure of graph usage with the indicators of mean favourable and unfavourable graph distortion across all graphs included in the annual report (i.e. the mean favourable and unfavourable RGD index for the graphs included by companies in their annual reports). Specifically, we now estimate the following equation (Model 3):

$$R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_8 RRGDFAV_{it} + \beta_9 RRGDUNF_{it} + \varepsilon_{it} \quad (3)$$

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

*RRGDFAV* = Fractional rank of RGDFAV. RGDFAV is mean Relative Graph Discrepancy (RGD) index of graphs which distortion is favourable to the company. This index measures graph distortion and (0) means no distortion or distortion that is unfavourable to the company.

*RRGDUNF* = Fractional rank of RGDUNF. RGDUNF is mean Relative Graph Discrepancy (RGD) index of graphs which distortion is unfavourable to the company. This index measures graph distortion and (0) means no distortion or distortion that is favourable to the company.

We now find that favourable graph distortion is significantly and negatively related to the ex-ante measure of the cost of equity. A negative coefficient is also observed for unfavourable graph distortion but results show that it is insignificantly different from zero. These results suggest that while unfavourable graph distortion does not have any impact on users' decisions, favourable distorted graphs introduce a bias on users' perceptions<sup>14</sup>. According to our results, annual report users perceive a better image of corporate performance when the annual report includes graphs that have been distorted to portray a more favourable view of the company. The same is true if we focus our attention only on financial graphs (RRGDFFAV) as we do in Model 4.

These results support our hypothesis H2. The information represented in graphs is usually included in the financial statements or other parts of the annual report. However, according to our results, users get a different picture of the company when the annual report includes favourable distorted graphs. It is interesting to notice that these results refer to an ex-ante measure of the cost of equity

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<sup>13</sup> Inasmuch as graphs representing financial variables could have a higher impact on users' decisions than non-financial graphs, we re-estimate equation (2) by including the number of financial graphs, instead of the total number of graphs. Results (unreported) remain unchanged.

<sup>14</sup> Similar results, unreported, are obtained when we use the GDI, instead of the RGD, as an index of graph distortion.

that is based on the predictions made by analysts, that is, the measure is based on the perceptions of highly sophisticated users.

We test the robustness of these results to the choice of the ex-ante measure of the cost of equity and to the inclusion of additional control variables.

As for the proxy for the cost of equity, we calculate two alternative measures of the ex-ante cost of equity:  $R_{PEF}$  and  $R_{MPEG}$ . The definition of these measures is given in the appendix. We also use the average ( $R_{AVRG}$ ) of the three measures calculated in our study. Table 4 and Table 5 provide descriptive statistics and correlation coefficients for all the proxies for the ex-ante cost of equity. As it is common with these measures, the four variables are highly correlated among them.

[Insert tables 4 and 5 around here]

Table 6 provides the results of estimating equation (3) with all the alternative measures of the ex-ante cost of equity.

[Insert Table 6 around here]

As we can see, the effect of favourable graph distortion on the ex-ante cost of equity is robust to the choice of the measure of the cost of equity. Favourable graph distortion is found to be negatively and significantly related to all the alternative measures of the ex-ante cost of equity calculated in our study.

Then we check if our results are driven by factors such as corporate performance or accruals quality. Prior literature documents a positive association between corporate performance and graph distortion (e.g. Beattie and Jones (1999, 2000)). Therefore, the effect of graph distortion on the cost of equity that we observe in this study could be driven by the fact that distorting companies are also those with the highest performance. Hence we add as control variable a measure of corporate performance (i.e. ROA). Second, Francis et al. (2005) 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 (CDA). The definition of this variable is provided in the appendix.

The results of our second sensitivity tests are provided in Table 7.

[Insert Table 7 around here]

Results show that, although corporate performance and accruals quality can be highly significant variables in explaining the ex-ante cost of equity, its inclusion in the model does not change

qualitatively our results. That is, the effect of favourable graph distortion on the ex-ante cost of equity remains.

The proxies used to measure the ex-ante cost of equity are based on analysts' estimations of earnings per share. Hence, our results could be interpreted as evidence that graph distortion affects users' (analysts') perceptions of corporate performance. However, it is important to check whether this ex-ante effect is also reflected in the ex-post returns. Therefore, in the next section we present the results obtained using average ex-post returns as a proxy for the cost of equity.

#### 4.2. EX-POST MEASURE OF THE COST OF EQUITY (Stock returns)

As a starting point in our analysis we estimate a one-factor asset-pricing model for each of the 68 companies in our sample<sup>15</sup>. The average coefficients and adjusted R's square of these estimations are presented in Table 8 (Model 1).

[Insert Table 8 around here]

Results show a mean beta of 0.84 and a mean adjusted R-square of 26.4%. We proceed by adding the graph usage factor (GRAPH factor) and estimating the following equation:

$$R_{jm} - R_{fm} = a_j + b_j (R_{Mm} - R_{fm}) + c_j \text{GRAPHfactor}_m + \varepsilon_{jm} \quad (4)$$

Where,

$R_{jm} - R_{fm}$  = monthly excess return for firm j.

$R_{Mm} - R_{fm}$  = monthly excess return on the market portfolio

$\text{GRAPHfactor}_m$  = return to the graph usage factor mimicking portfolio

Equation (4) is estimated for each company in our sample with at least 18 monthly returns. Table 8 (Model 2) reports the average coefficients of these estimations. Results show that graph usage does not exert a significant influence on stock returns. Results (unreported) are almost the same when the GRAPH factor is constructed relying exclusively on graphs representing financial variables. These results are in accordance with those obtained for the ex-ante measure of the cost of equity and reject our hypothesis H1. Taken together, results for the ex-ante and ex-post measures of the cost of equity indicate that the inclusion of graphs in corporate annual reports does not have any significant effect on the cost of equity capital. Insofar as graphs do not add new information, but represent data

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<sup>15</sup> A minimum of 18 monthly returns is required in these estimations.

already available in the financial statements or other parts of the annual report, it is not surprising that users' decisions are not affected by the presence of graphs.

We proceed with our analysis substituting the graph usage factor with a factor aimed at representing favourable graph distortion (RGDFAVfactor). Specifically, we estimate the following equation:

$$R_{jm}-R_{fm}=a_j+b_j(R_{Mm}-R_{fm})+d_jRGDFAVfactor_m+\varepsilon_{jm} \quad (4)$$

Where all the variables are defined as previously except for:

RGDFAVfactor<sub>m</sub>= return to the graph distortion factor mimicking portfolio

Average coefficients obtained from firm-specific estimations of Equation (4) are reported in Table 8 (Model 3). Results show that stock returns are not affected by the distortion of graphs included in the annual report. The coefficient of the RGDFAV factor is negative but it is insignificantly different from zero. Hence, these results reject our hypothesis H2. Results (unreported) are similar when we construct the RGDFAV factor relying on favourably distorted graphs representing financial variables. Although these variables might exert a higher influence on users' decisions than non-financial variables, results show that stock returns are not affected by the distortion of financial graphs. These results are in accordance with the market efficiency hypothesis and suggest that decision makers (at the aggregate level) are able to see through distortion and their decisions cannot be biased by means of 'rosy' graphs depicting a much more favourable view of corporate performance than that reflected in the financial statements.

Nonetheless, results presented in the previous section show the existence of a negative and significant relationship between favourable graph distortion and the ex-ante measures of the cost of equity. One way to explain this apparently contradicting result is that individuals' perceptions can be biased because of distorted graphs, but the aggregation process performed by the stock market leads to unbiased decisions. Prior research shows that the aggregation of individual's predictions leads to higher levels of accuracy (e.g. Chalos (1985), Solomon (1982)). Therefore, the possibility exists that analysts' estimations of earnings per share (the base for the ex-ante measure of the cost of equity) are influenced by graph distortion, even though stock prices resulting from the aggregation of a large number of decisions are not biased by distorted graphs.

### ***4.3 Interaction analysis***

To further investigate the relationship between graph distortion and analysts' perceptions we want now to analyse the possible interaction between overall transparency and graph distortion. We introduce a measure of the voluntary information provided by the company in their annual report (RINDEX) and an interaction term between disclosure and graph distortion. To facilitate the

interpretation of the results, the RGDFAV variable is dichotomized, that is, it takes the value (1) if the graphs in the annual report are materially distorted and (0) otherwise<sup>16</sup>. We estimate the following equation:

$$R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_7 RGDFAV\_D_{it} + \beta_8 RINDEX_{it} + \beta_9 RGDFAV\_D_{it} * RINDEX_{it} + \varepsilon_{it} \quad (5)$$

Where all the variables are defined as before except for:

*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 than 0.025 and the value of zero otherwise.

*RINDEX* = Fractional rank of the disclosure index corresponding to year *t* prepared by Actualidad Económica.

[Insert Table 9 around here]

Table 9 presents the results of the estimation of Equation (5) and shows that, except for the *RPEF\_PREM*, the reduction in the cost of equity due to distortion is partially offset by the positive relationship between disclosure and the cost of equity observed for distorting companies. These results provide moderate support for our hypothesis H3. In order to understand better the relationship between disclosure, graph distortion and the cost of equity it is useful to represent it in a graph. This is done in figure 2. 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 2 around here]

For those companies that did not distort graphs, the coefficient on *RINDEX* is not significantly different from zero. For those entities that present distorted graphs the coefficient of *RINDEX* is given by the coefficient of the interaction term ( $\beta_9$ ) and is positive. However the coefficient of the dummy variable ( $\beta_7$ ) is negative. When we consider these two effects together, we have that for low level of overall disclosure, distorting companies have a lower level of the ex-ante cost of equity capital. However, as the level of disclosure increases, information seems to be offsetting the bias

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<sup>16</sup> Equation (4) is then re-estimated including the *RRGDFAV* variable instead of the dummy. The tenor of the results is unchanged.

introduced by distorted graphs and distorting companies end up having a higher level of ex-ante cost of equity capital.

At low levels of disclosure users' perceptions might be 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. Therefore, our results suggest that the potential effect introduced by distorted graphs can be removed by means of disclosure. That is, even for the ex-ante measure of the cost of equity, users' predictions can only be potentially affected by graph distortion when the level of information provided by the company is low.

## 5 CONCLUSIONS

The wide use of graphs in corporate annual reports together with the frequency with which they are distorted to portray a more favourable view of corporate performance, suggest that companies expect benefits from using and distorting graphs. The information represented in graphs is usually reported also in the financial statements. Hence, market efficiency implies that stock prices would not be affected by the use of (distorted) graphs to display information already available in the financial statements or other sections of the annual report. This study investigates whether companies can benefit from the (miss)use of graphs in communicating information by examining the effect of graph usage and graph distortion on the cost of equity.

We find strong evidence supporting the market efficiency hypothesis when regarding the use of graphs: neither stock returns nor the ex-ante measure of the cost of equity are found to be significantly affected by the number of graphs included in corporate annual reports. Hence, we are confident that, despite their advantages in communicating information, the use of graphs does not affect users' perceptions and decisions in the capital market.

However, our results are more complex with respect to graph distortion. In accordance with the market efficiency hypothesis, we find that stock returns are not affected by the distortion of those graphs included in the annual report. Hence, results for the ex-post measure of the cost of equity suggest that the market sees through distortion so that decisions taken in the stock market are not biased by distorted graphs. Nonetheless, we observe a robust negative relationship between favourable graph distortion and the ex-ante measure of the cost of equity, although this negative relationship is partially offset by the positive association between the overall level of disclosure and the cost of equity observed for distorting companies. Taken together the results for the ex-ante and the ex-post measures of the cost of equity indicate that at the aggregate level users decisions are not affected by graph distortion. However, individual's perceptions can be potentially biased when graphs are distorted to portray a more favourable view of the company, especially when the level of



information provided is low. Hence, further research is needed to assess the potential bias introduced by distorted graphs in individuals' perceptions.

## APPENDIX

### (i) Measures of the ex-ante cost of equity capital

All three alternative proxies for the ex-ante cost of equity capital that we use in the paper are based on the valuation model known as the Abnormal Earnings Growth Valuation Model. The general valuation formula according to this model is as follows:

$$P_t = \frac{X_{t+1}}{r} + \sum_{\tau=2}^{+\infty} \frac{X_{t+\tau} + r d_{t+\tau-1} - (1+r)X_{t+\tau-1}}{r} = \frac{X_{t+1}}{r} + \sum_{\tau=2}^{+\infty} \frac{AEG_{t+\tau}}{r(1+r)^\tau} \quad (\text{A.1})$$

Where,

$P_t$  = closing price of the month of June

$x_t$  = earnings at time  $t$

$r$  = cost of equity capital

$d_t$  = the dividend payout at time  $t$

$AEG_t$  = Abnormal Earnings Growth rate at time  $t$ .

Starting from this general valuation formula, each of the three proxies is obtained by making some restrictive assumptions on the parameters of the model (cf. Easton and Monahan (2005)). The expressions for each of the three measures are as follows:

a) Price to Forward Earnings model (PEF)

$$P_0 = \frac{eps_1 + r_e d + eps_2}{(r_e + 1)^2 - 1} \quad (\text{A.2})$$

b) Price to Earnings Growth model (PEG)

$$P_0 = \frac{eps_2 - eps_1}{(r_e)^2} \quad (\text{A.3})$$

c) Modified Price to Earnings Growth models (MPEG)

$$P_0 = \frac{eps_2 + r_e d - eps_1}{(r_e)^2} \quad (\text{A.4})$$

$P_0$  = price of the stock of the company at the 30<sup>th</sup> of June of year  $t+1$

$d$  = dividend payout ratio for year  $t$

$eps_1$  = one year ahead consensus forecast of earnings per share at the 30<sup>th</sup> of June of year  $t+1$

$eps_2$  = two years ahead consensus forecast of earnings per share at the 30<sup>th</sup> of June of year  $t+1$

Solving for  $r_e$  in each of these equations produces the estimates of the ex-ante cost of equity.

ii) Current discretionary accruals (CDA)

To obtain a measure of discretionary accruals we use the model developed by Dechow and Dichev (2002) and modified by McNichols (2002). Specifically, we estimate the following equation for each industry and year:

$$TCA_{it} = b_0 + b_1 CFO_{it-1} + b_2 CFO_{it} + b_3 CFO_{it+1} + b_4 \Delta REV_{it} + b_5 PPE_{it} + \varepsilon_{it} \quad (A.5)$$

Where,

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

$\Delta CA_{it}$  = change in current assets between year t-1 and year t

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

$\Delta CL_{it}$  = 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

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

$NIBE_{it}$  = 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

All variables are scaled by total assets.

Discretionary current accruals (DCA) are the residuals of these regressions and constitute our measure of accruals quality.

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**Table 1: Descriptive Statistics**

	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>	<i>25th perc.</i>	<i>50th perc.</i>	<i>75th perc.</i>
$R_{PEG\_PREM}$	5.972	4.448	-0.693	25.031	3.134	5.128	7.682
NEST	15.927	9.103	1	40	9	16	21
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
GROWTH	0.103	0.235	-1.769	1.515	0.013	0.079	0.148
GRAPH	16.087	15.461	0	84	4.25	12	23
GDIFAV	56.314	148.062	0	1357.045	0	0	40.962
GDIUNF	5.192	21.271	0	234.783	0	0	0
GDIFFAV	56.133	200.623	0	2390.985	0	0	23.611
GDIRFAV	32.557	120.259	0	1077.778	0	0	0
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
ROA	6.273	5.820	-21.190	28.100	2.680	5.145	8.150
CDA	0.021	0.065	-0.318	0.238	-0.011	0.017	0.048
INDEX	0.637	0.150	0.230	0.960	0.550	0.630	0.750

The sample consists of 259 firm-year observations for the period 1996-2002.

$R_{PEG\_PREM}$  = Estimated risk premium calculated as  $R_{PEG}$  less the risk-free rate.

NEST = Number of analysts' estimations of one-year-ahead EPS.

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  $t+1$ .

BP = Book value of equity scaled by market value of equity on December 31<sup>st</sup> of year  $t$ .

LEV = Long term debt scaled by market value of equity on December 31<sup>st</sup> of year  $t$ .

V\_NI = Standard deviation of net income scaled by mean net income over a period of five years ending at December of year  $t$ .

GROWTH = Log of 1 plus the percentage change in the book value of equity along year  $t$ .

GRAPH = Total number of graphs in the annual report of year  $t$ .

GDIFAV = Mean favourable Graph Discrepancy Index (GDI) across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is unfavourable to the company.

GDIUNF = Mean unfavourable Graph Discrepancy Index (GDI) across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is favourable to the company.

GDIFFAV = Mean favourable GDI of financial graphs.

GDIRFAV = Mean favourable GDI of non-financial graphs.

RGDFAV = Mean favourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is unfavourable to the company.

RGDUNF = Mean unfavourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is favourable to the company.

RGDFFAV = Mean favourable RGD of financial graphs.

RGDRFAV = Mean unfavourable RGD of non-financial graphs.

ROA = Return on total assets on December 31<sup>st</sup> of year  $t$

CDA = Current discretionary accruals estimated by using the model developed by Dechow and Dichev (2002) as modified by McNichols (2002).

INDEX = Disclosure index prepared by Actualidad Económica for year  $t$ .



**Table 2: Correlation Matrix**

	R <sub>PEG PREM</sub>	NEST	BETA	BP	LEV	V_NI	GROWTH	GRAPH	RGDFAV	RGDUNF	RGDFFAV	RGDRFAV	ROA	CDA
NEST	-0.200 (0.001)													
BETA	0.222 (0.000)	-0.124 (0.046)												
BP	0.379 (0.000)	-0.329 (0.000)	0.099 (0.112)											
LEV	0.172 (0.006)	0.161 (0.009)	0.023 (0.707)	0.417 (0.000)										
V_NI	0.192 (0.002)	-0.121 (0.053)	0.168 (0.007)	0.091 (0.144)	-0.020 (0.745)									
GROWTH	-0.165 (0.008)	0.104 (0.093)	-0.011 (0.854)	-0.193 (0.002)	-0.028 (0.651)	0.088 (0.159)								
GRAPH	0.008 (0.903)	0.458 (0.000)	-0.119 (0.056)	0.044 (0.478)	0.324 (0.000)	-0.027 (0.661)	-0.037 (0.558)							
RGDFAV	-0.175 (0.005)	0.172 (0.005)	0.031 (0.616)	-0.036 (0.559)	0.081 (0.195)	-0.096 (0.122)	0.014 (0.822)	0.324 (0.000)						
RGDUNF	-0.077 (0.217)	0.180 (0.004)	-0.014 (0.825)	-0.073 (0.243)	0.095 (0.127)	-0.041 (0.516)	0.066 (0.291)	0.353 (0.000)	0.339 (0.000)					
RGDFFAV	-0.202 (0.001)	0.112 (0.073)	0.025 (0.689)	-0.048 (0.444)	0.034 (0.590)	-0.086 (0.168)	0.089 (0.152)	0.216 (0.000)	0.872 (0.000)	0.276 (0.000)				
RGDRFAV	-0.102 (0.103)	0.268 (0.000)	-0.004 (0.955)	-0.024 (0.698)	0.131 (0.036)	-0.057 (0.357)	-0.101 (0.106)	0.445 (0.000)	0.597 (0.000)	0.311 (0.000)	0.301 (0.000)			
ROA	-0.250 (0.000)	0.065 (0.298)	-0.153 (0.014)	-0.343 (0.000)	-0.543 (0.000)	-0.012 (0.853)	0.213 (0.001)	-0.237 (0.000)	-0.046 (0.456)	-0.111 (0.073)	-0.010 (0.871)	-0.054 (0.387)		
CDA	0.093 (0.163)	-0.088 (0.191)	0.007 (0.920)	0.062 (0.356)	0.076 (0.259)	-0.081 (0.225)	0.002 (0.976)	0.004 (0.947)	0.131 (0.050)	-0.021 (0.754)	0.090 (0.177)	0.071 (0.288)	0.166 (0.013)	
RINDEX	-0.220 (0.000)	0.466 (0.000)	-0.003 (0.959)	-0.064 (0.304)	0.247 (0.000)	-0.055 (0.375)	0.010 (0.876)	0.579 (0.000)	0.212 (0.001)	0.238 (0.000)	0.170 (0.006)	0.283 (0.000)	-0.323 (0.000)	-0.143 (0.032)

**Table 2 (continued)**

Table reports Spearman correlations. Significance levels are shown in brackets.

$R_{PEG\_PREM}$  = Estimated risk premium calculated as  $R_{PEG}$  (Easton, 2004) less the risk-free rate.

NEST = Number of analysts' estimations of one-year-ahead EPS.

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  $t+1$ .

BP = Book value of equity scaled by market value of equity on December 31<sup>st</sup> of year  $t$ .

LEV = Long term debt scaled by market value of equity on December 31<sup>st</sup> 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  $t$ .

GROWTH = Log of 1 plus the percentage change in the book value of equity along year  $t$ .

GRAPH = Total number of graphs in the annual report of year  $t$ .

RGDFAV = Mean favourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is unfavourable to the company.

RGDUNF = Mean unfavourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is favourable to the company.

RGDFFAV = Mean favourable RGD of financial graphs.

RGDRFAV = Mean unfavourable RGD of non-financial graphs.

ROA = Return on total assets on December 31<sup>st</sup> of year  $t$

CDA = Current discretionary accruals estimated by using the model developed by Dechow and Dichev (2002) as modified by McNichols (2002)

RINDEX = Fractional rank of the disclosure index prepared by Actualidad Económica for year  $t$ .

**Table 3: Regression of the ex-ante cost of equity on risk proxies, graph usage and graph distortion using fixed effects**

Model 1:  $R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \varepsilon_{it}$ ,  
 Model 2:  $R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_7 RGRAPH_{it} + \varepsilon_{it}$ ,  
 Model 3:  $R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_8 RRGDFAV_{it} + \beta_9 RRGDUNF_{it} + \varepsilon_{it}$ ,  
 Model 4:  $R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_{10} RRGDFFAV_{it} + \beta_{11} RRGDRFAV_{it} + \varepsilon_{it}$ ,

$R_{PREM}$  = Estimated risk premium =  $R_{PEG}$  less the risk-free rate.

**Panel A: Pooled OLS regression**

<i>Variable</i>	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>	
	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>
Intercept	4.382	0.000	4.410	0.000	4.936	0.000	5.101	0.000
NEST	-0.059	0.039	-0.057	0.060	-0.051	0.091	-0.057	0.064
LEV	1.149	0.128	1.157	0.135	1.122	0.145	1.136	0.143
V_NI	0.096	0.325	0.097	0.321	0.075	0.435	0.083	0.403
BETA	0.791	0.149	0.786	0.155	0.892	0.105	0.895	0.096
BP	2.089	0.010	2.102	0.008	2.111	0.010	2.053	0.011
GROWTH	-2.172	0.087	-2.164	0.089	-2.131	0.097	-1.839	0.160
RGRAPH			-0.134	0.899				
RRGDFAV					-1.721	0.072		
RRGDUNF					0.162	0.900		
RRGDFFAV							-2.604	0.005
RRGDRFAV							0.910	0.530
Adj. R <sup>2</sup>	0.135		0.131		0.138		0.149	

**Table 3 (continued)**

**Panel B.** Fixed effects regressions

<i>Variable</i>	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>		<i>Model 4</i>	
	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>
NEST	-0.147	0.011	-0.145	0.012	-0.130	0.027	-0.126	0.032
LEV	2.537	0.004	2.495	0.005	2.491	0.005	2.516	0.005
V_NI	0.264	0.022	0.265	0.022	0.270	0.021	0.279	0.018
BETA	-0.378	0.453	-0.386	0.438	-0.271	0.593	-0.293	0.567
BP	-0.109	0.912	-0.075	0.939	-0.127	0.897	-0.182	0.851
GROWTH	0.160	0.867	0.099	0.919	0.208	0.831	0.296	0.766
RGRAPH			-0.711	0.477				
RRGDFAV					-2.351	0.013		
RRGDUNF					-0.182	0.828		
RRGDFFAV							-2.230	0.015
RRGDRFAV							-1.032	0.260
Adj. R <sup>2</sup>	0.547		0.545		0.554		0.555	

The sample consists of 259 firm-year observations for the period 1996-2002.

$R_{PEG\_PREM}$  = Estimated risk premium calculated as  $R_{PEG}$  (Easton, 2004) less the risk-free rate.

NEST = Number of analysts' estimations of one-year-ahead EPS.

LEV = Long term debt scaled by market value of equity on December 31<sup>st</sup> 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.

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.

BP = Book value of equity scaled by market value of equity on December 31<sup>st</sup> of year t.

GROWTH = Log of 1 plus the percentage change in the book value of equity along year t.

RGRAPH = Fractional rank of the total number of graphs included in the annual report of year t.

RRGDFAV = Fractional rank of RGDFAV. RGDFAV is mean favourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is unfavourable to the company.

RRGDUNF = Fractional rank of RGDUNF. RGDUNF is mean unfavourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is favourable to the company.

RRGDFFAV = Fractional rank of RGDFFAV. RGDFFAV is mean favourable RGD of financial graphs.

RRGDRFAV = Fractional rank of RGDRAV. RGDRAV is mean unfavourable RGD of non-financial graphs.

**Table 4: Descriptive Statistics for alternative estimates of the ex-ante cost of equity**

	<i>Mean</i>	<i>Std. Dev.</i>	<i>Minimum</i>	<i>Maximum</i>	<i>25th perc.</i>	<i>50th perc.</i>	<i>75th perc.</i>
$R_{PEG\_PREM}$	5.972	4.448	-0.693	25.031	3.134	5.128	7.682
$R_{PEF\_PREM}$	3.112	3.127	-3.534	13.058	0.924	2.938	4.808
$R_{MPEG\_PREM}$	7.622	4.612	0.004	26.680	4.695	6.729	9.250
$R_{AVRG\_PREM}$	5.441	3.335	-0.264	15.256	3.275	4.887	7.155

**Table 5: Correlation between the ex-ante measures of the cost of equity**

	$R_{PEG\_PREM}$	$R_{PEF\_PREM}$	$R_{MPEG\_PREM}$
$R_{PEF\_PREM}$	0.507 (0.000)		
$R_{MPEG\_PREM}$	0.928 (0.000)	0.591 (0.000)	
$R_{AVRG\_PREM}$	0.919 (0.000)	0.747 (0.000)	0.959 (0.000)

Table reports Spearman correlations. Significance levels are shown in brackets.

$R_{PEG\_PREM}$  = Estimated risk premium calculated as  $R_{PEG}$  less the risk-free rate.

$R_{PEF\_PREM}$  = Estimated risk premium calculated as  $R_{PEF}$  less the risk-free rate.

$R_{MPEG\_PREM}$  = Estimated risk premium calculated as  $R_{MPEG}$  less the risk-free rate.

$R_{AVRG\_PREM}$  = Estimated risk premium calculated as the average of  $R_{PEG}$ ,  $R_{PEF}$  and  $R_{MPEG}$  less the risk-free rate.

**Table 6: Regression of  $R_{PEF\_PREM}$ ,  $R_{MPEG\_PREM}$  and  $R_{AVRG\_PREM}$  on risk proxies and graph distortion using fixed effects**

$$R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_8 RRGDFAV_{it} + \beta_9 RRGDUNF_{it} + \varepsilon_{it}$$

	Panel A		Panel B		Panel C	
	$R_{PEF\_PREM}$		$R_{MPEG\_PREM}$		$R_{AVRG\_PREM}$	
<i>Variable</i>	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>
NEST	-0.185	0.000	-0.098	0.089	-0.131	0.002
LEV	1.067	0.065	2.741	0.003	1.875	0.002
V_NI	-0.008	0.917	0.187	0.127	0.152	0.077
BETA	-0.980	0.026	-0.457	0.387	-0.731	0.086
BP	0.392	0.571	-0.049	0.962	0.042	0.952
GROWTH	0.353	0.635	0.289	0.776	0.224	0.732
RRGDFAV	-1.310	0.095	-2.706	0.004	-2.251	0.001
RRGDUNF	-0.181	0.848	-0.434	0.590	-0.604	0.345
Adj. R <sup>2</sup>	0.577		0.578		0.609	

The sample consists of 259 firm-year observations for the period 1996-2002. The dependent variable is  $R_{PEF\_PREM}$  in Panel A,  $R_{MPEG\_PREM}$  in Panel B and  $R_{AVRG\_PREM}$  in Panel C.

$R_{PEF\_PREM}$  = Estimated risk premium calculated as  $R_{PEF}$  less the risk-free rate.

$R_{MPEG\_PREM}$  = Estimated risk premium calculated as  $R_{MPEG}$  (Easton, 2004) less the risk-free rate.

$R_{AVRG\_PREM}$  = Estimated risk premium calculated as the average of  $R_{PEG}$ ,  $R_{PEF}$  and  $R_{MPEG}$  less the risk-free rate.

NEST = Number of analysts' estimations of one-year-ahead EPS.

LEV = Long term debt scaled by market value of equity on December 31<sup>st</sup> 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.

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.

BP = Book value of equity scaled by market value of equity on December 31<sup>st</sup> of year t.

GROWTH = log of 1 plus the percentage change in the book value of equity along year t.

RRGDFAV = Fractional rank of RGDFAV. RGDFAV is mean favourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is unfavourable to the company.

RRGDUNF = Fractional rank of RGDUNF. RGDUNF is mean unfavourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is favourable to the company.

**Table 7: Regression of the cost of equity on risk proxies and graph distortion using fixed effects**

$$R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_7 RRGDFAV_{it} + \beta_8 RRGDFAV_{it} + \beta_9 ROA_{it} + \beta_{10} CDA_{it} + \varepsilon_{it}$$

Variable	Panel A		Panel B		Panel C		Panel D	
	$R_{PEG\_PREM}$		$R_{PEF\_PREM}$		$R_{MPEG\_PREM}$		$R_{AVRG\_PREM}$	
	Coeff.	P-val	Coeff.	P-val	Coeff.	P-val	Coeff.	P-val
NEST	-0.121	0.029	-0.177	0.000	-0.085	0.111	-0.125	0.003
LEV	1.590	0.075	1.032	0.071	1.847	0.046	1.410	0.021
V_NI	0.168	0.280	-0.020	0.800	0.082	0.578	0.094	0.314
BETA	-0.454	0.350	-1.191	0.012	-0.689	0.193	-0.892	0.049
BP	0.510	0.701	0.971	0.253	0.774	0.573	0.692	0.451
GROWTH	1.082	0.287	0.748	0.299	1.150	0.283	0.726	0.307
RRGDFAV	-2.232	0.012	-1.327	0.041	-2.645	0.002	-2.296	0.001
ROA	-0.334	0.000	-0.037	0.378	-0.327	0.000	-0.172	0.000
CDA	3.090	0.277	5.413	0.010	5.793	0.049	5.296	0.014
Adj. R <sup>2</sup>	0.630		0.599		0.653		0.659	

The sample consists of 259 firm-year observations for the period 1996-2002. The dependent variable is  $R_{PEG\_PREM}$  in Panel A,  $R_{PEF\_PREM}$  in Panel B,  $R_{MPEG\_PREM}$  in Panel C and  $R_{AVRG\_PREM}$  in Panel D.

NEST = Number of analysts' estimations of one-year-ahead EPS.

LEV = Long term debt scaled by market value of equity on December 31<sup>st</sup> 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.

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.

BP = Book value of equity scaled by market value of equity on December 31<sup>st</sup> of year t.

GROWTH = Log of 1 plus the percentage change in the book value of equity along year t.

RRGDFAV = Fractional rank of RGDFAV. RGDFAV is mean favourable Relative Graph Discrepancy (RGD) index across all graphs in the annual report. This index measures graph distortion and (0) means no distortion or distortion that is unfavourable to the company.

ROA = Return on total assets on December 31<sup>st</sup> of year t

CDA = Current discretionary accruals estimated by using the model developed by Dechow and Dichev (2002) as modified by McNichols (2002).

**Table 8: Firm-specific regressions of stock returns on the market portfolio and graph usage and graph distortion factors**

Model 1:  $R_{jm} - R_{fm} = a_j + b_j (R_{Mm} - R_{fm}) + \varepsilon_{jm}$ ,  
 Model 2:  $R_{jm} - R_{fm} = a_j + b_j (R_{Mm} - R_{fm}) + c_j \text{GRAPHfactor}_m + \varepsilon_{jm}$ ,  
 Model 3:  $R_{jm} - R_{fm} = a_j + b_j (R_{Mm} - R_{fm}) + d_j \text{RGDFAVfactor}_m + \varepsilon_{jm}$

<i>Variable</i>	<i>Model 1</i>		<i>Model 2</i>		<i>Model 3</i>	
	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>	<i>Coeff.</i>	<i>P-val</i>
Constant	0.004	0.529	0.005	0.521	0.005	0.520
$R_{Mm} - R_{fm}$	0.836	0.020	0.852	0.013	0.851	0.012
GRPAGefactor <sub>m</sub>			0.118	0.327		
RGDFAVfactor <sub>m</sub>					-0.130	0.326
R-squared	0.264		0.295		0.296	

The table reports the average coefficient estimates obtained from the estimation of the asset-pricing models for each company included in our sample. A minimum of 18 monthly stock returns for the period June 1997 to May 2004 is required.

$R_{jm} - R_{fm}$  = monthly excess return for firm j.

$R_{Mm} - R_{fm}$  = monthly excess return on the market portfolio

GRAPHfactor<sub>m</sub> = return to the graph usage factor mimicking portfolio

RGDFAVfactor<sub>m</sub> = return to the graph distortion factor mimicking portfolio



**Table 9: Regression of the cost of equity on risk proxies, disclosure, and graph distortion using fixed effects**

$$R_{PREM_{it+1}} = \alpha_i + \beta_1 NEST_{it} + \beta_2 LEV_{it} + \beta_3 V\_NI_{it} + \beta_4 BETA_{it} + \beta_5 BP_{it} + \beta_6 GROWTH_{it} + \beta_7 RGDFAV\_D_{it} + \beta_8 RINDEX_{it} + \beta_8 RGDFAV\_D_{it} * RINDEX_{it} + \varepsilon_{it}$$

Variable	Panel A		Panel B		Panel C		Panel D	
	$R_{PEG\_PREM}$		$R_{PEF\_PREM}$		$R_{MPEG\_PREM}$		$R_{AVRG\_PREM}$	
	Coeff.	P-val	Coeff.	P-val	Coeff.	P-val	Coeff.	P-val
NEST	-0.150	0.020	-0.200	0.000	-0.123	0.061	-0.154	0.002
LEV	2.360	0.008	1.179	0.039	2.658	0.004	1.832	0.002
V_NI	0.276	0.019	-0.006	0.933	0.197	0.115	0.161	0.061
BETA	-0.340	0.492	-0.969	0.031	-0.512	0.330	-0.774	0.070
BP	-0.130	0.893	0.306	0.666	-0.096	0.925	-0.010	0.988
GROWTH	0.110	0.907	0.533	0.482	0.270	0.785	0.237	0.705
RINDEX	-1.828	0.203	1.728	0.124	-1.098	0.473	-0.589	0.605
RGDFAV_D	-3.321	0.002	0.211	0.795	-3.153	0.003	-2.368	0.002
RGDFAV_D*RINDEX	4.742	0.003	-1.381	0.320	3.961	0.014	2.803	0.026
Adj. R <sup>2</sup>	0.557		0.574		0.576		0.603	

The sample consists of 259 firm-year observations for the period 1996-2002. The dependent variable is  $R_{PEG\_PREM}$  in Panel A,  $R_{PEF\_PREM}$  in Panel B,  $R_{MPEG\_PREM}$  in Panel C and  $R_{AVRG\_PREM}$  in Panel D.

NEST = Number of analysts' estimations of one-year-ahead EPS.

LEV = Long term debt scaled by market value of equity on December 31<sup>st</sup> 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.

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.

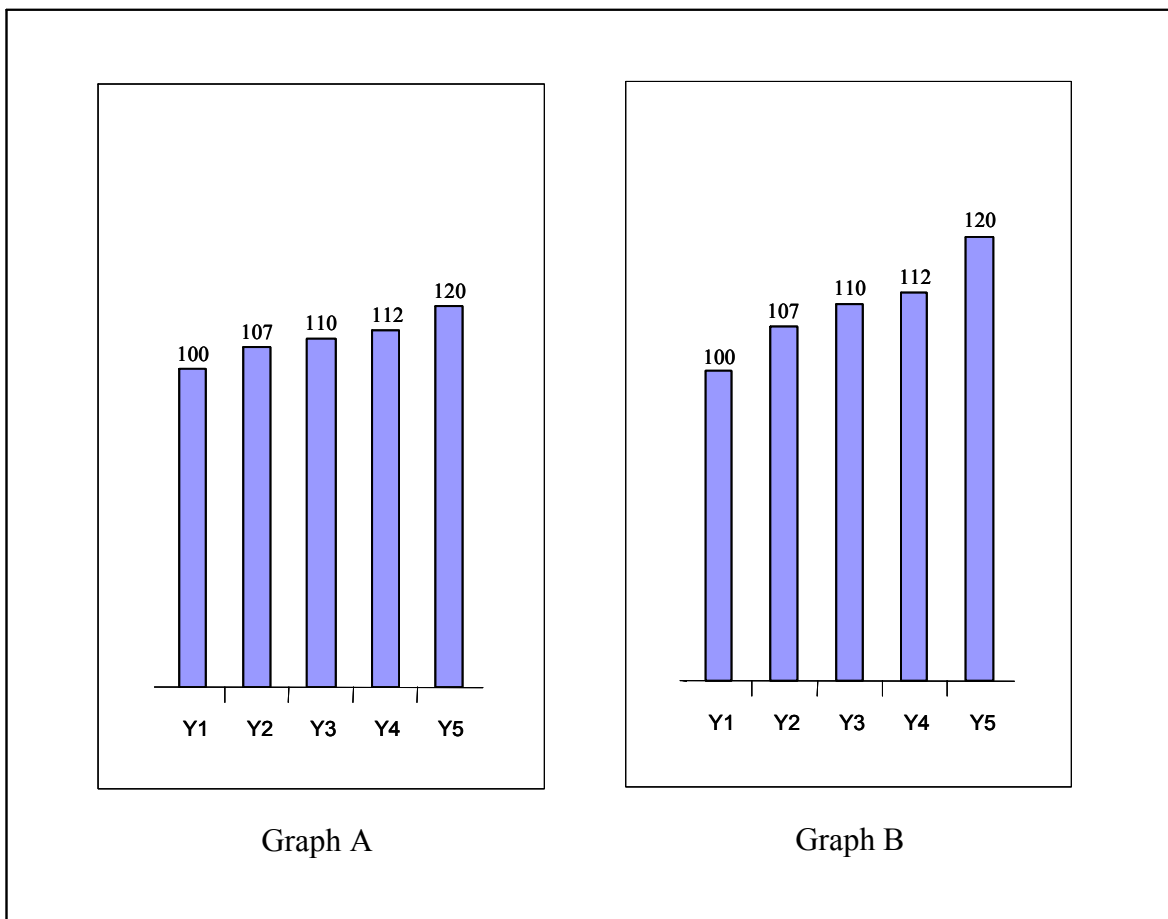
BP = Book value of equity scaled by market value of equity on December 31<sup>st</sup> of year t.

GROWTH = Log of 1 plus the percentage change in the book value of equity along 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 than 0.025 and the value of zero otherwise.

RINDEX = Fractional rank of the disclosure index corresponding to year prepared by Actualidad Económica.

Figure 1: Examples of undistorted and distorted graphs



Graphs A and B represent the same figures. While graph A is properly constructed (GDI = 0), graph B is distorted to enhance the rising trend in the variable (GDI = 115). The data disclosed at the top of the bars show an increase of 20% between year 1 and year 5. However, graph B depicts an increase of 43%. Although the level of distortion is high, without knowing that it is distorted, users, even experts, would find it difficult to realise that it has been distorted.

Figure 2: Relationship between disclosure level and the cost of equity for different levels of graph distortion

