

The influence of corporate social responsibility disclosure on share prices

Evidence from the United Kingdom

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Received 24 May 2013
Revised 5 February 2014
Accepted 22 March 2014

Abstract

Purpose – The purpose of this paper is to examine the association between share prices and the level of corporate social responsibility (CSR) disclosure of large UK companies, using CSR data from an independent firm and a time period and setting (the UK) that coincides with increased legislation and increased public awareness of corporate social and environmental issues. Against a background of increased interest by investors in CSR disclosure, prior mixed results on the association between CSR disclosure and share prices suggest the need for further research that overcome some of the identified limitations of the extant literature.

Design/methodology/approach – A modified Ohlson (1995) model is used to examine the relationship between CSR disclosure and share prices among the 100 largest UK companies. Three different measures of CSR disclosure are used to ensure robustness of results.

Findings – The paper finds that higher levels of CSR disclosure are associated with higher share prices. Furthermore, the paper provides evidence that CSR disclosure by companies operating in environmentally sensitive industries show a stronger association with share prices than CSR disclosure by companies operating in other industries. The paper concludes that CSR disclosure provides incremental value-relevant information to investors beyond financial accounting information.

Originality/value – To the best of our knowledge, this is the first paper to provide evidence of the incremental value of CSR disclosure to share price determination in the UK, a country where CSR disclosure is high on the agenda. Our findings provide evidence that CSR disclosures by companies and, in particular, disclosures following the global reporting initiative (GRI) guidelines, are useful to investors and shareholders, as it is related to share price information.

Keywords Corporate governance, Corporate social responsibility, Sustainability reporting, Environmental reporting, Market valuation, Social reporting

Paper type Research paper



The authors gratefully acknowledge KPMG for providing access to their social disclosure data. The authors would also like to thank an anonymous AFAANZ Conference 2012 reviewer and AFAANZ 2012 participants for their helpful comments.

1. Introduction

Corporate social responsibility (CSR) disclosures consist mainly of non-financial information and relate to companies' social and environmental impacts. CSR disclosures can be provided voluntarily, but regulatory requirements increasingly mandate some form of CSR disclosure, e.g. in the UK, Denmark and South Africa. The UK is one of the leading countries in CSR reporting (KPMG, 2011) and by 2008, 99 per cent of the 100 largest UK companies disclosed CSR information (KPMG, 2008) compared to 71 per cent in 2005 (KPMG, 2005). Following prior research by Choi *et al.* (2013), who hypothesise and find a positive relationship between impending regulation and carbon disclosure, we are particularly interested in examining a setting where CSR disclosure regulation is on the increase. According to KPMG (2008), the increase in CSR disclosure by UK companies could be due to impending regulation via the new UK Companies Act, 2006[1]. In terms of the UK Companies Act, 2006, listed companies' annual reports have to include directors' reports, which have to include a business review, which in turn has to include CSR information, specifically information regarding environmental matters, employees and social and community issues. The Act, therefore, mandates disclosure of information relating to environmental matters, employees and social and community issues in the annual report of listed companies, but does not provide guidance regarding the specific topics that need to be addressed under the main headings mentioned, nor does it mandate the extent of CSR disclosure required. Thus, both the specific information disclosed and the extent of disclosure, are still largely discretionary[2].

We are interested in the association between share price and CSR disclosure in the UK. The specific objective of this study is to examine whether higher levels of CSR disclosure by large UK companies (a country where CSR disclosure is high on the agenda) are associated with higher share prices. CSR disclosures by companies provide information which is not readily available to market participants from other sources and allow market participants to assess possible strategic advantage, as well as CSR-related risks. Surveys and interview data provide evidence that environmental information (which is part of CSR disclosure) is desired by UK institutional and individual investors, thus implying that the information is (or would be) useful for investment decision-making (Solomon and Solomon, 2006; De Villiers and Van Staden, 2010). Prior research examining the association between CSR disclosure and share returns in general (i.e. not related to specific environmental or social news or events) concludes that CSR disclosure is not directly associated with share returns in the UK (Murray *et al.*, 2006). Furthermore, prior research examining the association between CSR and the level of share price/market value of equity, provides mixed results, with evidence of CSR being associated with a lower share price/market value of equity (Hassel *et al.*, 2005), as well as evidence of CSR disclosure being associated with a higher share price/market value of equity (Schadewitz and Niskala, 2010; De Klerk and De Villiers, 2012).

The UK provides an interesting setting to test the association between CSR disclosure and share price, given the changes in regulation regarding CSR disclosure. If shareholders and investors really value CSR information, as reported by companies, there should be a positive association between CSR disclosure and share price information. Against this background and given the mixed results in prior research on the association between CSR and share prices in settings other than the UK, this paper makes a number of important contributions. First, no prior study examines this relationship within the UK setting. Second, no prior study examines this relationship in

a setting where CSR disclosure regulation is significantly increasing. Third, to overcome shortcomings in the current literature, we use recent data collected by an independent accounting firm (KPMG) for the 100 largest companies based on revenue in the UK. Fourth, we use the Ohlson (1995) model as specified by Barth and Clinch (2009), and additionally, control for the effect that size and leverage may have on the association between share price and CSR disclosure in robustness tests. Finally, our study provides evidence which could be generalisable to other settings where there is increased regulation and interest around CSR disclosures.

Our findings show that global reporting initiative (GRI)-related disclosure levels are positively associated with share prices. We contribute to the CSR disclosure literature by providing evidence that the level of CSR disclosure by UK companies is value-relevant in such a way that higher levels of CSR disclosure are associated with higher share prices. This finding contrasts with Hassel *et al.* (2005) who found that a decade ago (possibly in an era with different social norms), higher levels of CSR were associated with lower share prices in Sweden. It also contrasts with Murray *et al.* (2006) (the only prior study to use UK data in this area) who found no significant association between CSR disclosure and the share returns of large UK companies in an earlier period. Our findings may, therefore, be indicative of changing attitudes and, therefore, different associations in the UK today. Our findings will, therefore, be of interest to companies (managers) when considering disclosure decisions, shareholders when making investment decisions, analysts when preparing investment advice, regulators when considering further regulations around CSR disclosures and other non-financial stakeholders interested in companies' accountability around social and environmental issues. Our findings demonstrate the financial importance of CSR disclosure in line with the GRI requirements.

The remainder of this paper is organised as follows. Section 2 provides an overview of the prior literature that explored whether financial markets are interested in CSR disclosure, discusses the theoretical framework and states the hypotheses. Section 3 provides detail of data, measures of CSR disclosure and the valuation model used. Section 4 presents the results and Section 5 the conclusion.

2. Prior literature and hypotheses

2.1 Financial markets and CSR disclosure

Healy and Palepu (2001, p. 413) conclude that regulated financial accounting information and information presented under proposed new accounting standards provide valuable information to investors which assists them in assessing future earnings and cash flows. Also, following Choi *et al.* (2013) and KPMG (2008), an increase in CSR disclosure could be due to impending regulation. Given the increased interest in CSR disclosure in the UK (evident from the prior literature discussed in the remainder of this section), we argue that impending regulation would not only have an effect on the level of disclosure provided by companies, but could also potentially influence the value-relevance of the information. Whether CSR disclosure is value relevant remains an empirical question, which we aim to engage with.

Prior literature in the form of surveys provides evidence that environmental information is regarded as value-relevant by individual investors in Australia, the UK and the USA (De Villiers and Van Staden, 2010) and also in New Zealand (De Villiers and Van Staden, 2012). UK respondents want environmental information to be disclosed

because they, first, believe that companies should be accountable for their environmental impact and, second, respondents indicated that they need (or would need) the information for investment decision-making (De Villiers and Van Staden, 2010). CSR disclosure is also regarded as value-relevant by UK institutional investors who collect private social information (when it is not available) to assist them with investment decision-making (Solomon and Solomon, 2006). Several recent studies emphasise the importance of further CSR research (Glennie and Lodhia, 2013; Lawrence *et al.*, 2013; Summerhays and De Villiers, 2012; Samkin, 2012; Schaltegger *et al.*, 2013).

Studies using the Ohlson (1995) model are designed to examine the association between the share price/market value of equity and financial accounting information combined with, depending on the valuation model used, other non-accounting information (such as CSR disclosure) (Ohlson, 1995; Barth *et al.*, 2001; Hassel *et al.*, 2005). In contrast with a share return approach, which evaluates what is reflected in share price changes during a specific period, the objective when using a share price/market value of equity approach is to evaluate the market's view on the future cash flows and risk profile of a company as reflected in its share price at a specific point in time (Barth, 2006, p. 91).

Event studies evaluate the short-term effects of specific news or events on share returns. Event studies generally provide evidence that shareholders price negative information regarding environmental or social performance (Patten, 1990; Blacconiere and Patten, 1994; Lorraine *et al.*, 2004) into the share price of companies, but not positive information. Experimental type studies have attempted to provide information on the value relevance of both positive and negative environmental information. According to Chan and Milne (1999, p. 265), investors penalise bad environmental performers but do not have a significant reaction towards good performers. However, a more recent experimental study by Holm and Rikhardsson (2008, p. 538) suggests that positive information may create value for a company, as investors do take this into account when making investment decisions. Studies in Australia and Europe using share returns to evaluate potential economic outcomes of CSR disclosure more generally (i.e. not related to specific news or events) found no significant association between CSR disclosure and share returns (Murray *et al.*, 2006; Jones *et al.*, 2007; Moneva and Ortas, 2008). Jones *et al.* (2007) examined the association between sustainability disclosure and abnormal share returns for Australian companies for 2003/2004, and reported a negative but weak association. Similarly, Moneva and Ortas (2008) found no association between CSR disclosure by European companies using the GRI guidelines and share returns for 2004 and 2005. Murray *et al.* (2006) is the only study that uses UK data to examine the association between social and environmental disclosure and the financial market performance of large UK companies. Financial market performance was measured in terms of share returns. Murray *et al.* (2006) conducted a longitudinal and cross-sectional study over the period 1988 to 1997 and found no direct association between disclosure and share returns. Their data dates back to the 1990s, a period before the increased interest in CSR matters. Increased legislation and increased public awareness of corporate social and environmental issues make it more likely that capital markets will now pay closer attention to CSR disclosure to ensure that any clues it may provide regarding risks and future returns are taken into account when making investment decisions. Murray *et al.* (2006) use share market returns based on increases/decreases from previous levels in share prices and these previous levels could already have been

influenced by previous CSR information and disclosure. Therefore, we consider current share prices to be a better alternative, not least because it is based on a well-founded prior model, i.e. the [Ohlson \(1995\)](#) model, but also because the model is used in the specification recommended by [Barth and Clinch \(2009\)](#).

Prior research on the association between CSR disclosure (or areas thereof such as environmental disclosure) and the (level of) share price/market value of equity was conducted in different countries, focussed on larger companies, used different measures of disclosure, different versions of the [Ohlson \(1995\)](#) model, different scalars and provides some inconsistent results (see [Patten, 2002](#) and [Barth and Clinch, 2009](#)). These studies are summarised next. [Hassel *et al.* \(2005\)](#) found published information regarding environmental performance to be associated with a decrease in market value of equity for Swedish companies. Their findings supported the cost-concerned perspective, which attributes a decrease in market value to increased costs associated with the increase in performance and/or disclosure. [Moneva and Cuellar \(2009\)](#) find financial environmental disclosure by Spanish companies to be associated with an increase in share price, but not non-financial environmental information. [Schadewitz and Niskala \(2010\)](#) and [De Klerk and De Villiers \(2012\)](#) used the GRI guidelines as a measure of CSR disclosure, finding CSR disclosure to be positively and significantly associated with share price. [Schadewitz and Niskala \(2010\)](#) examined Finnish companies, and [De Klerk and De Villiers \(2012\)](#) examined South African companies. Statistical evidence provided by [Schadewitz and Niskala \(2010\)](#) indicates that the combined effect of CSR disclosure and financial accounting information explains market attributes better than an exclusive focus on financial accounting information. The research objectives of these studies, although different from each other to an extent, all relate to the association between CSR disclosure (or areas thereof) and share price/market value of equity.

The mixed results found in the literature could be due to several reasons. First, the use of data from a time period when social and environmental issues may not have translated into financial consequences as readily as today, e.g. [Murray *et al.* 2006](#) and [Hassel *et al.* \(2005\)](#) used data from the 1990s; second, the use of data from countries where governance structures and social norms do not necessarily suggest a link between CSR disclosures and financial consequences; and third, the use of unreliable, hand-collected CSR data. Overall, the mixed results and methodological issues mentioned, suggest the need for further research that improves on these limitations.

We overcome the limitations identified by using a timeframe that coincides with increased legislation and increased public awareness of corporate social and environmental issues. We use a country where social norms and governance structures (i.e. the introduction of the requirements for UK listed companies to disclose CSR information) suggest a link between CSR disclosures and financial consequences. We use three measures of CSR disclosure in our analyses, rather than hand-collected CSR data. The first measure is an indicator variable of whether the GRI framework is used for CSR disclosure or not (according to [KPMG \(2008\)](#), the GRI framework is globally the most widely used framework for CSR reporting). The second measure is also based on the GRI guidelines but takes into account the level of compliance with these guidelines. The third measure is a composite measure of CSR disclosure practices based on data

collected by KPMG during their 2008 international research on CSR-reporting practices. Data collected by KPMG can be relied upon, as it was their fifth research project of this nature over a period of 20 years, thus suggesting experience with, and stability in, the evaluation process.

We follow prior research by using a basic [Ohlson \(1995\)](#) model, in the same way that Ohlson-type models have historically been used, with CSR disclosure representing our non-financial variable of interest. Note that capital market participants prefer to source their CSR performance information from corporate disclosures, as reported in the [Radley \(2012\)](#) survey. We use three different measures of disclosure where higher scores represent higher levels of disclosure and thus greater commitment towards CSR reporting practices.

2.2 Theoretical framework and hypotheses

While a number of theories have been used in the CSR literature to explain the motivation for voluntary disclosure, we use information asymmetry from the voluntary disclosure literature as we focus on the influence of CSR disclosures on share prices and, therefore, on the information needs and usage of the shareholder/investor group. We argue that information asymmetry considerations between managers and shareholders affect the decisions by UK companies (managers) to voluntarily provide higher levels of CSR disclosure than those mandated by law. Based on agency theory, information asymmetry exists where there is separation of ownership and control between shareholders/potential shareholders and managers. Shareholders need information (i.e. CSR disclosure in the context of this study) about the environmental risks of a company's operations ([Al-Tuwaijri et al., 2004](#)) and management's policies to address these risks ([Clarkson et al., 2008](#)). The risks can potentially be very costly. Shareholders need relevant information to monitor management ([Healy and Palepu, 2001](#)) and to make more accurate estimates of future earnings and cash flows when valuing shares ([Healy and Palepu, 2001](#); [Al-Tuwaijri et al., 2004](#)). Shareholders who do not have the relevant information when valuing shares will assume the worst-case scenario and lower the price they are prepared to pay for shares in the company ([Healy and Palepu, 2001](#); [Cormier et al., 2005](#)). Shareholders may require a higher rate of return on investment if they do not have relevant information about future liabilities ([Healy and Palepu, 2001](#); [Dhaliwal et al., 2011](#)). Voluntary reporting, such as CSR disclosure, is used by managers to communicate information about the company's environmental and social performance to shareholders ([Healy and Palepu, 2001](#)). In addition, increased CSR disclosure may attract institutional investors who have long-term investment horizons ([Dhaliwal et al., 2011](#)). Managers make a cost/benefit assessment when deciding on the extent of disclosure ([Cormier et al., 2009](#)). Furthermore, managers are often incentivised with share-based payments and/or bonuses linked to earnings and share price performance. Thus, following the agency theory, managers have an incentive to provide CSR disclosure voluntarily to increase the share price. The first hypothesis of this study is, therefore, stated as follows:

H1. Higher levels of CSR disclosure are associated with higher share prices.

Prior research shows a positive association between sensitive industries and CSR disclosure ([Deegan and Gordon, 1996](#); [Clarkson et al., 2011](#)). Companies operating in environmentally sensitive industries have an increased risk associated with potential

litigation and future environmental liabilities and are exposed to higher levels of environmental publicity and public concern (De Villiers *et al.*, 2011). Because of these risks, investors in companies operating in environmentally sensitive industries will have more reason to fear negative cash flow effects from environmental and other social concerns. CSR disclosures provide information that allows investors to make a better informed assessment of these risks. If no information is provided, investors tend to assume the worst (i.e. adverse selection) and they then ensure that they do not suffer any negative consequences by adjusting the amount they are prepared to pay for shares in the company downwards. On the basis that CSR disclosure provides information that allows investors, in the case of some companies, to adjust their risk assessment of the company's future cash flows positively, and on the basis that these risks are greater for companies in environmentally sensitive industries, we argue that higher levels of CSR disclosure provided by companies in these industries will positively influence share prices (more than in other industries). Our second hypothesis is stated as:

H2. The association between higher levels of CSR disclosure and higher share prices are stronger among companies operating in environmentally sensitive industries.

3. Method

Against the background of increased regulation, and given the evidence provided by prior research of investors' interest in CSR disclosure, we examine whether higher levels of CSR disclosure by UK companies, the level still being a matter of choice for managers and directors, was associated with higher share prices in 2007/2008. This timeframe coincides with the introduction of the requirement for UK listed companies to disclose CSR information. We also examine whether CSR disclosure by companies operating in environmentally sensitive industries is assessed differently by market participants than CSR disclosure by companies operating in other industries. Additionally, we examine whether the combined effect of CSR disclosure with financial accounting information explains market attributes better than financial accounting information on its own. We use a modified Ohlson (1995) model and three measures of CSR disclosure in our analyses.

3.1 Sample data

Similar to prior research, we focus on large companies[3]. We start with the 100 largest UK companies (based on revenue), i.e. the companies included in the KPMG (2008) data set. Following our valuation model (discussed in Section 3.3), we eliminate 11 companies for lack of share price and/or other required financial data on Bureau van Dijk. We do not exclude bank and insurance companies from our sample but control for the effect their unique financial ratio characteristics may have on the results in additional tests. The final sample consists of 89 companies (including 20 bank and insurance companies). KPMG (2008) used corporate social information which is available in the public domain, issued between mid-2007 and mid-2008 to examine trends in CSR disclosure (KPMG, 2008). We use the same sample period in our study. Note that our sample period predates the CSR disclosure requirements of the new Companies' Act, yet managers may already have been influenced to increase their level of CSR disclosure due to the impending regulations.

3.2 Measures of CSR disclosure

We use KPMG data collected during the 2008 research project of CSR-reporting practices to measure disclosure. KPMG includes stand-alone CSR reports, company websites and annual reports in their analysis. KPMG (2008) provides a comprehensive CSR database representing a credible and independent source, covering the CSR-reporting practices of the 250 largest companies worldwide (the Global Fortune 250 or G250 companies), as well as the 100 largest companies (the N100 companies) in 22 countries. According to KPMG (2008), CSR disclosure has increased over time and the GRI guideline has now become the most widely used framework for reporting. KPMG (2008) data were used because they cover a broad spectrum of CSR areas (rather than focusing exclusively on environmental disclosure). Furthermore, the 2008 data are sourced from the fifth comprehensive research project performed by KPMG (the first was in 1993), suggesting some stability in the evaluation process. We use three measures of CSR disclosure based on the data collected by KPMG. The measures of CSR disclosure which we use are:

Comp. A continuous measure of CSR disclosure with a theoretical range from 0 to 87, a higher number signifying more CSR disclosure. The following categories of CSR reporting are covered in the KPMG (2008) data and are represented in the score: overall environmental strategy, stakeholder engagement, corporate management systems, disclosure, governance, climate change, supply chain, responsible investment, assurance, whether or not a company uses the GRI guidelines for CSR disclosure and the GRI level applied by a company. These categories consist of a total of 87 specific CSR disclosure practices. The composite measure is calculated by adding one for each of the 87 possibilities. Thus, a higher number shows a higher level of CSR disclosure.

GRI. An indicator variable showing whether a company uses the GRI guidelines. The GRI is globally the most widely used framework for CSR disclosure, with more than 77 per cent of the G250 and 69 per cent of the N100 companies in 22 countries following the GRI guidelines. We argue that companies that adopt the GRI framework are more likely to have higher-quality CSR disclosure. *GRI* is coded 1 for companies using GRI, and 0 for companies that do not.

GRI_level. A measure of the level of CSR disclosure based on the GRI G3 guideline. GRI G3 allows companies to declare the extent to which they disclose CSR, with A indicating that they disclose all 50 core indicators, B indicating that they disclose a smaller set of indicators and C indicating even less disclosure (KPMG, 2008). Companies can get independent third-party assurance of this level of compliance (indicated by a "+") or simply declare their own compliance level. We scored the *GRI_level* from zero to six (where A+ = 6, A = 5, B+ = 4, B = 3, C+ = 2, C = 1, companies using the G2 guidelines = 1 and companies that do not use the GRI guidelines = 0). Thus, a higher number shows a higher level of CSR disclosure.

3.3 Valuation model

We use a modified Ohlson (1995) model [4] to evaluate whether the level of CSR disclosure is associated with share prices at the end of the 2007/2008 reporting period. The Ohlson (1995) model is based on the premise that market value of equity is a function of book value, accounting earnings (i.e. financial accounting information) and other non-accounting information. Many capital markets-based accounting research use

the following modified [Ohlson \(1995\)](#) model as a basis to evaluate the value relevance of accounting information ([Barth and Clinch, 2009](#), p. 255):

$$MVE_t = \alpha_0 BVE_t + \alpha_1 EARNSt + \varepsilon \quad (2)$$

Where MVE_t is the market value of equity at time t , BVE_t equals book value of equity at time t , $EARNSt$ is earnings for period t and ε is the regression error. An analysis using the above equation is based on the association between share price/market value of equity, book value and earnings ([Barth and Clinch, 2009](#)). We use a share price specification of the above model, as recommended by [Barth and Clinch \(2009, p. 264\)](#)[5].

Our overall objective is to evaluate the relationship between share prices and the CSR disclosure of UK companies. We also examine whether the combined effect of financial accounting information with CSR disclosure explains market attributes better than an exclusive focus on financial accounting information. Three steps are followed to achieve our objectives ([Hassel et al., 2005](#)). The first step is to examine whether financial accounting information (book value and earnings in the regression model) is associated with share price (see equation [3] below). The second step is to add CSR disclosure to represent other non-accounting information in the regression model (see equation [4] below). The equations for Steps 1 and 2 are as follows:

$$\text{Step 1: } P_{i,t} = \beta_0 + \beta_1 BV_{i,t} + \beta_2 E_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$\text{Step 2: } P_{i,t} = \beta_0 + \beta_1 BV_{i,t} + \beta_2 E_{i,t} + \beta_3 CSR_{i,t} + \varepsilon_{i,t} \quad (4)$$

Where $P_{i,t}$ is the share price of company i on the last day of the month, three months after the end of the financial year. $P_{i,t}$ three months after the end of the financial year is used to allow time for the publication and analysis of financial statements. $BV_{i,t}$ is the book value of equity per share of company i and is calculated as the difference between total assets and total liabilities at the end of the financial year, scaled by the number of shares in issue, three months after the end of the financial year. $E_{i,t}$ is net income for the year of company i , after interest and tax, scaled with the number of shares in issue on the last day of the month, three months after the end of the financial year. $CSR_{i,t}$ is a measure of the level of CSR disclosure provided by a company and ε is the regression error. We use three measures of CSR disclosure and estimate equation (4) separately, using the three measures. The measures are *Comp*, *GRI* and *GRI level*. The measures of CSR disclosure are not deflated, as is common in this kind of study.

Based on *H1*, we expect β_3 , the coefficient for CSR disclosure in equation (4), to be positively and significantly associated with share price. Also of interest is whether the explanatory power of our model (measured in terms of the R^2) increases when CSR disclosure is added as an independent variable to the regression (see equation [4]). We use an *F*-test to examine whether the change in the R^2 is significant.

For the final step, following [Hassel et al. \(2005\)](#), we extend equation (4) to examine whether CSR disclosure provided by companies operating in environmentally sensitive industries is associated with higher share prices than CSR disclosure by companies operating in other industries. We add a variable for environmentally

sensitive industries (*ES*) and a variable representing the interaction between these industries and CSR disclosure (*ES CSR*) as additional explanatory variables of share price (see equation [5]).

$$\text{Step 3: } P_{i,t} = \beta_0 + \beta_1 BV_{i,t} + \beta_2 E_{i,t} + \beta_3 CSR_{i,t} + \beta_4 ES_{i,t} + \beta_5 (ES_{i,t} CSR_{i,t}) + \varepsilon_{i,t} \quad (5)$$

We use the three measures of CSR disclosure (*Comp*, *GRI* and *GRI_level*), and estimate equation (5) separately using the three measures. Indicator variable $ES_{i,t}$ is equal to 1 if a company is operating in an environmentally sensitive industry and 0 if not. $ES_{i,t} CSR_{i,t}$ represents the interaction between environmentally sensitive industries and CSR disclosure. $ES_{i,t} CSR_{i,t}$ is calculated by multiplying variable *ES* with the measure of CSR disclosure (*Comp*, *GRI* and *GRI_level*, respectively). Variables $ES_{i,t}$ and $ES_{i,t} CSR_{i,t}$ are not deflated, as they are independent of company size. All other variables are as discussed earlier.

The following industries are identified as environmentally sensitive: mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; and construction (Nomenclature of Economic Activities (NACE) Rev. 2 core codes on Bureau van Dijk: 0,610, 2,120, 3,511, 4,120). Of the 89 sample companies, 36 are identified as environmentally sensitive companies. Based on *H2*, we expect β_5 , the coefficient of the variable representing the interaction between *ES* and *CSR* in equation (5), to be positively and significantly associated with share price. We do not predict the sign of β_4 .

In additional tests, we exclude the 20 bank and insurance companies from our sample to show robustness. Our sample period coincides with the global financial crisis period and we attempt to control for potential biases in our results owing to the number of loss companies. The Ohlson (1995) valuation model is based on a predicted positive and significant association between share price, book value of assets and earnings. This association might be different for loss companies. Similarly, the association between share price and CSR disclosure might be different for loss companies. Thus, we eliminate loss companies (companies with negative earnings and/or book value) from the full sample of 89 companies, as well as the sample excluding bank and insurance companies (69 companies), and report the results. Additionally, we control for the possibility that financial accounting information could have been anticipated by shareholders before the publication of the financial statements and factored into share price at the end of the financial year. Thus, to show robustness, we use share price data (share prices, number of shares and market value of equity) at the end of the financial year to test the effect on our results. In order to reduce the effect that outliers (refer to descriptive statistics discussed in Section 4) may have on the results, we do a 90 per cent winsorisation on the data and report the results.

Size and leverage may have a more significant effect on the share price of companies during a financial crisis period and, in addition, bank and insurance companies have different financial ratio characteristics compared to other companies. Thus, we include size, measured as the natural logarithm of total assets, and leverage as control variables in additional tests (refer to equations [3], [4] and [5] in Table III).

4. Results

4.1 Descriptive statistics

Table I provides the descriptive statistics of the share price specification of the modified Ohlson (1995) model. On average, the share price for sample companies is £8.74 (with a median of £6.61). The maximum share price is £52.33 and the minimum is £0.63. The mean book value per share is £3.95 (median £2.33) with a maximum of £20.61 and a minimum of -£0.40. The average earnings per share of the sample companies is £0.75 with a maximum of £4.47 and a minimum of -£3.06. These variables are positively skewed. The composite measure of CSR disclosure (*Comp*) has a mean score of 30.17 with a maximum of 64 of a possible 87 and a minimum of 3. The maximum GRI level

	$P_{i,t}$	$BV_{i,t}$	$E_{i,t}$	$Comp_{i,t}$	$GRI_level_{i,t}$
Number of observations	89	89	89	89	89
Mean	8.74	3.95	0.75	30.17	0.92
Median	6.61	2.33	0.52	31.00	0.00
Standard deviation	8.49	4.13	1.06	12.81	1.93
Maximum	52.33	20.61	4.47	64	6
Minimum	0.63	-0.40	-3.06	3	0

No. of companies using GRI at each level specified in GRI G3

GRI level	No. of companies
A+	8
A	0
B+	6
B	1
C+	2
C	3
Still use the GRI G2 framework	10
Do not use the GRI	59
Total	89

Notes: $P_{i,t}$ is the share price (per share) on the last day of the month three months after the end of the financial year; $BV_{i,t}$ is the book value of equity per share and is calculated as the difference between total assets and total liabilities at the end of the financial year, scaled with the number of shares in issue, three months after the end of the financial year; $E_{i,t}$ is the net income for the year after interest and tax, scaled with the number of shares in issue on the last day of the month, three months after the end of the financial year; *Comp* is a composite numerical measure of a company's CSR practices; *GRI_level* is a measure of compliance to the GRI G3 framework with A+ level coded 6, A coded 5, B+ coded 4, B coded 3, C+ coded 2, C and companies using the GRI G2 framework coded 1, and companies not using the GRI guidelines coded 0. Variables *GRI* and *ES* are indicator variables and are not presented in Table I. *GRI* is a measure of CSR disclosure, indicating whether a company uses the GRI guidelines or not. $GRI_{i,t}$ is coded 1 for companies using the GRI guidelines, otherwise 0. *ES* represents environmentally sensitive industries. $ES_{i,t}$ is equal to 1 if a company is operating in an environmentally sensitive industry and 0 if not. Thirty of the sample companies use the GRI guidelines as disclosure framework and 36 of the sample companies are categorised as environmentally sensitive (*ES*). The measures of CSR disclosure (*Comp*, *GRI* and *GRI_level*) are discussed in Section 3.2. Refer to Section 3.3 [equation (5)] for a description of environmentally sensitive industries (*ES*).

Table I.
Descriptive statistics for the Ohlson (1995) model with share price as dependent variable

score (*GRI_level*) is 6 and the minimum is 0. A zero indicates that a company is not using the GRI disclosure framework for CSR disclosure. Thirty of the sample companies use the GRI guidelines as a disclosure framework and 36 of the sample companies are categorised as environmentally sensitive (*ES*).

4.2 Regression results of the Ohlson (1995) model

Following Ohlson (1995), we expect book value and earnings to be positively and significantly associated with share price/market value of equity. Based on our hypotheses, we expect CSR disclosure (see equation [4]) to be positively and significantly associated with share price (*H1*). We also expect CSR disclosure provided by companies operating in environmentally sensitive industries (see equation [5]) to be assessed differently by market participants (*H2*). Additionally, we expect the increase in the R^2 to be statistically significant when the measures of CSR disclosure are added to the regression model in equation (4) and (5).

The results of equations (3–5), following the share price specification of the modified Ohlson (1995) model on the sample of 89 companies, are presented in Table II. As expected, both β_1 and β_2 , the coefficients for book value per share and earnings per share, are positively and significantly associated with share price for equations (3–5). The adjusted R^2 for equation (3), based on financial accounting information only, is 0.433. The adjusted R^2 increases when the three measures of CSR disclosure are added to the regression model in equation (4), [0.457 for the composite measure (*Comp*); 0.502 for the GRI measure (*GRI*); and 0.471 for the GRI level (*GRI_level*)]. The increase in the R^2 is significant at the 5 per cent level when the composite (*Comp*) measure is used and significant at the 1 per cent level when the GRI measure (*GRI*) and the GRI level (*GRI_level*) are used. Two of the three measures of CSR disclosure, *GRI* and *GRI_level*, are significant at the 1 per cent level (coefficients 4.989 and 1.024) for equation (4) while the composite measure (*Comp*) is significant at the 5 per cent level (coefficient 0.119). The increase in the R^2 when environmentally sensitive industries (*ES*) and the interaction variable between these industries and CSR disclosure are added to the regression in equation (5) is significant at the 1 per cent level for all three measures of CSR disclosure. The coefficient for the interaction term between *ES* and *CSR* is positive and significant at the 1 per cent level for all three measures of CSR disclosure (coefficients 0.287; 9.297 and 1.951). The untabulated results of collinearity diagnostic tests provide evidence that multicollinearity is unlikely to be an issue in equations (3–5) as the variance inflation factors (*VIF*'s) range between 1.068 and 1.284 for all variables except for the interaction term between *ES* and *CSR* (which is to be expected).

When we eliminate loss companies from the sample of 89 companies, the untabulated results are qualitatively similar to the results shown in Table II. In additional tests, we established that the results, when share price data at the end of the financial year, instead of data with a three-month lag are used, are qualitatively similar to the results reported above except for the composite measure of CSR disclosure which is significant at the 1 per cent level instead of at the 5 per cent level. When data are winsorised at a 90 per cent level, the coefficients for the composite measure (*Comp*) as well as the measure representing the GRI level (*GRI_level*) are positive and significant at the 5 per cent level for equation (4) and the coefficient for the GRI measure (*GRI*) is positive and significant at the 1 per cent level. The increase in the R^2 for equation (4) is significant at the 5 per cent level when the composite measure (*Comp*) and the GRI level are used, and significant at

Table II.
Regression results with share price as the dependent variable [a share price specification of the Ohlson (1995) model]

	Equation (3) Dependent	Equation (4) (with CSR as Comp) Dependent	Equation (4) (with CSR as GR) Dependent	Equation (4) (with CSR as GR_level) Dependent	Equation (5) (with CSR as Comp) Dependent	Equation (5) (with CSR as GR) Dependent	Equation (5) (with CSR as GR_level) Dependent
Intercept	2.988 (3.018)***	-0.176 (-0.101)	1.805 (1.833)*	2.874 (3.004)***	2.843 (1.446)	1.963 (1.983)**	2.387 (2.299)**
BV _{i,t}	0.750 (4.349)***	0.691 (4.047)***	0.724 (4.473)***	0.668 (3.950)***	0.756 (4.872)***	0.715 (4.872)***	0.664 (4.201)***
E _{i,t}	3.716 (5.521)***	3.472 (5.200)***	3.190 (4.926)***	3.040 (4.365)***	2.369 (3.652)***	2.552 (4.194)***	2.072 (3.080)***
Comp _{i,t}		0.119 (2.198)**			-0.043 (-0.668)		
GR _{i,t}			4.989 (3.591)***			-1.189 (-0.629)	
GR_level _{i,t}				1.024 (2.695)***			-0.573 (-0.913)
ES _{i,t}					-3.883 (-1.150)	0.862 (0.531)	3.423 (2.380)**
ES _{i,t} Comp _{i,t}					0.287 (2.841)***	9.297 (3.534)***	
ES _{i,t} GR _{i,t}							
ES _{i,t} GR_level _{i,t}							
Adjusted R ²	0.433	0.457	0.502	0.471	0.558	0.599	1.951 (2.534)***
F value	34.552 (p < 0.01)	25.670 (p < 0.01)	30.518 (p < 0.01)	27.132 (p < 0.01)	23.212 (p < 0.01)	27.336 (p < 0.01)	23.405 (p < 0.01)
Observations	89	89	89	89	89	89	89
Significance of R ² change compared to equation (3)	n/a	(p < 0.05)	(p < 0.01)	(p < 0.01)	(p < 0.01)	(p < 0.01)	(p < 0.01)

Notes: The *t*-statistic is reported in parenthesis and is two-tailed, except for the following variables of interest: *Comp_{i,t}*, *GR_{i,t}*, *GR_level_{i,t}*, *ES_{i,t}Comp_{i,t}*, *ES_{i,t}GR_{i,t}*, and *ES_{i,t}GR_level_{i,t}*, which are one-tailed. Significance two-tailed: *t* > 2.575 = *** Significant at the 1% level; *t* > 1.960 = ** Significant at the 5% level; *t* > 1.645 = * Significant at the 10% level. Significance one-tailed: *t* > 2.327 = *** Significant at the 1% level; *t* > 1.645 = ** Significant at the 5% level; *t* > 1.282 = * Significant at the 10% level. Share price *P_{i,t}* is measured three months after the end of the financial year. The number of shares in issue three months after the end of the financial year is used as scalar for book value and earnings. Refer to equations (3)–(5) for more information on how the variables are measured.

the 1 per cent level when the GRI measure (*GRI*) is used. For equation (5), using winsorised data, the interaction variable between *ES* and CSR disclosure is positive and significant at the 1 per cent level for the models using the composite measure (*Comp*) and the GRI (*GRI*) measures of CSR disclosure and positive and significant at the 5 per cent level for the model using the GRI level (*GRI_level*). The increase in the R^2 for equation (5), using winsorised data, is significant at the 1 per cent level for all three measures of CSR disclosure.

The results are robust when we eliminate the 20 bank and insurance companies from our sample and use a sample of 69 companies. The results for the sample of 69 companies are untabulated. When share price data three months after the end of the financial year is used in equations (3–5), all three measures of CSR disclosure are positive and significant at the 1 per cent level for equation (4), the interaction variable between *ES* and the measures of CSR disclosure in equation (5) is positive and significant at the 5 per cent level for the composite measure (*Comp*) and the GRI level (*GRI_level*), and positive and significant at the 1 per cent level for the GRI measure (*GRI*) of CSR disclosure. The increase in the R^2 when we add the variables for CSR disclosure in equation (4) and the variables representing environmentally sensitive industries (*ES*) and the interaction between *ES* and CSR disclosure in equation (5) are significant at the 1 and 5 per cent levels. The results are qualitatively similar when we eliminate loss companies from our sample. The results when we use share price data at the end of the financial year, instead of with a three-month lag, are comparable with the results reported above. The results are also comparable when we winsorise the data at a 90 per cent level, except for the interaction variable between environmentally sensitive industries (*ES*) and the CSR measure representing the level of GRI (*GRI_level*), which is not significant.

Overall, the results of the Ohlson (1995) model provide evidence that higher levels of CSR disclosure by companies are associated with higher share prices (*H1*) and that the association between higher levels of CSR disclosure and share prices are stronger for companies operating in environmentally sensitive industries (*H2*). Based on the significance of the increase in the R^2 , the results also provide evidence that CSR disclosure provides incremental value-relevant information, beyond financial accounting information, to shareholders.

4.3 Results of additional tests controlling for size and leverage

Table III presents the results of our adjusted model after controlling for size and leverage. This model is used as a robustness test for the share price specification of the Ohlson (1995) model (see equations [3[∧]]–[5[∧]]) in Table III for more information regarding the adjusted model). Similar to the results presented in Table II, the coefficients for book value and earnings are positive and significant for equations (3[∧]–4[∧]). Size, measured as the natural logarithm of total assets, is negative but not significant for equation (3[∧]) as well as for equation (5[∧]) using the GRI measure of CSR disclosure (*GRI*) (coefficients –0.619 and –0.734). The coefficient for size is negative and significant at the 10 per cent level for equation (4[∧]) using the GRI measure (*GRI*) as well as for equation (5[∧]) using the composite measure (*Comp*) and the GRI level (*GRI_level*) as measures of disclosure (coefficients –0.959, –0.904 and –0.808). Size is negative and significant at the 5 per cent level for equation (4[∧]) using the composite measure (*Comp*) and the GRI level (*GRI_level*) as measures of CSR disclosure (coefficients –1.313 and –1.145). Leverage is

Table III.
Regression results
for the share price
specification of the
Ohlson (1995) model
after controlling for
size and leverage

$P_{i,t}$	Equation (3*) (with CSR as Comp)		Equation (4) (with CSR as GR)		Equation (4) (with CSR as GRI_level)		Equation (5) (with CSR as Comp)		Equation (5*) (with CSR as GRI)		Equation (5*) (with CSR as GRI_level)	
	Dependent	Dependent	Dependent	Dependent	Dependent	Dependent	Dependent	Dependent	Dependent	Dependent	Dependent	Dependent
Intercept	17.286 (1.488)	28.014 (2.411)**	23.423 (2.152)**	28.733 (2.483)**	21.902 (1.990)**	18.433 (1.837)*	20.574 (1.873)*	0.810 (4.472)***	0.822 (4.894)***	0.770 (4.469)***	0.789 (5.127)***	0.735 (4.477)***
$BY_{i,t}$	3.695 (5.500)***	3.384 (5.216)***	3.172 (4.974)***	2.910 (4.267)***	2.445 (3.786)***	2.612 (4.305)***	2.074 (3.098)***	-0.619 (-1.191)	-0.959 (-1.955)*	-1.145 (-2.204)**	-0.734 (-1.634)	-0.808 (-1.648)*
$Size_{i,t}$	-0.017 (-0.241)	0.044 (0.621)	0.030 (0.456)	0.041 (0.592)	0.068 (0.886)	0.045 (0.732)	0.050 (0.759)					
$Lev_{i,t}$		0.176 (3.054)***	5.349 (3.834)***	1.263 (3.224)***								
$Comp_{i,t}$												
$GRI_level_{i,t}$												
$ES_{i,t}$												
$ES_{i,t}Comp_{i,t}$												
$ES_{i,t}GRI_{i,t}$												
$ES_{i,t}GRI_level_{i,t}$												
Adjusted R^2	0.439	0.490	0.518	0.496	0.564	0.603	0.565					
F value	18.245 ($p < 0.01$)	17.909 ($p < 0.01$)	19.917 ($p < 0.01$)	18.308 ($p < 0.01$)	17.258 ($p < 0.01$)	20.109 ($p < 0.01$)	17.295 ($p < 0.01$)					
Observations	89	89	89	89	89	89	89					
Significance of R^2 change compared to equation (3*)	n/a	$(p < 0.01)$	$(p < 0.01)$	$(p < 0.01)$	$(p < 0.01)$	$(p < 0.01)$	$(p < 0.01)$					

Notes: Equations (3*)-(5*) are based on the share price specification of the Ohlson (1995) model used in equations (3)-(5) but include size and leverage as additional control variables of Equations (3*)-(5*). The t -statistic is reported in parenthesis and is two-tailed, except for the following variables of interest: $Comp_{i,t}$, $GRI_{i,t}$, $GRI_level_{i,t}$, $ES_{i,t}Comp_{i,t}$, $ES_{i,t}GRI_{i,t}$, and $ES_{i,t}GRI_level_{i,t}$, which are one-tailed. Size is measured as the natural logarithm of total assets at the end of the financial year. The leverage ratio (Lev) is calculated as total debt divided by total equity at the end of the financial year. *Significance at the 10% level; **Significance at the 5% level and ***Significance at the 1% level

not significant for equations (3[^]), (4[^]) or (5[^]). As expected, the three measures of CSR disclosure (*Comp*, *GRI* and *GRI_level*) are positively and significantly associated with share price at the 1 per cent level for equation (4[^]) (coefficients 0.176; 5.349 and 1.263). When the variables for environmentally sensitive industries (*ES*) and the interaction variable between these industries and CSR disclosure are added to the regression in equation (5[^]), the correlation coefficient for the interaction variable is positive and significant at the 1 per cent level for all three measures of CSR disclosure (coefficients 0.273; 9.158 and 1.838). The increase in the R^2 for equation (4[^]) as well as equation (5[^]) is significant at the 1 per cent level for all three measures of CSR disclosure. The reported results are unaffected when we add an additional indicator variable to the adjusted model representing bank and insurance companies, and also when we add an interaction variable between bank and insurance companies and leverage. The untabulated *VIF*'s range between 1.101 and 2.123 for all the variables specified in equations (3[^]–5[^]), except for the interaction term between *ES* and *CSR*. Thus, multicollinearity is unlikely to be an issue in our research design.

When we eliminate loss companies from the sample of 89 companies, the untabulated results are qualitatively similar to the results shown in Table III except for the interaction variable between environmentally sensitive industries (*ES*) and *GRI_level* in equation (5[^]), which is positive and significant at the 5 per cent level instead of the 1 per cent level, and the increase in the R^2 which is significant at the 5 per cent level instead of the 1 per cent level for equation (4[^]) using the composite measure of CSR disclosure (*Comp*). In additional analysis, we determined that the results, when using share price data at the end of the financial year instead of share price data with a three-month lag, are qualitatively similar to the results reported in Table III. When data are winsorised at a 90 per cent level the coefficient for the three measures of CSR disclosure (*Comp*, *GRI* and *GRI_level*) are positive and significant at the 1 per cent level for equation (4[^]) and the increase in the R^2 significant at the 1 per cent level. For equation (5[^]), using winsorised data, the interaction variable between *ES* and CSR disclosure is positive and significant at the 1 per cent level for the model using the composite (*Comp*) and *GRI* (*GRI*) measures of CSR disclosure, and positive and significant at the 10 per cent level for the model using the *GRI* level (*GRI_level*) as a measure of CSR disclosure. The increase in the R^2 for equation (5[^]), using winsorised data, is significant at the 1 per cent level for all three measures of CSR disclosure. The results reported in Tables II and III are robust to the elimination of the 20 bank and insurance companies from the sample, i.e. using a sample of 69 companies. Therefore, the results of the adjusted model using a sample of 89 companies, as well as a sample of 69 companies using both the original and the adjusted model, support the findings of our main analyses reported in Section 4.2 above.

5. Conclusion

We evaluate the relationship between share prices and the CSR disclosure of large UK companies. We argue that CSR disclosure provided by a company (managers) reduces information asymmetry between managers and shareholders. Thus, higher levels of CSR disclosure are expected to be associated with higher share prices. We evaluate whether CSR disclosure provides incremental value-relevant information, beyond financial accounting information, to shareholders (see Hassel *et al.*, 2005) and test whether CSR disclosure is positively associated with share price (*HI*). We also examine whether CSR disclosure provided by companies operating in environmentally sensitive

industries is associated with higher share prices than CSR disclosure by companies operating in other industries (*H2*).

Our results provide evidence in support of *H1*, namely, that CSR disclosure is positively and significantly associated with share price in 2007/2008. Evidence is also provided that higher levels of CSR disclosure by companies operating in environmentally sensitive industries are associated with higher share prices than CSR disclosure by companies operating in other industries. In addition, we provide evidence that financial accounting information and CSR disclosure combined, explain market values better than an exclusive focus on financial accounting information. The results are robust when controlling for size and leverage. Thus, in summary, our results imply that investors can find additional information within CSR disclosure that will assist them in assessing the value of shares. Companies (and managers) can take advantage of this knowledge by increasing their CSR disclosures to potentially reap the benefit of an increased share price. This is especially true for companies in the environmentally sensitive industries such as oil and mining.

We contribute to the literature by overcoming some important prior shortcomings and by being the first to examine the relationship between CSR disclosure and UK share prices. We use a CSR disclosure measure based on independent ratings from a reliable source, namely, the 2008 KPMG data, being the fifth since 1993, thus bestowing a measure of objectivity and reliability to our disclosure measure over and above hand-collected data. Furthermore, we use a timeframe that coincides with increased legislation and increased public awareness of corporate social and environmental issues, and a country where social norms and governance structures suggest a link between CSR disclosures and financial consequences. Our research findings will be of interest to regulators from other countries where there is increased legislation around CSR disclosures or countries where they are considering implementing legislation. Our results show that CSR disclosure by companies is important to investors and shareholders, and more specifically, that disclosure following GRI guidelines is positively associated with share price information. Our findings may be of interest to regulators, because they suggest the possibility that companies can influence their share price by way of voluntary disclosure decisions. There may be a need for regulators to assess whether additional regulation is warranted for CSR disclosures to reduce any risk of abuse by companies. Our finding that reporting following the GRI guidelines could have positive outcomes will also be of interest to managers.

Our study covers a limited time period and includes only large UK companies. Thus, our results may not be generalisable to smaller companies and different time periods. Our results may also not be generalisable to other countries where there are no regulatory requirements, or pending requirements on companies to report on certain CSR activities – it may be possible that these requirements lead companies to voluntarily provide more CSR disclosure and to an increased interest in CSR disclosure by investors. Future research could evaluate whether shareholders value CSR disclosure differently over a period of time and whether share price/market value of equity is associated with CSR disclosure in a specific reporting period, or with a long-term CSR disclosure strategy. Future research could examine a larger sample and evaluate whether CSR disclosure provides additional information beyond public perceptions about the CSR performance of a company (see Plumlee

et al., 2010; Clarkson *et al.*, 2013). Future research could also, following the implementation of the new UK Companies Act, 2006, test the relationship between the key information categories on which disclosure is required and the actual disclosure provided (see Ho and Taylor, 2013). Finally, future research could consider cross-country comparisons.

Notes

1. The relevant section in the Act is Section 417, Subsection 5.
2. We use the qualifier “largely” in this sentence, because some CSR disclosures are mandatory when they resort under the general financial accounting disclosure rules, such as future rehabilitation provisions for mining companies.
3. Prior research also shows a positive association between company size and CSR disclosure (Patten, 2002; Al-Tuwaijri *et al.*, 2004; Clarkson *et al.*, 2008).
4. The Ohlson (1995) valuation model, or modified versions thereof, has been used extensively in both capital market research (Barth and Clinch 2009) and social responsibility research (Hassel *et al.*, 2005; Moneva and Cuellar, 2009; Schadewitz and Niskala, 2010; De Klerk and De Villiers, 2012; Clarkson *et al.*, 2013). In simplified form, the Ohlson (1995) model is stated as follows:

$$MVE_t = \alpha_0 BVE_t + \alpha_1 AB_EARNNS_t + \alpha_2 v_t + \varepsilon \quad (1)$$

Where MVE_t is the market value of equity at time t , BVE_t equals book value of equity at time t , AB_EARNNS_t is abnormal earnings for period t (calculated as the difference between net income for period t and opening book value of equity multiplied by the required rate of return), and v_t other non-accounting information (such as CSR disclosure).

The calculation of the abnormal earnings (AB_EARNNS_t) term in the Ohlson (1995) model is problematic. The required rate of return of a company is required to calculate abnormal earnings but this is often unobtainable. Modified versions of the Ohlson (1995) model have been developed and used to overcome this problem. Some studies use a substitute for the required rate of return (for example, Schadewitz and Niskala, 2010; Clarkson *et al.*, 2013), while others restate the model in terms of current period earnings (for example, Hassel *et al.*, 2005; Moneva and Cuellar, 2009; De Klerk and De Villiers, 2012).

5. Although alternative scalars have been recommended, notably market value of equity (recommended by Easton and Sommers, 2003), we follow Barth and Clinch’s (2009, p. 283) more recent, well considered and tested conclusion that a model using a share price specification (i.e. scaling with number of shares) mitigates scale effects more effectively than a model using a market value of equity specification.

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