The Quality of Sustainability Reporting and Cost of Equity Capital: Australian Evidence

Keywords: corporate sustainability and responsibility; environmental reporting; cost of equity capital.

Abstract:

This paper examines the relationship between firms' sustainability reporting practices and their ex-ante cost of equity capital. In doing so, we ask whether investors' reward firms that make higher quality sustainability disclosures. Such a reward is consistent with both altruistic and self-interested investor behaviour. Using proprietary data obtained from a specialist ethical investment research firm, we document a significant negative association between quality sustainability reporting and the cost of equity capital for ASX 200 firms through 2003-2005. We also test for industry-specific associations and find that our main results are driven heavily by the reporting behaviour of, and market response to, firms in the energy and industrial sectors. Both our main and industry-specific results appear robust to numerous variations in sample composition and model specification.

The Quality of Sustainability Reporting and Cost of Equity Capital: Australian Evidence[1]

1. Introduction

> "If further evidence could be gathered to suggest that markets can be persuaded to start to see the social and environmental implications of their financial decisions then a practical case can be added to the moral case that substantive environmental disclosure needs to become a regular, significant and regulated part of corporate disclosure" Murray et al. (2006, p. 246)

This paper seeks to identify whether firm value as reflected in market prices reflects information present or inferable from firms' sustainability reporting practices. In particular, we are concerned with firms' cost of equity capital, which reflects the discount rate applied by investors when converting firms' expected future performance into present day values. While a trend towards more frequent and higher quality sustainability disclosures has been evident in Australian firms for some time (Department of Environment and Heritage, 2000), little evidence exists as to the impact, if any, that these disclosures have on market participants, and the price setting mechanism. Our paper is thus a response to Murray et al.'s (2006) call for empirical evidence capable of informing the regulators, firms and investors.

Why might firms (managers) make sustainability disclosures additional to those mandated by regulators? Traditional signalling theory suggests an obvious incentive; firms with relatively little or low quality disclosures may be perceived to be hiding politically or economically unpalatable information regarding their current performance or future risk exposure (Akerlof 1970). Alternately, Figge (2005) found that in the long run environmental disclosure may lead to the creation of corporate value as a result of the synergies between economic and environmental performance. Furthermore, a significant literature has developed which argues that corporations, being abstract entities created by society, must demonstrate their legitimacy to society if they are to survive in the long run (Dowling and Pfeffer 1975). Firms whose apparent behaviour is significantly incongruent with societal expectations may suffer through consumer or supplier boycotts, or future legislative action aimed at curtailing the firm's aberrant behaviour (Terreberry, 1968). Each of these consequences of a firm's perceived illegitimacy have obvious consequences for the firm's expected future cash flows, and thus the current value of the firm's equity. Regardless of whether sustainability reporting quality

[1] The authors wish to thank CAER - Corporate Analysis. Enhanced Responsibility for access to their proprietary data regarding the sustainability reporting performance of Australian firms, and the considerable assistance provided by their staff. We particularly acknowledge the assistance of Duncan Paterson (CEO) and Philip Sloane (Head of Research). Details of the data obtained are provided later in this paper.

affects either or both the perceived riskiness of a firm's future earnings, or the level of long-run earnings, rational investors will be prepared to pay a premium for each dollar of short-run earnings expected of high quality reporting firms. It is thus plausible that managers may believe that benefits will accrue to the pursuit of a quality sustainability reporting policy, either because investors ascribe lower risk to the earnings stream of high quality reporters, or because higher quality sustainability reporting affects the level of long-run earnings stream that investors anticipate. While we focus predominantly on the first possible link between sustainability reporting and managerial (firm) interests, that of reduction in perceived risk, the results of our tests could equally validly be interpreted as supporting an expected future earnings explanation. Thus, while the central purpose of this paper is to provide evidence as to whether firms which make high quality sustainability disclosures experience a lower cost of equity capital, we are not greatly concerned by the possibility that a portion of any estimated cost of equity effect actually reflects the market's expected long-run earnings growth relative to short-run growth.[2]

We define sustainability reporting consistent with the Global Reporting Initiative (GRI 2006), p.3):

> Sustainability reporting is the practice of measuring, disclosing and being accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development. 'Sustainability reporting' is a broad term synonymous with others used to describe reporting on economic, environment and social impacts.

Implicit in this definition is a concept of capital maintenance that considers the amount of wealth to be maintained to include items not directly controlled by the reporting entity.

Why study the ex ante cost of equity, rather than stock returns? Stock return data is traditionally applied in 'event studies', whereby a particular stimulus (event) is identified and stock price changes surrounding the event estimated in an attempt to determine whether the 'event' caused a change in stock price. This method is suitable for use in cases where discrete events, and the moment at which such events become publicised, are reliably identifiable. In the case of sustainability reporting, however, information is often provided via several media,

[2] Price premia paid in respect of higher expected long-run earnings do not, strictly speaking, reflect a lower cost of equity. However, as conventional methods of estimating cost of equity typically measure expected short-term earnings growth and project this growth forward, a firm with abnormally strong (weak) expected long-run earnings will trade at a relatively high (low) stock price with respect to short-run earnings growth. The measure of cost of equity employed here would reflect the incidence of such a premium as a reduction in the cost of equity. This is of no great concern to us, as we are primarily interested in whether quality reporters are rewarded by markets. Whether this is due to risk-reduction or increases in expected return is of little consequence here. For an extended analysis of this issue see Plumlee et al. (2009).

which may be made publicly available at different times. Rather than attempt to detect changes in stock price over a particular time interval, we seek to determine, on an annual basis, whether the currently available set of sustainability information regarding a firm is associated with the price paid for the firm's stock, after controlling for fundamental factors likely to affect the relativity of stock price and expected future performance. Thus, we seek to identify relatively permanent premia paid by investors for firms that make high quality sustainability disclosures. The ex ante cost of equity measures the rate of return required by investors to induce them to maintain their investment in the firm, and is imputed from the current stock price and expected future earnings growth.

The following section reviews relevant prior literature on sustainability reporting and its association with cost of equity capital. Sections 3 and 4 describe respectively the measurement of sustainability reporting quality and cost of equity. Our regression models are specified in Section 5. The sample and statistical method are described in Section 6. Finally Section 7 presents and analyses our results.

2. Literature Review and Hypothesis Development

This section reviews the relevant literature regarding the development of sustainability reporting in Australia and the market response to sustainability reporting, and develops the core hypothesis of this paper.

1.1 Sustainability Reporting and Disclosure in Australia

Tension regarding the identification of the stakeholders to whom a corporation is accountable is evident in the academic literature of the mid-20th century. Writing at the nadir of the Great Depression, Berle (1931) argued that the powers and duties given to directors of a corporation should be directed towards the benefit of shareholders only. Refuting this argument, Dodd (1932) asserted that corporations have obligations to society that extend beyond those owed to shareholders and creditors. This long-running debate was intensified by Friedman's (1962) claim that as a corporate executive, the manager of a business is the agent of the owners of a corporation, and their direct responsibility to the owners is to maximise returns. For much of the 20th century, firms were evaluated solely on financial criteria, but increasingly firms are also being evaluated on non-financial criteria such as environmental performance (Kristoffersen et al., 2006). There has been a steep increase in the quantity and quality of environmental and social disclosures in many countries following

criticisms that the traditional financial reporting framework gives an incomplete picture of the operation of a company (Elkington, 1998; Gray et al., 1995; Murray et al., 2006). The timeliness in the increase in sustainability disclosures is consistent with the exponential growth of ethical investment funds (D'Antonio et al., 2000) and the widespread popularity of sustainability rating indices such as Dow Jones Sustainability Index and the FTSE4Good Index. Clearly, there has been a fundamental change in the way a large number of companies collect, use and distribute information related to the natural environment compared with a decade ago (Schaltegger and Burritt, 2005).

A number of initiatives have been introduced aimed at promoting sustainability reporting by the Australian Government. In 2005, a study by CAER – Corporate Analysis. Enhanced Responsibility (2005) revealed that the number of ASX 300 companies producing sustainability reports increased from 42 in 2004 to 52 in 2005, but that the incidence of such reporting was heavily concentrated in the 200 largest firms. CPA Australia (2005) reported similar trends. In June 2005 when the Parliamentary Joint Committee on Corporations and Financial Services resolved to inquire into Triple-Bottom-Line reporting, particularly regarding the current legal framework, and the regulatory mechanism in place (Commonwealth of Australia, 2006). During the inquiry, the Committee heard evidence that many Australian companies are employing responsible corporate approaches, in areas beyond a company's traditional core business. Despite the increasing interest in sustainability reporting in Australia, the majority of such disclosures are voluntary in nature. The only federally related mandated reporting requirements are:

- s. 299(1)(f) of the Corporations Act 2001 which requires companies to include details in their annual reports regarding the extent which they have complied with environmental laws and licences; and
- ss. 1013(A) to (F) of the Corporations Act 2001, requiring providers of financial products with an investment component to disclose the extent to which labour standards or environmental, social or ethical considerations are taken into account in investment decision-making.

While Frost and English (2002) suggested that the introduction of s. 299 (1)(f) has led to an increase in the level of information reported, other studies have been highly critical of the legislation. For example, Burritt (2002) raises concerns regarding the subjective assessment of what constitutes a *significant* environmental regulation and preparer discretion over the

level of detail provided. Despite the recent increase in environmental disclosures by Australian firms, Australia lags behind many other countries with respect to sustainability reporting and the main reason behind this trend is the lack of more stringent mandatory environmental regulation (CAER, 2005).

1.2 Realised Market Returns and Sustainability Reporting

Following Belkaoui (1976), numerous papers have studied the association between environmental or social disclosures and stock market performance. The majority of such papers employ short-run or long-run stock returns in assessing the information content of sustainability reports (Shane and Spicer 1983; Murray et al. 2006; Ingram 1978; Patten 1990; Al-Tuwaijri et al. 2004; Anderson and Frankle (1980); and Freedman and Jaggi 1986). As with all events studies, these papers assume market efficiency when testing the information content of environmental or social disclosures. If markets prices efficiently reflect all available information regarding firms' future cash flows, environmental disclosure that effect the expected level, or riskiness, of those cash flows should induce a change in market prices.

The results of prior studies are mixed, which to some extent is likely to reflect the fact that papers examined different stimuli (different aspects or instances of sustainability reporting) in different markets and time periods. Belkaoui (1976) compares the average monthly abnormal returns of 50 firms that voluntarily disclose pollution control expenditures in their annual reports with 50 other firms that do not disclose this information and detects no significant effect of pollution control expenditures on price behaviour. Similarly, Ingram (1978) does not find a significant difference between the variance of returns between firms that do and do not disclose environmental information in their reports. However, results suggest that a relation between voluntary environmental disclosures and monthly returns can be found in specific industries and disclosure years. Murray et al.(2006), in a longitudinal study of large UK firms find no systematic relationship between sustainability disclosure quality and realised stock returns. While prices fell across the industry, firms that had previously made more extensive environmental disclosures suffered less significant falls in stock price.

Other empirical studies provide evidence of a significant association between environmental disclosure and the capital market. Shane and Spicer (1983) found a significant association between the stock returns of US firms and the publication by a third-party of corporate social responsibility performance information. Blaconniere and Patten (1994) studied the short-window stock returns of US chemical firms in the days immediately following the chemical

leak at Union Carbide's Bhopal plant. Magness (2002) found that the stock prices of Canadian gold mining firms' fell significantly following the Placer Dome accident, but that firms disclosing some concern about environmental management suffered a less severe fall in stock price. In a recent international study, Lee et al.(2009) report a negative association between quality sustainability reporting and realised market returns, and suggest that this may be due to the fact that such firms' trade at a premium price reflecting a lower cost of equity.

The mixed results reported regarding the association between sustainability disclosures and stock returns has been attributed by Patten (2005) as partially reflecting the literature's reliance on broad measures of disclosure. Al-Tuwaijri et al. (2004) classifies these measures two groups: measures that quantify the level of disclosure in the annual report (for example number of pages or words) and those that assign a particular score to qualitative factors such as existence of an environment policy, achievement of environmental goals and others. Inevitably, attempts to quantify and measure the notional information content of reports are imperfect; the very essence of information is its potential to change the perceptions of the recipient, and the likelihood that this will occur is specific to context and individuals. Page counts do not discriminate according to quality or relevance of content, and may include pictures that have no information content, while simple word counts may ignore necessary graphs and tables (Al- Tuwaijiri et al, 2004). Disclosure scores necessarily require subjective weighting of items which, however robustly determined, require the researcher to impute the beliefs of a heterogeneous group of stakeholders.

These methods, commonly described as content analysis are frequently employed in the literature to evaluate the extent of disclosure (Gray, Kouhy and Lavers 1995, Guthrie and Parker 1990). Cormier and Magnan (1999) contend that the Wiseman Index is a good proxy for environmental disclosure because it is a comprehensive measure which allows information of various types to be integrated into single comparable figure; and also it allows for researchers' judgments to be impounded in rating the 'value of disclosure'. By virtue of its strengths, the Wiseman index or a variant thereof has been used by many scholars (Freedman and Wasley, 1990; Bewley and Li, 2000; Patten, 2002; Hughes et al., 2001). The main criticism levelled against the Wiseman index is that it does not distinguish between quality and quantity of disclosure. Clarkson et al. (2008) computes an index which takes account of hard disclosures and soft disclosures. The hard disclosure items such as quantitative measures receive higher scores than soft disclosures such as existence of environment policy because the latter is easily mimicked by firms. Thus, the index computed

by Clarkson et al. (2008) has the merit of distinguishing between those genuine firms who have a good performance and disclose from those who have a bad performance and still disclose positively.

Rather than employing a scholar-defined measure of sustainability reporting quality, this paper uses proprietary classifications of reporting quality prepared by an independent, not-for-profit, research firm that provides advice to ethical investors. This measure is detailed in Section 3.

1.3 Cost of Equity Capital and Sustainability Disclosures

Another commonality of most prior studies is their reliance on 'event study' method. Botosan and Plumlee (2005) argue that the impact of disclosure might not be adequately addressed by examining share price response, because prices changes may reflect both changes in expected cash flows and changes in investors' required return (discount rate). Stock returns have been used in the literature because they are deemed to reflect changes in the present value of expected future dividends, hence, price is deemed to be a good benchmark for the value of firms (Kothari, 2001). We do not dispute the usefulness of 'event study' research in certain circumstances, and, given our research question, it is of little import whether investors pay a premium for the stock of high quality reporting firms because of discount rate or expected cash flow effects. We opt for an alternative method, the estimation of the ex ante cost of equity capital, because it reflects the stock of available information at a point in time, rather than individual information signals.

The disclosure literature, both with respect to financial and sustainability reporting, consistently predicts a negative association between the incidence or quality of disclosure and the cost of equity capital. From an analytical finance perspective this hypothesis is normally attributed to the impact of disclosure on information asymmetry and estimation risk. Diamond and Verrecchia (1991) argue that there is an inverse relationship between information asymmetry and disclosure. This is consistent with the 'market for lemons' argument which essentially states that in the absence of information, investors assume that the reporting entity is of low-quality (Akerlof, 1970). In other words, investors consider undisclosed information to be bad news, and determine their demand for the stock accordingly. A higher demand for a firm's stock is translated into a higher price, ceteris paribus, which subtends a lower cost of equity capital.

The second stream of research shows that disclosure affects estimation risk. Handa and Lim (1993) define estimation risk as the additional risk incorporated in the covariance structure of returns by investors facing incomplete information. According to pure finance theory, a firm's risk profile can be divided into systematic and unsystematic components. Systematic risks are those risks which cannot be diversified, while unsystematic risks are eliminated by diversification. Research by Barry and Brown (1985), Handa and Linn (1993) and Coles et al. (1995) suggest that estimation risk is a non-diversifiable risk which influences the forecast accuracy of a security's future return. If at least part of the estimation risk component is non-diversifiable, then it should be priced by the market. Handa and Linn (1993) shows that a Bayesian investor attributes more systematic risk to a firm with poor disclosure than one with good disclosure, and this risk is priced by the market.

There is a significant literature examining the relationship between the quality of financial disclosures and the cost of equity capital. Botosan (1997) finds that high quality disclosure is associated with lower cost of equity capital for firms with low analyst following. Cheng and Collins (2006) examine the associations between firm's implied cost of equity capital, the strength of shareholder rights regimes and the level of disclosure of financial attributes and find that stronger shareholder rights and increased financial transparency (through increased disclosure) are jointly associated with significantly lower cost of equity capital. Lambert et al. (2007) examine the association between cost of equity capital and accounting information. Lambert et al. (2007) developed a model based on the Capital Asset Pricing Model to obtain estimates of the cost of capital and report that accounting disclosure has both a direct and indirect effect on the cost of capital. The direct effect arises because disclosure affects market participants' perceptions about the distribution of future cash flows. The indirect effect occurs because disclosure affects a firm's real decisions which change the ratio of a firm's expected future cash flows to the covariance of these cash flows with the sum of all firms' cash flow changes. Lambert et al. (2007) conclude that an increase in the quality of information leads to a decline in the cost of capital.

With respect to the hypothesised relationship between the cost of equity and sustainability disclosures, the information asymmetry effect appears to be of the greatest relevance. In some industries, the events to which sustainability reporting pertains have potentially significant impact on the firm's ability to survive, and generate returns to investors. Higher quality sustainability reporting decreases information asymmetry between firm insiders and other stakeholders, and may reduce investors' uncertainty regarding the firm's future

environmental and social performance, and the cash flows associated with these. Consider for example a firm that operates in an industry that necessarily produces air pollution, and which does not produce any sustainability information. Stakeholders, including potential equity investors, may experience great uncertainty regarding the impact of future environmental events on such a firm's future economic performance, and adjust their required return accordingly. Similarly, investors may also adjust downwards their expectation of the firm's long-run earnings stream, to accommodate the possible effects of future compensation claims and litigation. While such expected cash flow effects are not, strictly speaking, reflective of cost of equity changes, they will affect estimates of cost of equity capital generated by conventional methods to the extent that cash flow effects occur beyond the growth horizon of the model employed.

To the authors' knowledge, Richardson and Welker (2001) is the only published paper that focuses on the relationship between sustainability reporting and firms ex ante cost of capital. While Richardson and Welker describe their paper as dealing with social reporting, environmental activities are included in their conceptualisation of social reporting. Contrary to expectations, Richardson and Welker found a significant positive relationship between social disclosures and cost of equity capital using a sample of Canadian firms for the years 1990, 1991 and 1992. The authors suggested that the possibility that many aspects of a firm's socially responsible behaviour may have been perceived by the market as implying negative NPV, and that the disclosure of this behaviour increased perceived risk. In sensitivity tests, Richardson and Welker found that the positive relation between cost of equity and social disclosure held only for firms with below-industry median performance.

In a recent working paper, Plumlee et al.(2009) find a negative relationship between cost of equity and the quality of firm's environmental disclosures, although this relationship is weaker where disclosures occur through a stand-alone report. Another working paper, Dhalliwal et al.(2009), finds that the adoption of stand-alone voluntary CSR reporting reduces the cost of equity capital for a sample of US firms.

Notwithstanding Richardson and Welker's (2001) unexpected result, we predict a negative relationship between the quality of sustainability disclosures and the ex-ante cost of equity capital. We discount Richardson and Welker's result for two reasons: first, their sample was drawn from a period more than a decade prior to ours, and societal and investor awareness of the importance of sustainability has undeniably increased over this period; and second,

environmental disclosures received a maximum weighting of just 18% of the disclosure score employed.

Consequently, H1 is stated formally in positive form:

> H1: There is a negative association between ex ante cost of equity capital and environmental disclosure.

3. Measurement of Firms' Sustainability Reporting Quality

The measurement of sustainability disclosures based solely on annual report data has been criticised in many recent studies (McMurtrie, 2006). This is because environmental information can be conveyed to stakeholders through various other mediums such as company website, stand-alone reports and the media. Guthrie at al. (2006) argue that with the advent of improved technology, companies are increasingly using the internet to showcase their environmental performance, thereby questioning the importance of the annual report as the primary avenue for reporting on sustainability issues. This argument has been well-supported by prior research. For instance, Gray et al. (1995), argue that all communications should be monitored if one is to capture all CSR by an entity. Zeghal and Ahmed (1990) add that examining disclosure solely through annual reports gives an incomplete view of firm's activities. A recent study by Frost et al. (2005) found that annual reports tend to provide limited insights into corporate sustainability, and that alternative reporting media are better sources. Similarly, in a recent study commissioned by CPA Australia, shareholders and analysts were found to rely a lot on various sources for their environmental information (CPA Australia, 2005).

This study uses data provided by an independent not-for-profit research firm, CAER - Corporate Analysis. Enhanced Responsibility (CAER).[3] This organisation provides information to subscribers interested in applying environmental, social and governance criteria to their investment activity. The organisation's clients include a number of ethical investment funds. Between 2003 and 2005, CAER analysed the sustainability disclosures of all firms in the ASX 200 at June 30 of each year, and identified firms as having acceptable sustainability disclosures where at least three of the following criteria were met:

[3] This organisation was formerly known as the Centre for Australian Ethical Research, hereafter 'CAER'.

Report component	Criteria: Example - Environment Section
• Statement of policy	• Provides details of environmental policy
• Description of main impacts/issues	• Describes main impacts/issues in key areas – energy, emissions, waste, water etc
• Quantitative data	• Provides quantitative data (including year-on-year data) in all key areas, as graphs or tables
• Performance measured against targets	• Provides measure of performance against targets in key areas

In determining whether each of the above criteria is satisfied, CAER researchers considered the substance of the information reported by companies. Thus, professional judgement was applied in determining whether disclosures provided substantive information, or were largely 'window-dressing'. For the purpose of the current study, sustainability disclosure is measured by a dichotomous dummy variable SUSTAIN, equal to 1 if a particular firm was classified by CAER as having made acceptable sustainability disclosures, and equal to 0 otherwise.[4]

While all attempts to measure what is inherently a qualitative phenomenon are prone to error and misspecification, our measure has two advantages. First, the classification of firms' sustainability reporting behaviour was conducted independently of the authorship of this paper. Second, research was performed by an organisation whose core function and expertise focus on the identification of firms whose stock is acceptable for inclusion the investment portfolios of individuals or trusts concerned with sustainable corporate behaviour. Thus, unlike measures constructed by academics, this measure is likely to be more representative of advice provided to investors.

4. Estimating the Ex Ante Cost of Equity Capital

A firms' ex ante cost of equity capital is equivalent to the discount rate used by investors when converting the expected future cash flows from an investment in the firm's stock to a

[4] An additional measurement scheme was considered, which recognised acceptable sustainability disclosure as requiring, in addition to the CAER criteria, that firm disclosure was modelled on Global Reporting Initiative guidelines. However, the very low incidence of firms meeting this more restrictive criteria made its employment in empirical models problematic.

present day value. From a pure finance theory perspective, factors that affect the rate at which investors discount each dollar of future profits include; the risk free rate of interest; the perceived risk attaching to the firm's expected profits; and investors' risk tolerance. Given that, at any instant in time, the risk free rate of interest and investors' average risk tolerance are constant, investors' required return with respect to individual firms varies singularly in proportion to the perceived riskiness of firms' expected future performance. This required return is equivalent to the firm's cost of equity capital; it is the rate of return that is impounded in the firm's current share price.

Thus, if one could observe the totality of the future cash flow stream expected by investors in a firm's stock, the ex ante cost of equity is the interest rate which equilibrates the present value of those cash flows with the current market price. The future cash flows expected by investors are not, however, perfectly observable. Methods of estimating the cost of equity capital use either discounted cash flow (Botosan 1997) or residual earnings-based approaches (Claus and Thomas 2001; Gode and Mohanram 2003; Easton 2004; Cheng et al. 2006).

Studies using the residual earnings-based model rely on the availability of security analyst forecasts of earnings and in some cases dividends, and are defined only where forecast earnings possess certain numerical properties. For example, Easton's (2004) PEG model is only defined if analysts two-year ahead earnings forecast (EPS2) is greater than forecast earnings one-year ahead (EPS1). Such restrictions may bias the sample towards more stable firms (Francis et al. 2004). Furthermore, most of the residual income method hinges on the clean-surplus assumption in the forecasted earnings figures which Ohlson (2001) argues hardly holds. Other studies by Abarbanell and Lehavy (2002), Bhattacharya et al. (2003) and Johnson and Schwartz (2003) have shown that there are significant differences between GAAP earnings and earnings forecast, thereby questioning the reliability of earnings forecast, which are used in some of the cost of capital valuation models.

Despite the criticisms, models based on earnings forecast have been demonstrated to bear a significant correlation with economic fundamentals expected to drive investors' required return. Botosan and Plumlee (2005) tested the relative reliability of several approaches including the target price method (Botosan and Plumlee 2002), the industry method (Gebhardt et al. 2001), the finite horizon method (Lee et al. 1999), the economy- wide growth model (Ohlson Juettner –Nauroth 2003) and the simple PEG ratio (Easton 2004). They found that estimates from the PEG model are consistently and predictably related to market risk,

leverage risk, information risk, residual risk and growth. Easton (2004) proposed a modification to the PEG model (the modified-PEG) model which incorporates expected period 1 dividends and causes less erosion in sample size due to cases where EPS2<EPS1.

However, if one makes certain reasonable assumptions regarding the relationship between a firm's earnings and long-run dividend generating ability, and one accepts observable expectations of firms' short-term growth as unbiased proxies for the firms' long-term abnormal earnings growth, Easton (2004) has shown that the cost of equity can be estimated by:[5]

$$k_e = \frac{eps_2 - eps_1 + k_e \times Div_1}{P_0} \qquad (1)$$

Where

k_e = cost of equity capital

eps_2 = analysts' consensus earnings forecast 2 years ahead

eps_1 = analysts' consensus earnings forecast 1 year ahead

Div_1 = analysts' consensus foreast dividend 1 year ahead

This is commonly described as the modified-PEG model (the modification being the addition of the term including expected dividends). The value of k_e that solves equation (1) thus represents the estimated cost of equity capital for a firm. Now, if after controlling for other factors known to be associated with a company's cost of equity, such as financial distress, size and book-to-market ratio, firms' measured cost of equity varies systematically with sustainability disclosure policy, this variation in the cost of equity can be interpreted as implying that such disclosure affects investors' demand for firms' stock. Stated differently, if firms' with higher quality sustainability disclosures are measured as having systematically lower cost of equity, this implies that investors are prepared to sacrifice greater current wealth for each dollar of these firms' future expected earnings.

For each firm-year, we estimate the cost of equity in the month immediately following the release of the firm's annual report. This ensures that sustainability information in the annual reports is publicly available when cost of equity is estimated. While firms can potentially

[5] Recent papers employ numerous models of the ex ante cost of equity, several of which are more complex than the modified-PEG model employed here (Gode and Mohanram 2003, for example). These models typically require longer-horizon forecast data the modified-PEG model, and if applied to the Australian firms would result in a significant reduction in sample size. Simpler models such as the modified-PEG and the original PEG model have been shown to demonstrate similar robustness to the more data-intensive models (Botosan and Plumlee 2005).

meet CAER's sustainability reporting criteria through media other than the annual report, the release of the annual report is the organisation's cue for reviewing their assessment of firms' reporting performance. Consistent with bulk of the extant literature, median analyst forecasts are employed as our consensus measure.

5. Regression Models

This section describes the regression models used to test our hypothesis. Equation 2 regresses cost of equity against sustainability reporting quality and control variables. Industry and year effects are controlled by dummy variables in this model.

$$k_e = a + B1.SUSTAIN + B2.SIZE + B3.LEVERAGE + B4.BtoM + INDUSTRY + YEAR \quad (2)$$

Where

k_e = cost of equity capital

$SUSTAIN$ = dichotomous dummy variable = 1 if firm measured as exhibiting acceptable sustainability disclosure, 0 otherwise

$SIZE$ = natural log of firm's total assets

$LEVERAGE$ = ratio of total debt to total assets

$BtoM$ = book - to - market ratio

$INDUSTRY$ = a vector of dummy variables indicating industry sector membership

$YEAR$ = a vector of dummy variables indicating year

The control variables included in Eqn. 2 are consistent with those employed in the literature. SIZE is included because larger firms have been found to have lower costs of equity capital, presumably because of lower perceived risk (REF). Financial leverage (LEVERAGE) is included, because prior studies document a positive relationship between this or similar measures and firms' cost of equity.[6] Similarly, firms' book-to-market ratio (BtoM), consistently exhibits a positive relationship with cost of equity in prior studies. Intuitively, this relationship arises because the market has less confidence in the economic value of high book-to-market firms' reported assets and earnings, and thus discounts future expected

[6] In Appendix A, we repeat all tests substituting Zmijiewski's Z-score for LEVERAGE. Zmijiewski's Z-score is an increasing function of leverage and decreasing function of performance. Our results were substantively unaffected, but the use of the Z-score necessarily restricted sample size as it is not applicable to banks. We also ran regressions including firms' beta statistic as an additional regressor in the models, however, due to the extremely high correlation of this variable with LEVERAGE or Z-Score, the inclusion of beta simply added noise to the estimation process. Finally, we estimated regressions including firms' de-levered beta, with no effect on our results, but no improvement in the overall explanatory power of our regressions.

growth in reported earnings more severely. Industry dummies are included to proxy for differences in firms' inherent business risk, while year dummies control for variation in the underlying risk-free rate across time.

A significant negative coefficient for SUSTAIN would be consistent with our hypothesis that firms who engage in quality sustainability reporting experience a lower ex ante cost of equity capital. In testing this relationship, a number of sensitivity tests are performed, in which various sample restrictions are applied.

In addition to our tests of the economy-wide relationship between the quality of sustainability reporting and firms' cost of equity, we test for evidence of industry-specific effects. To this end, we replace the variable SUSTAIN, with a series of dummy variable representing the interaction between SUSTAIN and each of the INDUSTRY dummy variables. Thus, a significant negative coefficient for SUSTAIN.ENERGY indicates a negative association between cost of equity and sustainability reporting in the energy sector.

$$
\begin{aligned}
k_e = {} & a + B1.SUSTAIN.ENERGY + B2.SUSTAIN.MATERIAL \\
& + B3.SUSTAIN.INDUSTRIAL + B4.SUSTAIN.CONSDISC \\
& + B5.SUSTAIN.CONSSTAP + B6.SUSTAIN.FINANCIALS \\
& + B7.SUSTAIN.TELCOS + B8.SIZE \\
& + B9.LEVERAGE + B10.BtoM + INDUSTRY + YEAR
\end{aligned} \tag{3}
$$

Where

k_e = cost of equity capital

$SUSTAIN$ = dichotomous dummy variable = 1 if firm measured as exhibiting acceptable sustainability disclosure, 0 otherwise

$SIZE$ = natural log of firm's total assets

$LEVERAGE$ = ratio of total debt to total assets

$BtoM$ = book - to - market ratio

$INDUSTRY$ = a vector of dummy variables indicating industry sector membership

$YEAR$ = a vector of dummy variables indicating year

The control variables included in Eqn. 3 are identical to those in Eqn. 2.

6. Sample, Method and Descriptive Statistics

Our sample is drawn from firms included in the ASX 200 on June 30 of each year between 2003 and 2005. The potential sample of 600 firms was reduced for several reasons. First, in order to estimate firms' cost of equity capital, analyst forecasts for earnings one and two years ahead, and for dividends one year ahead are required. Further, even where forecasts are available the modified-PEG model is only defined for certain combinations of implied earnings growth and dividends.[7] Estimates of k_e were only available for 539 firms. Furthermore, there were three GICS sectors (Health Care, IT, Utilities) for which no firms were identified as providing satisfactory sustainability reports. To avoid our dichotomous sustainability variable potentially proxying for latent industry effects not accounted for by our industry dummies, we eliminated all firms in these industries.[8] This reduced our sample by a further 97 firm-years. Finally, we truncated our sample at 1st and 99th percentiles of the distribution of estimated cost of equity, which when applied to our already reduced sample eliminated a further 38 firm-years. Our final sample thus comprises 404 firm-years. Appendix A reports the results of our main and sensitivity tests using Zmijiewski's Z-SCORE rather than LEVERAGE as our proxy for financial distress. This sample is further reduced due to the inapplicability of the Z-SCORE method to banks, and the unavailability of requisite data.

Our hypothesis is tested using pooled OLS regression. While fixed effects, clustered standard error, and 'changes' models were contemplated, the small number of observations per subject, and the low within-subject variability of the SUSTAIN variable rendered these problematic. All regressions reported in this paper were re-estimated on single year samples, and coefficients were broadly consistent across years, although p-values were necessarily lower due to the lesser sample size in the single-year regressions. Thus while the longitudinal nature of our data likely means that the OLS assumption of independence of errors is breached, it does not appear that this breach has severely impacted our results.

Descriptive statistics regarding the distributions of the continuous and dichotomous variables are presented in Table 1.

[INSERT Table 1 HERE]

[7] For example, if forecast dividends are zero, forecast EPS2 must be greater than forecast EPS1 for Equation 1 to be solvable. Essentially, PEG-based models assume positive growth (after adjusting for period 1dividends).
[8] Inclusion of these firms does not substantially alter our results.

Variance inflation factors (VIFs) were calculated to test for the presence of significant multicolinearity among our independent variables. No VIF exceeded 4.0, suggesting that multicolinearity presents no problems for the interpretation of our results.

7. Results

Table 2 reports the results of our test of the overall relationship between cost of equity and sustainability reporting, as well as those of three sensitivity tests and our industry specific model. Column 1 of this table reports our main test of H1. The coefficient on SUSTAIN is negative and significant (B=-0.0071, p=0.0704), supporting our hypothesis that the cost of equity is lower for firms with higher quality sustainability reporting. The results reported in Appendix A, where LEVERAGE is replaced by DISTRESS, are similar. Thus it appears that the market pays a slight premium for the equity of firms with higher quality sustainability disclosures. Whether this premium reflects a truly lower required return, or the possibility that better disclosures alter the markets expectation of the firms' long-run earnings stream relative to the growth in short-term earnings is unclear. However, in either case, there appears to be a potential reward for quality reporting.

[INSERT Table 2 HERE]

Columns 2 to 4 of Table 2 report the results of sensitivity tests of our main hypothesis. In Column 2, we restrict exclude from our sample firms with cost of equity in the bottom quartile. The logic behind this test follows Dhaliwal et al.(2009), who argue that firms with already low cost of equity are less likely to benefit from high quality reporting. While our overall model specification improves, there is no noticeable difference in the association between quality sustainability reporting and firms' cost of capital relative to the full sample results.

In Columns 3 and 4, we divide our sample in to firms above and below the median value of SIZE, and repeat the regression specified in Eqn. 2. It is clear from these two regressions, that our key result holds only with respect to large firms, with the coefficient for SUSTAIN negative and significant in this model (B=-0.0079, p=0.0489).[9] In the regression estimated on the sample of small firms, there is no association between cost of equity and SUSTAIN.

[9] A similar result was generated when the effect of firm size on reporting quality was operationalised through the addition of a dummy variable and its interaction with SUSTAIN. The method reported in Table 2 is preferable because it allows the models to assume a different functional form for large and small firms.

These results are consistent with the proposition that larger firms' behaviour is subjected to greater public scrutiny, and therefore behaviour judged as socially responsible is more likely to be rewarded. This is the classic political cost argument of Watts and Zimmerman (197X).

Finally, in Column 5, we test our industry-specific model, in which SUSTAIN is replaced by a vector of variables representing interactions between SUSTAIN and each of the industry dummy variables. We detect significant associations between cost of equity and SUSTAIN in the energy and industrial sectors only. Given the implications of the behaviour of firms in the energy sector for serious environmental concerns such as global warming, it is not surprising that firms in this sector have issues of substance to report and experience greater market reaction to their disclosure practices. This market reaction need not be the result of demand from concerned ethical investors, nor the demand of other investors concerned with the impact of environmental legislation on such firms. It is also plausible that investors interested purely in financial returns perceive a greater risk attaching to the future performance of firms that presently disclose very little regarding their contribution to sustainability. While firms in the industrial sector arguably contribute less directly to environment degradation, member firms such as those in the transport and construction industry groups are significant users of fossil fuels, and, in the case of transport firms, are reasonably well-known to the public.

The lack of a significant association between sustainability reporting and cost of equity in the materials sector is surprising, given the predominance of mining firms present in this sector and the significant associations detected in energy and industrial firms. A possible explanation is that, with a few glaring exceptions, firms in the materials sector are smaller and less well-known to the general public that firms in the energy sector. Additionally, the environmental consequences of the mining of gold and other precious metals are less obvious that those of oil, gas and coal extraction.

It is less surprising that firms in the remaining sectors exhibit no relationship between cost of equity and sustainability reporting. Quite simply, the activities of retail firms, financial services providers and telecommunications firms are of less environment sensitivity that firms in the sectors discussed above.

8. Conclusion

This paper has provided the first quantitative evidence of the association between Australian firms sustainability reporting practices and the ex ante cost of equity capital incurred by these

firms. We report a significant association between firms that provide high quality sustainability disclosures and the ex ante cost of equity capital. Further, we find that this effect is concentrated in industry sectors for which environmental performance is of particular relevance. This result has clear implications for reporting entities, investors and regulators.

There are numerous limitations to our results. First, we rely on a single measure of sustainability reporting quality, and all such measures are necessarily noisy. However, our measure of reporting quality has the advantage of being prepared by an independent specialist organisation, and as such is arguably a sound proxy for the information actually used by ethical investment funds when constructing their portfolios. Second, while we have attempted to control for other factors likely to affect cost of equity, we have not attempted to disentangle any possible endogeneity between this measure and firm's reporting behaviour. Future research may wish to consider an instrumental variables approach, although the identity of potential instruments is not obvious. A third limitation is that we do not attempt to discriminate between genuine cost of equity effects, and effects associated with the relative magnitude of firm's long-run and short-run earnings performance.

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Table 1

Continuous Variables	N	Mean	25%	Median	75%	SD	Min.	Max.
Ke	405	0.118	0.095	0.110	0.125	0.038	0.065	0.297
BtoM	405	0.604	0.360	0.550	0.820	0.357	-0.720	3.280
LEVERAGE	405	0.330	0.280	0.328	0.381	0.091	0.033	0.852
SIZE	405	21.478	20.350	21.360	22.420	1.608	18.360	26.760
Dichotomous Variables	N	Mean	SD	Sum				
CAER	405	0.235	0.424	95				
ENERGY	405	0.054	0.227	22				
MATERIALS	405	0.170	0.376	69				
INDUSTRIALS	405	0.175	0.381	71				
CONSDISC	405	0.198	0.399	80				
CONSSTAP	405	0.091	0.288	37				
FINANCIALS	405	0.296	0.457	120				
TELCOS	405	0.015	0.121	6				
SUSTAIN.ENERGY	405	0.022	0.148	9				
SUSTAIN.MATERIALS	405	0.094	0.292	38				
SUSTAIN.INDUSTRIALS	405	0.037	0.189	15				
SUSTAIN.CONSDISC	405	0.005	0.070	2				
SUSTAIN.CONSSTAPLE	405	0.025	0.155	10				
SUSTAIN.FINANCIALS	405	0.044	0.206	18				
SUSTAIN.TELCOS	405	0.007	0.086	3				
Yr2003	405	0.351	0.478	142				
Yr2004	405	0.319	0.466	129				

Table 2

VARIABLES	(1) ALL FIRMS	(2) Ex-Bottom Quartile Ke	(3) BIG FIRMS	(4) SMALL FIRMS	(5) INDUSTRY SPECIFIC
SUSTAIN (-)	-0.0071*	-0.0078*	-0.0079**	0.0056	
	(0.0704)	(0.0689)	(0.0489)	(0.5612)	
BtoM (+)	0.0293***	0.0312***	0.0215***	0.0604***	0.0302***
	(0.0000)	(0.0000)	(0.0020)	(0.0000)	(0.0000)
LEVERAGE (+)	0.0476**	0.0291	0.0723***	0.0461	0.0544**
	(0.0249)	(0.1289)	(0.0099)	(0.1028)	(0.0137)
SIZE (-)	-0.0038***	-0.0043***	0.0025*	-0.0143***	-0.0040***
	(0.0057)	(0.0028)	(0.0927)	(0.0025)	(0.0041)
ENERGY		0.0450**	0.0330**		0.0432***
		(0.0362)	(0.0197)		(0.0001)
INDUSTRIALS	-0.0245***	0.0184	0.0299**	-0.0385***	0.0111*
	(0.0057)	(0.3672)	(0.0163)	(0.0051)	(0.0759)
MATERIALS	-0.0121	0.0377*	0.0340***	-0.0253*	0.0219***
	(0.1645)	(0.0683)	(0.0064)	(0.0651)	(0.0041)
CONSDISC	-0.0336***	0.0096	0.0138	-0.0426***	
	(0.0002)	(0.6374)	(0.2719)	(0.0013)	
CONSSTAP	-0.0361***	0.0059	0.0190	-0.0646***	-0.0052
	(0.0002)	(0.7747)	(0.1199)	(0.0005)	(0.5127)
FINANCIALS	-0.0433***	0.0050	0.0025	-0.0602***	-0.0108*
	(0.0000)	(0.8055)	(0.8279)	(0.0000)	(0.0646)
TELCOS	-0.0422**	0.0000	0.0000	0.0000	-0.0091
	(0.0114)	(.)	(.)	(.)	(0.6652)
SUSTAIN.ENERGY					-0.0292**
					(0.0311)
SUSTAIN.MATERIALS					-0.0071
					(0.2055)
SUSTAIN.INDUSTRIALS					-0.0163*
					(0.0625)
SUSTAIN.CONSDISC					0.0013
					(0.9581)
SUSTAIN.CONSSTAP					0.0037
					(0.7838)
SUSTAIN.FINANCIALS					0.0016
					(0.8626)
SUSTAIN.TELCOS					-0.0053
					(0.4280)
Yr2003	-0.0067	-0.0076	-0.0012	-0.0166**	-0.0062
	(0.1227)	(0.1108)	(0.7798)	(0.0240)	(0.1526)
Yr2004	-0.0048	-0.0056	-0.0018	-0.0110	-0.0043
	(0.2777)	(0.2473)	(0.6962)	(0.1369)	(0.3265)
CAER	-0.0071	-0.0078	-0.0079*	0.0056	
	(0.1408)	(0.1377)	(0.0979)	(0.5612)	
Constant	0.2019***	0.1825***	0.0016	0.4177***	0.1695***
	(0.0000)	(0.0000)	(0.9693)	(0.0000)	(0.0000)
Observations	405	315	213	194	405

R-squared	0.1579	0.2063	0.1727	0.2274	0.1676

One-tailed p-values in parentheses, ***, **, * indicate 99%, 95%, 90% confidence levels.

Appendix A – Alternate Model Using Z-Score (DISTRESS)

Table 3

Continuous Variables	N	Mean	25%	Median	75%	Std. Dev	Min.	Max.
Ke	341	0.119	0.095	0.109	0.129	0.040	0.065	0.297
BtoM	341	0.604	0.350	0.550	0.820	0.352	-0.220	3.280
DISTRESS	341	-1.850	-2.460	-1.880	-1.130	1.094	-5.200	1.160
SIZE	341	21.232	20.330	21.230	22.130	1.314	18.360	25.170

Dichotomous Variables	N	Mean	Std. Dev	Sum	Min.	Max.
SUSTAIN	341	0.235	0.424	80	0	1
ENERGY	341	0.065	0.246	22	0	1
MATERIALS	341	0.188	0.391	64	0	1
INDUSTRIALS	341	0.199	0.400	68	0	1
CONSDISC	341	0.208	0.407	71	0	1
CONSSTAP	341	0.079	0.270	27	0	1
FINANCIALS	341	0.243	0.430	83	0	1
TELCOS	341	0.018	0.132	6	0	1
SUSTAIN.MATERIALS	341	0.103	0.304	35	0	1
SUSTAIN.INDUSTRIALS	341	0.035	0.185	12	0	1
SUSTAIN.CONSDISC	341	0.006	0.076	2	0	1
SUSTAIN.CONSSTAPLE	341	0.023	0.152	8	0	1
SUSTAIN.FINANCIALS	341	0.032	0.177	11	0	1
SUSTAIN.TELCOS	341	0.009	0.094	3	0	1
SUSTAIN.ENERGY	341	0.026393	0.160536	9	0	1
YR2003	341	0.349	0.477	119	0	1
YR2004	341	0.314	0.465	107	0	1

Table 4

VARIABLES	(1) ALL FIRMS	(2) Ex-Bottom Quartile Ke	(3) BIGFIRMS	(4) SMALLFIRMS	(5) INDUSTRY SPECIFIC
SUSTAIN (-)	-0.0082	-0.0085	-0.0085	0.0008	
	(0.0686)*	(0.0820)*	(0.0710)*	(0.9388)	
BtoM (+)	0.0270***	0.0392***	0.0103*	0.0625***	0.0271***
	(0.0000)	(0.0000)	(0.0638)	(0.0000)	(0.0000)
DISTRESS (+)	0.0058***	0.0052**	0.0052**	0.0080***	0.0061***
	(0.0028)	(0.0146)	(0.0255)	(0.0066)	(0.0019)
SIZE (-)	-0.0081***	-0.0090***	-0.0006	-0.0162***	-0.0081***
	(0.0000)	(0.0000)	(0.4206)	(0.0013)	(0.0000)
Energy		0.0371		0.0686***	0.0434***
		(0.1034)		(0.0045)	(0.0002)
INDUSTRIALS	-0.0257***	0.0076	-0.0019	0.0254	0.0126*
	(0.0057)	(0.7264)	(0.8654)	(0.2389)	(0.0592)
MATERIALS	-0.0125	0.0265	0.0017	0.0425*	0.0246***
	(0.1729)	(0.2280)	(0.8742)	(0.0538)	(0.0031)
CONSDISC	-0.0369***	-0.0008	-0.0177	0.0232	-
	(0.0001)	(0.9709)	(0.1494)	(0.2830)	
CONSSTAP	-0.0322***	0.0015	-0.0153	0.0000	0.0016
	(0.0030)	(0.9471)	(0.1887)	(.)	(0.8734)
FINANCIALS	-0.0454***	-0.0097	-0.0313***	0.0083	-0.0080
	(0.0000)	(0.6582)	(0.0049)	(0.7039)	(0.2363)
TELCOS	-0.0333*	0.0000	-0.0302*	0.0000	-0.0025
	(0.0576)	(.)	(0.0574)	(.)	(0.9110)
SUSTAIN.ENERGY (-)					-0.0224
					(0.0861)*
SUSTAIN.MATERIALS					-0.0072
					(0.2225)
SUSTAIN.INDUSTRIALS					-0.0137
					(0.1239)
SUSTAIN.CONSDISC					0.0082
					(0.7594)
SUSTAIN.CONSSTAP					0.0036
					(0.8205)
SUSTAIN.FINANCIALS					-0.0082
					(0.2479)
SUSTAIN.TELCOS					0.0048
					(0.8739)
YR2003	-0.0102**	-0.0112**	-0.0025	-0.0219***	-0.0098**
	(0.0377)	(0.0404)	(0.6574)	(0.0057)	(0.0470)
YR2004	-0.0076	-0.0094*	-0.0056	-0.0117	-0.0072
	(0.1256)	(0.0901)	(0.3228)	(0.1374)	(0.1506)
Constant	0.3221***	0.3065***	0.1462**	0.4210***	0.2864***
	(0.0000)	(0.0000)	(0.0447)	(0.0002)	(0.0000)

Observations	341	261	170	173	341
R-squared	0.1957	0.2391	0.1767	0.2510	0.2010

One-tailed p-values in parentheses*** p<0.01, ** p<0.05, * p<0.1