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Corporate social responsibility: what motivates management to disclose?

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# Corporate social responsibility: what motivates management to disclose?

Tay Chia Ling and Nigar Sultana

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## Abstract

**Purpose** – The purpose of this paper is to provide empirical evidence on the significance of signal breaches from technical trading indicators in explaining variations in the level of corporate social responsibility disclosures (CSRSD) by firms. The authors seek to determine whether firms disclose corporate social responsibility (CSR) information in a genuine attempt to report their impact on society and environment or whether firms use CSRSD as a shield to legitimise their business operations.

**Design/methodology/approach** – Signal breaches from the Moving Average Convergence Divergence and Chande's TrendScore technical trading indicators were utilised, while the voluntary environmental and social accounting disclosure index developed by Williams (1998) was adapted to measure the extent of CSRSD by Singaporean firms in 2011. Ordinary least squares regression was the principal multivariate statistical technique used to analyse the data collected.

**Findings** – Findings of this paper indicate a positive and significant association between the number of technical indicator signal breaches for a firm and the level of CSRSD by that firm, particularly in the environment, energy, human resources and products and customers categories.

**Research limitations/implications** – The collection of CSRSD information is based solely on annual reports and within the context of Singapore. Results, therefore, are not completely generalisable to different jurisdictional settings.

**Practical implications** – Findings suggest that firms with a volatile stock price trend provide greater CSRSD, possibly as a legitimacy strategy to distract or change the perceptions of investors from its current legitimacy status. Findings, therefore, highlight to regulators the need to strengthen regulatory requirements and implement stricter guidelines on CSR reporting, given the importance of CSRSD to users.

**Social implications** – Findings from this study have several implications for various stakeholders including investors, regulators and society in general. Overall, findings also suggest that stakeholders should not rely solely on CSRSD in their decision-making process.

**Originality/value** – This is the first paper that has proxied stock price movement by using breaches in technical trading indicators when examining reported levels of CSRSD by firms. Moreover, results greatly build on the sparse CSR research on Singapore.

**Keywords** Singapore, Corporate social responsibility, Legitimacy, Technical trading indicators

**Paper type** Research paper

## Introduction

Over the past several decades, corporate social responsibility disclosure (CSRSD) has become an integral part of corporate policy and practice. Although an annual report used to be the main method for management to disclose a firm's impact on society including human rights, labour practices, community involvement and environment, heightened interest in corporate social responsibility (CSR) in recent years has resulted in the increasing use of stand-alone sustainability reports, websites and other social media, such as Twitter, by firms to demonstrate their emphasis on CSR practices (Owen, 2006; PricewaterhouseCoopers, 2010; Whitehouse, 2006). Recently, there have been concerns in the USA that firms in the tobacco industry used CSR as a tool to legitimise their business operations (Hirschhorn, 2004). Similarly, DeTienne and Lewis (2005) show how Nike used

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*CSR* as a shield to protect their image whilst violating the human rights of its employees. Research indicates that investors consider social responsibility practices as an important factor when making investment decision (Laurita, 2001). As such, it is both timely and important to address the question whether firms genuinely feel morally or ethically responsible to disclose *CSR* information to different stakeholders or whether firms use *CSR* information as a tool to enhance/maintain the current perceptions of key stakeholders including investors. Thus, the main motivation of our study is to determine what motivates management/firms to disclose *CSR* information. Specifically, in this paper, we examine to what extent signal breaches from technical trading indicators (i.e. stock price volatility) influences the level of *CSR* by publicly listed Singaporean firms.

A technical trading indicator is a key indicator of stock price movement that has the most influence on investors' decision-making process[1] (Milton, 2012; Padley, 2011). Technical trading indicators are commonly employed by technical analysts in predicting stock price patterns and market trends and sending signals to investors on the viability of a stock trading in the market. Studies by Lui and Mole (1998) and Zwart *et al.* (2009) have provided empirical evidence suggesting that relying on technical analyses improves the performance of investment strategies. When firm stocks experience high levels of aggregate volatility, technical indicators reflecting price movement will provide investors with guidance to when prices might revert to the mean (Beath, 2010). Management may respond to this volatility by disclosing additional information by the way of *CSR* reporting in a bid to reassure investors of the firm's legitimacy and continued viability (Asif *et al.*, 2011; Smith *et al.*, 2010). Hence, this behaviour by firms leads to the question whether signal breaches in technical trading indicators[2] (employed by technical analysts) influence firms' *CSR* practices, given that management may potentially use *CSR*[3] to restore the confidence of investors in times of market uncertainty.

This paper makes various contributions. This paper is the first (to the best knowledge of the authors) to provide an examination of the association between the signal breaches in technical trading indicators from a securities/stock exchange and the extent of *CSR*. Analysing the possible interactions between *CSR* and financial markets is both important and timely in light of events such as the 2008 global financial crisis and global warming. In aforementioned times of high market volatility, firms may respond to technical analysts' forecasts of erratic price movements by employing *CSR* as a legitimising strategy to assure investors and other market participants of its continued viability. In addition, the majority of empirical research to date using Singapore data has provided either a descriptive basis of disclosure patterns or sought to find associations between a limited number of firm characteristics and *CSR*. Analyses carried out in this paper develop insights into and identifies key determinants of *CSR* within the Singapore context on a broader scale. Prior *CSR* studies in the context of Singapore have only focussed on two firm characteristics: firm size and industrial sector classification in relation to varying levels of *CSR* among firms (Andrew *et al.*, 1989; Foo and Tan, 1988; Tsang, 1998). Singapore also provides an ideal setting for examination, given the growing awareness and implementation of *CSR* among Singaporean firms, particularly over the past five years (Tay, 2009). In over just four decades, Singapore has established itself as a thriving financial hub of international repute, serving not only its domestic economy but also the wider Asia-Pacific region and, in some instances, globally. Some analysts have even predicted that Singapore would soon grow to become the world's largest offshore financial centre by 2015 (Dixon, 2012). The growing influence of finance firms, banks, etc. in Singapore's capital market has, therefore, increased the number of traders and, consequently, the use of trend and technical analyses.

Firms may respond to the increased scrutiny of financial analysts and investors by way of increased *CSR* (Becchetti and Ciciretti, 2009; Brown, 1998). However, empirical research has not been forthcoming in investigating the developments and drivers of *CSR* among Singaporean firms (Andrew *et al.*, 1989; Cheng and Courtenay, 2006; Foo and Tan, 1988;

Low *et al.*, 1985; Tsang, 1998). Rather, most empirical research done on *CSR* is predominately carried out in the context of industrialised countries such as Europe, USA, United Kingdom (UK), Australia and New Zealand. However, it is inappropriate to generalise the results from these empirical studies to less developed countries such as Singapore, as the stage of economic development is likely to affect a country's *CSR* practices (Tsang, 1998). Findings from this paper will, therefore, greatly build on the minimal *CSR* research in Singapore. Furthermore, one major limitation faced by prior *CSR* studies completed on Singapore is that such studies only cover a limited number of industries, mainly focussing on the service and light industries (Andrew *et al.*, 1989; Low *et al.*, 1985; Tsang, 1998). By focussing on firms from all industry sectors in our sample, findings of this paper will be generalisable across industries. Fourth, this paper uses the voluntary environmental and social accounting disclosure (*VESAD*) index developed by Williams (1998) to measure the extent of *CSR* by publicly listed Singaporean firms. The extensive 101-item *VESAD* disclosure index, comprising five main categories (i.e. environment, energy, human resources, products and customers and community involvement), will also serve to provide an in-depth analysis of the categories of *CSR*. Key findings from this paper will, therefore, be able to contribute to the continued use of the *VESAD* disclosure index, justifying its adaptability and appropriateness to future *CSR* research. Finally, in addition to contributing to the limited research done on *CSR* reporting practices in Singapore, choosing 2011 as this paper's observation window also presents a more accurate picture of the current *CSR* practices in Singapore. Additionally, Rodriguez-Gonzalez, 2011 is also selected, as it presents a period of financial market uncertainty as the world economy struggles to recover from the global financial crisis and governments and regulators announce new measures to restore market confidence (Kang, 2011; Menon, 2011).

Briefly, findings from this paper indicate a positive and significant association between the number of technical indicator signal breaches for a firm during 2011 and the level of *CSR* by that firm. Furthermore, findings also provide insightful evidence on the category of *CSR* that corporate management and investors are most concerned about. Specifically, findings show that firms with greater volatile stock prices provide more *CSR* information in the environment, energy, human resources and products and customers categories. Overall, findings suggest that firms with a more volatile stock price trend (i.e. more signal breaches in technical trading indicators) provide greater *CSR* in annual reports, which can be interpreted as a legitimacy strategy employed to distract and/or change the perceptions of investors about firms' current status. Results are robust to alternative measures of *CSR*, technical trading indicators and other control variables.

The remainder of the paper is organised as follows. The next section reviews the literature on *CSR*, leading to this paper's hypothesis. Subsequently, the data and research methodology utilised are outlined, followed by the descriptive statistics and main results. The final section concludes this paper.

## Literature review and hypothesis development

Academic interest in *CSR* practices by firms has produced a number of studies examining various aspects of *CSR*, including ideological foundations, purposes, management and the development of performance measurement and external disclosures (Ullman, 1985). *CSR* studies have been mainly carried out in Western countries, such as the USA, UK, a number of European countries, Australia and New Zealand, but increasingly so in Asian (e.g. Malaysia, Indonesia, Thailand, Hong Kong) and Middle Eastern (e.g. Saudi Arabia) countries (Abbott and Monsen, 1979; Abu-Baker, 2000; Belkaoui and Karpik, 1989; Clark and Gibson-Sweet, 1999; Deegan and Gordon, 1996; Lynn, 1992; Roberts, 1992). Notwithstanding this, *CSR* practices have also been examined in a Singapore setting (Andrew *et al.*, 1989; Foo and Tan, 1988; Low *et al.*, 1985; Tsang, 1998). However, most of the Singaporean *CSR* studies are dated and do not present an accurate picture of the

current *CSR* reporting practices among Singaporean firms, given significant changes in the *CSR* landscape in Singapore. Some studies have also adopted a comparative approach in assessing the intensity of *CSR* across two or more countries (Chen and Bouvain, 2009; Golob and Bartlett, 2007; Newson and Deegan, 2002; M.S. Williams and Ho, 1999). The awareness and implementation of *CSR* in Singapore has been increasing over the past five years with the formation of the Singapore Compact in 2005, a national society promoting *CSR* in Singapore (Kang, 2011; Singapore Stock Exchange, 2011). It is envisaged that, through the implementation of *CSR*, companies can reap benefits such as improved firm reputation, better economic performance, high morale among employees and, consequently, attracting more/better investors. Employees will also take greater pride in their company, which, in turn, will result in increased firm productivity (Brammer and Pavelin, 2006; Branco and Rodrigues, 2006; Bronn and Vidaver-Cohen, 2009).

In a recent survey conducted by the Singapore's Ministry of Trade and Industry, findings indicated that of the 507 Singaporean firms surveyed, 203 firms (or 40 per cent of all respondents) understood the term *CSR*, and of these 203 *CSR*-aware respondents, 135 firms (or 67 per cent of the *CSR*-aware respondents) have implemented *CSR* activities (Tay, 2009). There has also been a rise in sustainability reporting in Singapore using the Global Reporting Initiative (GRI) reporting framework from 0 in 2007, 1 in 2008 to more than 20 in 2010 (The *CSR Digest*, 2010). Furthermore, as a result of the launch by International Organization for Standardization (ISO) of an international standard (i.e. ISO 26,000) that offers guidance on socially responsible behaviour and possible actions with relevant stakeholders in November 2010, the Singapore Government has sought to further encourage businesses to engage in *CSR* activities.

Despite the growing awareness and implementation of *CSR* practices by companies in Singapore, few studies have been conducted to investigate its development and identify the drivers underpinning firms disclosing *CSR* information. To date, only two major *CSR* studies have been conducted in Singapore (Low *et al.*, 1985; Tsang, 1998). Tsang (1998) found that larger Singaporean firms listed on the Singapore Exchange (SGX) tend to disclose more *CSR* information in their annual reports. Studies also found that the banking and finance sector had the highest proportion of *CSR* disclosing firms, whereas the hotel sector had the smallest proportion of firms engaged in *CSR* (Low *et al.*, 1985; Tsang, 1998).

Investors have generally relied on financial statements, company announcements and analysts' forecasts in making investment decisions (Beath, 2010). Hence, additional voluntary information included in a firm's annual report could potentially influence an investor's investment decision or strategy. How key investors or the market values a firm's stock could then, in turn, affect its performance/valuation. In wake of the 2008 financial crisis which caused a period of considerable market uncertainty and badly affected investor confidence, it is both timely and important to study the consequences that voluntary disclosures have on investors and on the firms' stock performance/valuation. Empirical evidence has linked voluntary disclosures to investment decisions and stock performance (Asif *et al.*, 2011; Cormier and Magnan, 2007; Epstein and Freedman, 1994; Lakhali, 2009; Smith *et al.*, 2010). The impact voluntary disclosures have on investment behaviour or stock performance is attributed to investors preferring to invest in more transparent, responsible and sustainable firms (Cormier and Magnan, 2007).

Technical analysis assumes/expects that all fundamental market information is automatically processed into decisions whether to *buy* or *sell* a security, therefore, strictly focussing on price changes for that security. Empirical findings have provided support for the value and influence of technical analysis in capital markets. The seminal paper by Brock *et al.* (1992) provided support for the types of technical strategies explored by firms. Fernandez-Rodriguez *et al.* (2000) found results that provided strong support for the financial profitability of technical trading rules. Park and Irwin (2007) report that from a survey of 95 modern studies considering technical analysis, 56 studies report that technical

analysis provides beneficial results to firms ultimately in terms of improving their likelihood to raising funds.

Notably, researchers have sought to evaluate both the determinants as well as the consequences of *CSR* by firms. Although much of prior *CSR* empirical research has examined the linkage between firm characteristics, corporate governance features and the extent of *CSR* (Brammer and Pavelin, 2006; Gamerschlag *et al.*, 2011; Hackston and Milne, 1996; Huafang and Yuan, 2007), the influence *CSR* has on investors and its interactions with the stock market have not been examined sufficiently (Cormier and Magnan, 2007; Epstein and Freedman, 1994; Smith *et al.*, 2010). Even studies that have examined the interaction between firms' *CSR* and investors have only investigated this linkage by measuring stock performance or liquidity (Cormier and Magnan, 2007; Welker, 1995). No study to date has examined the association between *CSR* and stock performance in terms of breaches in technical indicators. Additionally, most *CSR* studies have been carried out in industrialised Western countries (i.e. Europe, USA, Australia) with an increasing number of recent *CSR* studies in Asia (i.e. China, Hong Kong) and other developing countries (i.e. Malaysia, Indonesia), but little has been done recently to investigate the development of *CSR* in Singapore.

Based on the general principles of organisational legitimacy theory (Clark and Gibson-Sweet, 1999; Patten, 1991), this paper suggests that management may voluntarily provide *CSR* information for two purposes. First, management may disclose their *CSR* efforts to protect their self-interests by fostering, sustaining and legitimising relationships with key stakeholders and presenting a positive external social image. Second, management may release *CSR* information in response to social, political and economic pressures that expect businesses to be socially responsible. Therefore, gestures by corporate management in voluntarily disclosing *CSR* information in annual reports may very well be a legitimising strategy employed by those firms to repair, maintain or enhance the current perceptions of the firm by key stakeholders.

The global financial crisis of 2008 resulted in skittish investment behaviour, as stock markets around the world displayed high levels of aggregate volatility. While technical analysts predict erratic future stock prices movements through the use of technical trading indicators, firms may respond to such negative forecasts by employing *CSR* as a legitimisation strategy to reassure investors and other market participants of its operations and continued viability. In times of market uncertainty, risk adverse investors prefer stable, sustainable and long-horizon investment options which are usually associated with firms who not only create value for shareholders but also for its external and environmental stakeholders who both impact and are impacted by firms (Freedman, 1984). Prior research suggests that when there is uncertainty in the market, investors predominantly use *CSR* information to make investment decisions (Chui *et al.*, 2010; Guay *et al.*, 2003; Jegadeesh and Titman, 2001; Laurita, 2001). Therefore, it is logical to expect firms to disclose more *CSR* information in times of aggregate volatility in stock prices. Therefore, based on prior literature and related theoretical arguments, the hypothesis for this paper is postulated as follows:

*H1. There is a positive association between the number of technical trading indicator breaches by firms and the extent of CSR by those firms.*

## Research method

### *Sample selection and source documentation*

The initial sample for this paper comprised all 782 firms listed on the SGX as at the beginning of January 01, 2011. Consistent with prior literature, the following exclusions were made:

- firms incorporated and domiciled outside Singapore;
- real estate investment trust securities;
- entities listing the *SGX* as a secondary rather than primary listing;
- entities that established their initial public offering during the 2010 financial year; and
- any entity relisting on the *SGX* during 2010 having been previously delisted (Bouten *et al.*, 2011; Gallego, 2005; Kotonen, 2009; Roberts, 1992; Trotman and Bradley, 1981)[4].

After these exclusions, the top 100 firms by market capitalisation were selected for the final usable sample[5].

Table I provides an industry breakdown of the sampled firms according to the *SGX* industry classification. A review of Table I indicates that the property sector is the most highly represented in the sample, followed by the manufacturing sector. The representation of industry breakdown in the sample is consistent with the representation of the *SGX* as a whole.

Data for this paper were collected from multiple sources. To measure *CSR*, the primary source is the firm's annual report. Data with respect to technical indicator measures were drawn from the *ShareInvestor* trading website[6]. Apart from the *ShareInvestor* portal, other major trading platforms (e.g. Bloomberg, CNBC) were used to verify technical indicator information collected from *ShareInvestor*. Information on control variables were drawn from either the firm's annual report or *ShareInvestor* as appropriate.

#### *Dependent variable measurement – extent of CSR*

In prior *CSR* research, there are three main methods used to measure the level of *CSR* by firms. These are content analysis, formalised *CSR* index and a self-constructed checklist (Alsaseed, 2006; Davis and Searcy, 2010; Gallego, 2005; Khan, 2011). This paper adopts the self-constructed *VESAD* index developed by Williams (1998). Although the *GRI* reporting index is widely used in the past literature, we adopt the self-constructed *VESAD* index for a number of reasons. Specifically, although the *VESAD* index closely mirrors the *GRI* index, the *VESAD* index is more comprehensive than *GRI* index[7]. Also, the *VESAD* index has previously been applied to measure the level of *CSR* in the annual reports of Singaporean firms (Williams and Ho, 1999), and the continued use of the *VESAD* checklist in this paper can also provide an update on the current levels of *CSR* among listed Singaporean firms[8]. A copy of the *VESAD* checklist used is provided in Table A1.

To compute the level of *CSR* for each individual firm, the score for each item on the *VESAD* checklist is summed and then divided by the maximum number of items of the checklist[9]. Thus, for the dependent variable denoted as *CSR<sub>i</sub>*, the level of *CSR* of the firm *i* in the annual report for 2011 is the sum of all *VESAD* checklist item scores

<i>SGX</i> classification	Industrial sector	No. of firms	% of sample
1	Finance	6	6
2	Multi-industry	11	11
3	Construction	5	5
4	Commerce	9	9
5	Hotels/restaurants	5	5
6	Transport/storage/communications	13	13
7	Manufacturing	15	15
8	Properties	20	20
9	Services	12	12
10	Agriculture	3	3
11	Mining	1	10
		100	100

assigned divided by the total number of VESAD checklist items, namely, 101 items. This can be represented mathematically in Equation (1):

$$CSEDisc_i = \left( \sum VESAD_{i,j} \right) / \left( \sum VESAD_j \right) \quad (1)$$

where,

$CSRDisc_{i,t}$  = The CSR score of firm  $i$  in 2011;

$VESAD_{i,j}$  = The score awarded to firm  $i$  in 2011 associated with VESAD checklist item  $j$ ; and

$VESAD_j$  = The VESAD item  $j$  applicable in 2011.

#### *Independent variable measurement – breaches in technical trading indicators*

The independent variable in this paper is the number of breaches in technical trading indicators. A technical indicator is a series of data points that are derived from the use of a formula pertinent to the price data of a security. Price data include any combination of the share price open, high, low or close over a period of time. Some technical indicators use simple formulas (e.g. moving averages), whereas others (e.g. stochastics) apply very complex formulae. Regardless of the complexity of the formula, technical indicators provide unique perspectives on the strength and direction of shifts in the underlying price trends of a security. Technical indicators are broadly categorised into different classes, depending on the specific focus of the indicator (e.g. trend, momentum, volatility, band range, volume and oscillators). Frequently, signal rules (e.g. *buy* and *sell*, short, neutral and long) are associated with specific technical indicators. Whilst signal rules offer no certainty of the accuracy of a perceived trend, or specific success of an action to take based on the signal rule, such rules can reduce subjective bias. Technical analysis focusses on the price action of an investment with consideration to volume and investor sentiments. Prior research (Chui *et al.*, 2010; Guay *et al.*, 2003; Jegadeesh and Titman, 2001) suggests that share price trends and momentum influence finance and accounting issues such as underpricing, earnings management, analyst predictions and information disclosure. Furthermore, past research also suggests that trend and momentum trading strategies may be more effective than traditional buy-and-hold strategies, particularly for passive retail investors (Drehmann *et al.*, 2005; Leivo and Patari, 2011; Verardo, 2009).

Breaches in technical trading indicators can be measured in a number of ways. Of the various technical indicators used by analysts, the *Moving Average Convergence Divergence (MACD)* indicator is amongst the most widely understood and used (Chiang *et al.*, 2012; Chong *et al.*, 2010; Coe and Laosethakul, 2010; Tung and Quek, 2011). The MACD “momentum” indicator displays the relationship between two moving price averages (Appel, 1979). In basic terms, the MACD indicator comprises two key lines; that is, the *MACD line* and the *signal line*. Both the *MACD* and *signal lines* are plotted on a graph to enable the identification of key crossover signal points. Typically, the *MACD line* is calculated by subtracting the 26-day exponential moving average from the 12-day exponential moving average. The *signal line*, meanwhile, is a 9-day exponential moving average. If the *MACD line* crosses the *signal line* from below, this is interpreted as a *bullish crossover* and a signal to *buy*. In contrast, when the *MACD line* crosses the *signal line* from above, this is referred to as a *bearish crossover* and a signal to *sell*. Consistent with Appel (1979), we measure  $MACD_i$  as the sum of the number of times during 2011 that the MACD indicator for the stock of firm  $i$  provides a bullish/bearish moving crossover signal (i.e. bullish crossover–short-term moving average cuts long-term moving average from below; bearish crossover–short-term moving average cuts long-term moving average from above).  $MACD_i$  values can, therefore, range from zero to infinite. Lower (higher) values infer greater stability (movement) in price trends.



### Control variables measurement

For purposes of this paper, control variables associated with firm-level characteristics (i.e. firm size, age, profitability, leverage and industry type) and corporate governance features (i.e. board size, board independence, duality and external auditor type) are included. All control variables included have been used in prior research as being potential compounding determinants of CSR (Baek *et al.*, 2009; Epstein and Freedman, 1994; Gray *et al.*, 1995; Tilt, 2001; Welker, 1995). Specifically, firm size (denoted as  $FSize_i$ ) is measured as the natural logarithm of the market capitalisation of firm  $i$  at the end of 2011. As for age of the firm, the control variable  $Age_i$  is the number of days since the date of incorporation of firm  $i$  till the end of 2011. In terms of financial ratios, profitability (denoted by the variable  $ROA_i$ ) is measured as the ratio of net earnings after income tax, depreciation and interest of firm  $i$  in 2011 divided by the total assets of firm  $i$  at the end of 2011. Leverage (denoted by the variable  $Lev_i$ ) is measured as the ratio of total liabilities of firm  $i$  at the end of 2011 to total assets of firm  $i$  at the end of 2011. To control for possible industrial sector differences in the voluntary disclosure of CSR information by firms, a dichotomous variable denoted as  $Industry_i$  is formed. Specifically, firm  $i$  is scored 1 if at the end of 2011, that entity is classified as being within the manufacturing industry as per SGX industrial sector classification; otherwise, firm  $i$  is scored 0. In relation to control variables for corporate governance measures,  $BSize_i$  is the total number of members on the board of directors of firm  $i$  at the end of 2011. Board independence (denoted as  $Bind_i$ ) is measured as the proportion of members on the board of firm  $i$  at the end of 2011 defined as independent to the total number of board members of firm  $i$  at the end of 2011. For  $Duality_i$ , a score of 1 is assigned to firm  $i$  if at the end of 2011, the same individual occupies the roles of chairperson of the board and chief executive officer (CEO); otherwise, firm  $i$  is scored 0. For this paper, auditor quality is represented by a dichotomous indicator variable denoted as  $Big_4_i$ . Specifically, firm  $i$  is scored 1 if the external auditor that signed the statutory audit report in 2011 is a  $Big_4$  audit firm (i.e. Deloitte, Ernst & Young [E&Y], KPMG or PricewaterhouseCoopers [PwC]); otherwise, firm  $i$  is scored 0.

### Statistical tests and models

The main ordinary least squares (OLS) regressions to be used in this paper are defined in Equation (2):

$$CSRDisc_i = \beta_0 + \beta_1 MACD_i + \lambda_1 FSize_i + \lambda_2 Age_i + \lambda_3 ROA_i + \lambda_4 Lev_i + \lambda_5 Industry_i + \lambda_6 BSize_i + \lambda_7 Bind_i + \lambda_8 Duality_i + \lambda_9 Big_4_i + \varepsilon_{it} \quad (2)$$

where,

$CSRDisc_i$  = The total CSR score of firm  $i$  in 2011;

$MACD_{i,t}$  = Sum of the number of times during 2011 that the  $MACD$  indicator for the stock of firm  $i$  provides a bullish/bearish moving crossover signal (i.e. bullish crossover—short-term moving average cuts long-term moving average from below; bearish crossover—short-term moving average cuts long-term moving average from above);

$FSize_i$  = Natural logarithm of the market capitalisation of firm  $i$  at the end of 2011;

$Age_i$  = Number of days from the time of incorporation of firm  $i$  till the end of 2011;

$ROA_i$  = The ratio of the net earnings after income tax, depreciation and interest of firm  $i$  for 2011 divided by the total assets of firm  $i$  at the end of 2011;

$Lev_i$  = The ratio of total liabilities of firm  $i$  at the end of 2011 divided by the total assets of firm  $i$  at the end of 2011;

$Industry_i$  = An indicator variable where firm  $i$  is scored 1 if classified under SGX industry sector classification to be from the manufacturing sector at the end of 2011, otherwise, scored 0;

$BSize_i$  = Number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;

- $Blnd_i$  = Number of individuals sitting on the board of directors of firm  $i$  at the end of 2011 classified as independent directors divided by the total number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;
- $Duality_i$  = An indicator variable where firm  $i$  is scored 1 if the same individual occupies the roles of chairperson of the board and CEO at the end of 2011, otherwise, scored 0;
- $Big_4_i$  = An indicator variable where firm  $i$  is scored 1 if the external auditor that signed the audit report for financial statements of 2011 is a *Big\_4* audit firm (i.e. Deloitte, E&Y, KPMG or PwC), otherwise, scored 0;
- $\beta_k, \lambda_k$  = Coefficients on the independent and control variables;
- $\beta_0$  = Intercept term; and
- $\varepsilon_{jt}$  = Error term.

## Research findings

### *Descriptive statistics*

As reported in [Table II](#), based on the 101-item disclosure index, the average *CSR\_S* score for the full sample is 21.210 with a median of 15.500. This represents an average (median) *CSRDisc* percentage of 21.000 per cent (15.347 per cent) with a minimum of 0.000 per cent and a maximum of 70.297 per cent. For the *MACD* indicator, the average (median) number of signal breaches is 13.180 (13.000). For the *MACD* indicator, the maximum of signal breaches is 21.000 with a minimum of 6.000. In contrast, the maximum number of *Chande's TrendScore* signal breaches is 30.000 with a minimum of 8.000.

The average capitalisation of a firm is SGD\$4,135.027 million with a median of SGD\$1,100.000 million. The age (i.e. time between the date of incorporation and the end 2011) of firms within the sample is 11,496.440 days (approximately 31.500 years) with a median of 10,469.000 days. The average return on assets ( $ROA_i$ ) for the full sample is 7.359 per cent, inferring that every SGD\$1 invested in assets generates approximately SGD\$0.074 in net profit. The majority of firms in the sample had  $ROA_i$  values below the average, implying that a small group of firms in the sample had substantially higher  $ROA_i$  values than the mean. Further, the minimum  $ROA_i$  is negative (i.e. -9.536 per cent), indicating that some firms in the full sample suffered financial losses during 2011. Meanwhile, the ratio of total liabilities to total assets (i.e. leverage or *LEV*) is 46.887 per cent on average with a median value of 45.816 per cent. The average leverage ratio indicates that every SGD\$1 in assets is financed by SGD\$0.469 in debt. Not unexpectedly, financial and telecommunication firms had the highest leverage values.

Descriptive statistics associated with corporate governance features show that the average board size is 8.740 with a median value of 9.000. This is greater than that reported in prior Singapore corporate governance studies ([Van der Zahn and Tower, 2004](#)) but is not unexpected, given the focus on larger firms in this paper which are more likely to have a greater number of individuals serving on the board. The average board independence is 53.665 per cent with a median of 50.000 per cent. Again, board independence values are higher than previous studies of the broader Singapore capital market ([Rusmin et al., 2006](#)). This difference can again be attributed to the focus on larger firms in this paper rather than the entire *SGX*. Larger firms, having access to greater resources, facing higher political risks and having independent directors with reputational capital in potential jeopardy, are likely to have greater motivation in appointing more independent directors to the board compared to smaller firms. In terms of duality, 29 per cent of the sample had the same individual occupying both Chairperson and CEO roles. Finally, given the focus on large firms, 92 per cent of the firms in the sample engaged a *Big\_4* audit firm.

Results in [Table III](#) show the Pearson and Spearman correlations between the dependent variable (i.e. *CSRDisc*) and  $MACD_i$  to be positive and significant. Correlation matrix results in [Table III](#) also reveals significant bivariate associations between *CSRDisc* and control

**Table II** Descriptive statistics (*N* = 100)

Variables	Mean	Median	SD	Minimum	Maximum
<i>Panel A: Continuous variables</i>					
<i>CSR<sub>S<sub>i</sub></sub></i>	21.210	15.500	18.084	0.000	71.000
<i>CSRDisc<sub>i</sub></i> (%)	21.000	15.347	17.905	0.000	70.297
<i>MACD_Bull<sub>i</sub></i>	6.590	6.500	1.664	3.000	11.000
<i>MACD_Bear<sub>i</sub></i>	6.590	7.000	1.718	3.000	10.000
<i>MACD<sub>i</sub></i>	13.180	13.000	3.286	6.000	21.000
<i>TScore_Plus10<sub>i</sub></i>	8.890	8.500	3.309	1.000	18.000
<i>TScore_Neg10<sub>i</sub></i>	11.810	11.000	3.460	5.000	24.000
<i>TScore<sub>i</sub></i>	20.700	21.000	4.380	8.000	30.000
<i>Makt_Cap<sub>i</sub></i> (SGD\$millions)	4,135.027	1,100.000	8,055.903	312.600	49,739.790
<i>FSize<sub>i</sub></i>	21.150	20.819	1.287	19.560	24.630
<i>Age<sub>i</sub></i>	11,496.440	10,469.000	8,055.908	1,557.000	45,343.000
<i>SqrtAge<sub>i</sub></i>	101.515	102.317	34.687	39.459	212.939
<i>ROA<sub>i</sub></i> (%)	7.359	6.679	5.489	-9.536	19.429
<i>LEV<sub>i</sub></i> (%)	46.887	45.816	19.502	5.148	98.688
<i>BSize<sub>i</sub></i>	8.740	9.000	2.186	4.000	15.000
<i>Blnd<sub>i</sub></i> (%)	53.665	50.000	15.867	28.571	90.909
Variables	Yes ('1')	(%) Sample	No ('0')	(%) Sample	
<i>Panel B: Dichotomous variables</i>					
<i>Industry<sub>i</sub></i>	15.000	15.000	85.000	85.000	
<i>Duality<sub>i</sub></i>	29.000	29.000	71.000	71.000	
<i>Big_4<sub>i</sub></i>	92.000	92.000	8.000	8.000	

**Notes:** *CSR<sub>S<sub>i</sub></sub>* = sum of *VESAD* items scored 1 of firm *i* for 2011; *CSRDisc<sub>i</sub>* = the *CSR*D score of firm *i* for 2011 whereby the number of items on the *VESAD* index is scored 1 for firm *i* in 2011 divided by total number of *VESAD* items; *MACD\_Bull<sub>i</sub>* = sum of the number of times during 2011 that the *MACD* indicator for the stock of firm *i* provides a bullish moving crossover signal (i.e. bullish crossover–short-term moving average cuts long-term moving average from below); *MACD\_Bear<sub>i</sub>* = sum of the number of times in 2011 that the *MACD* indicator for the stock of firm *i* provides a bearish moving crossover signal (i.e. bearish crossover–short-term moving average cuts long-term moving average from above); *MACD<sub>i</sub>* = sum of the number of times in 2011 that the *MACD* indicator for the stock of firm *i* provides a bullish/bearish moving crossover signal (i.e. bullish crossover–short-term moving average cuts long-term moving average from below; bearish crossover–short-term moving average cuts long-term moving average from above); *TScore\_Plus10<sub>i</sub>* = sum of the number of times in 2011 that *Chande's TrendScore* indicator for the stock of firm *i* indicates a strong upward (i.e., score of + 10) trend; *TScore\_Neg10<sub>i</sub>* = sum of the number of times in 2011 that *Chande's TrendScore* indicator for the stock of firm *i* indicates a strong downward (i.e. score of - 10) trend; *TScore<sub>i</sub>* = sum of the number of times in 2011 that *Chande's TrendScore* indicator for the stock of firm *i* indicates a strong upward (i.e. score of + 10) or downward (i.e. score of -10) trend; *Makt\_Cap<sub>i</sub>* = the market capitalisation of firm *i* in 2011; *FSize<sub>i</sub>* = Natural logarithm of the market capitalisation of firm *i* in 2011; *Age<sub>i</sub>* = the number of days from the time of incorporation of firm *i* in 2011; *SqrtAge<sub>i</sub>* = the square root of the number of days from the time of incorporation of firm *i* in 2011; *ROA<sub>i</sub>* = the ratio of the net earnings after income tax, depreciation and interest of firm *i* in 2011 divided by the total assets of firm *i* at the end of 2011; *Lev<sub>i</sub>* = the ratio of total liabilities of firm *i* at the end of 2011 divided by the total assets of firm *i* at the end 2011; *Industry<sub>i</sub>* = an indicator variable where firm *i* scored 1 if classified under *SGX* industry sector classification to be from the manufacturing sector at the end of 2011, otherwise, scored 0; *BSize<sub>i</sub>* = number of individuals sitting on the board of directors of firm *i* at the end of 2011; *Blnd<sub>i</sub>* = number of individuals sitting on the board of directors of firm *i* at the end of 2011 classified as independent directors divided by the total number of individuals sitting on the board of directors of firm *i* at the end of 2011; *Duality<sub>i</sub>* = an indicator variable where firm *i* scored 1 if the same individual occupies the roles of chairperson of the board and CEO at the end of 2011, otherwise, scored 0; and *Big\_4<sub>i</sub>* = an indicator variable where firm *i* scored 1 if the external auditor that signed the audit report for financial statements at the end of 2011 is a *Big\_4* audit firm (i.e. Deloitte, E&Y, KPMG or PwC), otherwise, scored 0

variables for firm characteristics and corporate governance features (e.g. *FSize<sub>i</sub>*, *SqrtAge<sub>i</sub>*, *ROA<sub>i</sub>*, *Lev<sub>i</sub>*, *Industry<sub>i</sub>*, *BSize<sub>i</sub>*, *Blnd<sub>i</sub>*, *Duality<sub>i</sub>* and *Big\_4<sub>i</sub>*). Specifically, four of the nine control variables (i.e. *FSize<sub>i</sub>*, *Lev<sub>i</sub>*, *BSize<sub>i</sub>* and *Blnd<sub>i</sub>*) are positively and significantly (for both Pearson and Spearman's correlations) associated with *CSRDisc<sub>i</sub>*. Meanwhile, *ROA<sub>i</sub>* is positively and significantly correlated with the dependent variable for the Pearson correlation. *Blnd<sub>i</sub>* and *Big\_4<sub>i</sub>* are both positively (Pearson and Spearman correlations) associated with *CSRDisc<sub>i</sub>*, but not at conventionally significant levels. Finally, *Duality<sub>i</sub>* (*SqrtAge<sub>i</sub>*) is negatively and significantly (insignificantly) associated with *CSRDisc<sub>i</sub>*. With respect to the control variables used in the OLS regression analysis, [Table III](#) results indicate significant bivariate associations between several variables. For instance, there is a positive and significant association between *BSize<sub>i</sub>* and *FSize<sub>i</sub>* (i.e. 0.532 for Pearson

**Table III** Pearson correlation (below diagonal) and Spearman correlation (above diagonal)

Variable	$CSRDisc_i$	$MACD_i$	$FSize_i$	$SqrtAge_{i,t}$	$ROA_i$	$Lev_i$	$Industry_i$	$BSize_i$	$Blnd_i$	$Duality_i$	$Big_4_i$
$CSRDisc_i$		0.289**	0.586**	-0.054	0.137	0.249*	0.102	0.504**	0.307**	-0.305**	0.169
$MACD_i$	0.407**		0.501**	-0.081	0.034	0.117	0.093	0.265**	0.250*	-0.038	0.179
$FSize_i$	0.572**	0.069		-0.034	0.054	0.123	0.113	0.511**	0.362**	-0.270**	0.310**
$SqrtAge_i$	-0.051	-0.005	0.016		-0.047	-0.164	0.023	0.104	0.051	-0.005	0.116
$ROA_i$	0.246*	0.185	0.052	-0.091		-0.144	0.071	0.125	0.016	0.001	0.105
$Lev_i$	0.265**	0.046	0.264**	-0.070	-0.081		-0.116	-0.001	-0.034	0.075	0.111
$Industry_i$	0.117	-0.170	0.107	0.024	0.068	-0.115		-0.003	-0.066	0.040	0.021
$BSize_i$	0.436**	0.208*	0.532**	0.084	0.164	0.073	-0.001		0.089	-0.351**	0.118
$Blnd_i$	0.347**	0.097	0.405**	0.107	0.018	0.010	-0.056	0.115		-0.115	0.151
$Duality_i$	-0.281**	0.024	-0.262**	-0.007	-0.024	0.023	0.040	-0.309**	-0.136		-0.136
$Big_4_i$	0.161	0.090	0.265**	0.124	0.083	0.103	0.021	0.134	0.155	-0.136	

Notes: \*\*, \*Significant at the 1 and 5% (two-tailed) confidence levels. Values reported in the top right corner of the matrix are based on Spearman correlations with values reported in the bottom left corner of the matrix based on Pearson correlations.  $CSRDisc_i$  = the CSR score of firm  $i$  in 2011 whereby the number of items on the VESAD index is scored 1 for firm  $i$  in 2011 divided by total number of VESAD items;  $OTISc_i$  = sum of  $MACD_i$ ,  $TScore_i$ ,  $RSI_i$  and  $Will%R_i$  scores of firm  $i$  in 2011;  $MACD_i$  = sum of the number of times in 2011 that the MACD indicator for the stock of firm  $i$  provides a bullish/bearish moving crossover signal (i.e. bullish crossover–short-term moving average cuts long-term moving average from below; bearish crossover–short-term moving average cuts long-term moving average from above);  $FSize_i$  = natural logarithm of the market capitalisation of firm  $i$  in 2011;  $SqrtAge_i$  = the square root of the number of days from the time of incorporation of firm  $i$  in 2011;  $ROA_i$  = the ratio of the net earnings after income tax, depreciation and interest of firm  $i$  in 2011 divided by the total assets of firm  $i$  at the end of 2011;  $Lev_i$  = the ratio of total liabilities of firm  $i$  at the end of 2011 divided by the total assets of firm  $i$  at the end of 2011;  $Industry_i$  = an indicator variable where firm  $i$  scored 1 if classified under SGX industry sector classification to be from the manufacturing sector at the end of 2011, otherwise scored 0;  $BSize_i$  = number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;  $Blnd_i$  = number of individuals sitting on the board of directors of firm  $i$  at the end of 2011 classified as independent directors divided by the total number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;  $Duality_i$  = an indicator variable where firm  $i$  scored 1 if the same individual occupies the roles of chairperson of the board and CEO at the end of 2011, otherwise, scored 0;  $Big_4_i$  = an indicator variable where firm  $i$  scored 1 if the external auditor that signed the audit report for financial statements in 2011 is a Big\_4 audit firm (i.e. Deloitte, E&Y, KPMG or PwC), otherwise, scored 0

correlation and 0.511 for Spearman's Rho correlation). However, none of the bivariate correlations between the control variables are close to (or exceed) critical limits (i.e. 0.800) that may imply multicollinearity concerns (Hair *et al.*, 1998)[10].

### Main analyses

The main OLS regression results are presented in Table IV. Results reported in Column I tests the association between the composite score for technical indicator scores and  $CSR$ . Regression results reported in Table IV are statistically significant with adjusted- $R^2$  values ranging from 41.100 per cent (Column I) to 49.800 per cent (Column II). The coefficient on  $MACD_i$  is positive and statistically significant in regression results reported in Columns II and III ( $t$ -statistics 1.777 and 1.816, respectively). This result indicates that  $CSR$  is likely to increase when the number of signal breaches from technical indicators increases.

With respect to the control variables, Table IV Columns I-VIII indicates that the coefficients (i.e.  $\lambda_1$ ,  $\lambda_3$ ,  $\lambda_4$  and  $\lambda_7$ ) corresponding to  $FSize_i$ ,  $ROA_i$ ,  $Lev_i$  and  $Blnd_i$  are (as expected) positive and statistically significant across all regressions models. Results are consistent with the prior literature that larger, more profitable and highly leveraged firms have a greater incentive to disclose more  $CSR$  information (Rahman *et al.*, 2011; Siregar and Bachtiar, 2010; Trotman and Bradley, 1981; Wallace *et al.*, 1994). Additionally, firms that have board members who are independent tend to disclose greater levels of  $CSR$  (Babio *et al.*, 2005; Baek *et al.*, 2009; Barako and Brown, 2009; Huafang and Yuan, 2007). Meanwhile, the coefficient on  $Duality_i$  (i.e.  $\lambda_8$ ) is negative and statistically significant across all regressions reported consistent with the view that where the CEO and board chairperson role is not vested in the same individual,  $CSR$  is likely to be higher (Lakhal, 2005; Siregar and Bachtiar, 2010). As for industry (i.e.  $Industry_i$ ) and board size (i.e.  $BSize_i$ ), the coefficients on these two control variables (i.e.  $\lambda_5$  and  $\lambda_6$ ) are positive across all regression results reported in Table IV. This moderately significant influence of the industry

**Table IV** Main regression model results ( $N = 100$ )

Variables	Expected significance	Column I (MACD <sub><i>i</i></sub> ) <i>b</i>	Column I (MACD <sub><i>i</i></sub> ) <i>t</i> -statistics	Column II (TSCORE <sub><i>i</i></sub> ) $\beta$	Column II (TSCORE <sub><i>i</i></sub> ) <i>t</i> -statistics
Intercept	?		-3.109**		-4.402**
MACD <sub><i>i</i></sub>	+	0.163	1.816*		
TScore <sub><i>i</i></sub>	+			0.225	2.844**
FSize <sub><i>i</i></sub>	+	0.210	1.803*	0.312	2.965**
SqrtAge <sub><i>i</i></sub>	+	-0.053	-0.677	-0.056	-0.729
ROA <sub><i>i</i></sub>	+	0.199	2.528**	0.164	2.120*
Lev <sub><i>i</i></sub>	+	0.197	2.413**	0.196	2.459**
Industry <sub><i>i</i></sub>	?	0.110	1.390	0.151	1.942†
BSize <sub><i>i</i></sub>	?	0.175	1.833†	0.124	1.311
Blnd <sub><i>i</i></sub>	+	0.197	2.289*	1.179	2.118*
Duality <sub><i>i</i></sub>	-	-0.152	-1.846*	-0.154	-1.927*
Big_4 <sub><i>i</i></sub>	+	-0.029	-0.357	-0.037	-0.476
Summary					
Adjusted R <sup>2</sup>			0.428		0.456
F statistic (significance)			8.411**		9.309**

**Notes:**

$$CSRDisc_i = \beta_0 + \beta_1 MACD_i + \lambda_1 FSize_i + \lambda_2 SqrtAge_i + \lambda_3 ROA_i + \lambda_4 Lev_i + \lambda_5 Industry_i + \lambda_6 BSize_i + \lambda_7 Blnd_i + \lambda_8 Duality_i + \lambda_9 Big\_4_i + \varepsilon_{it} \quad (4)$$

$$CSRDisc_i = \beta_0 + \beta_1 TScore_i + \lambda_1 FSize_i + \lambda_2 SqrtAge_i + \lambda_3 ROA_i + \lambda_4 Lev_i + \lambda_5 Industry_i + \lambda_6 BSize_i + \lambda_7 Blnd_i + \lambda_8 Duality_i + \lambda_9 Big\_4_i + \varepsilon_{it} \quad (5)$$

where \*\*, \*, † = 1, 5 and 10% significance with one-tailed significance level where direction of sign on coefficient predicted, otherwise, two-tailed;  $CSRDisc_i$  = the CSR score of firm  $i$  in 2011;  $MACD_i$  = sum of the number of times in 2011 that the MACD indicator for the stock of firm  $i$  provides a bullish/bearish moving crossover signal (i.e. bullish crossover–short-term moving average cuts long-term moving average from below; bearish crossover–short-term moving average cuts long-term moving average from above);  $TScore_i$  = Sum of the number of times in 2011 that *Chande's TrendScore* indicator for the stock of firm  $i$  indicates a strong upward (i.e. score of + 10) or downward (i.e. score of -10) trend;  $FSize_i$  = natural logarithm of the market capitalisation of firm  $i$  at the end of 2011;  $SqrtAge_i$  = square root of the number of days from the time of incorporation of firm  $i$  till the end of 2011;  $ROA_i$  = the ratio of the net earnings after income tax, depreciation and interest of firm  $i$  for 2011 divided by the total assets of firm  $i$  at the end of 2011;  $Lev_i$  = the ratio of total liabilities of firm  $i$  at the end of 2011 divided by the total assets of firm  $i$  at the end of 2011;  $Industry_i$  = an indicator variable where firm  $i$  is scored 1 if classified under SGX industry sector classification to be from the manufacturing sector at the end of 2011, otherwise, scored 0;  $BSize_i$  = number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;  $Blnd_i$  = number of individuals sitting on the board of directors of firm  $i$  at the end of 2011 classified as independent directors divided by the total number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;  $Duality_i$  = an indicator variable where firm  $i$  is scored 1 if the same individual occupies the roles of chairperson of the board and CEO at the end of 2011, otherwise, scored 0;  $Big\_4_i$  = an indicator variable where firm  $i$  is scored 1 if the external auditor that signed the audit report for financial statements in 2011 is a *Big\_4* audit firm (i.e. Deloitte, E&Y, KPMG or PwC), otherwise, scored 0;  $b_k, \lambda_k$  = coefficients on the independent and control variables;  $b_0$  = intercept term; and  $\varepsilon_{it}$  = error term

sector and board size on *CSR* is consistent with results reported in prior *CSR* studies (Said *et al.*, 2009; Wallace *et al.*, 1994).

**Sensitivity analyses**

*Alternative measure – dependent variable.* Analyses presented thus far have focussed on total *CSR*. As noted previously, the *CSR* index used in this paper comprises five main themes/categories. To determine whether technical indicator signal breaches are associated with the extent of disclosure within specific *CSR* categories, additional regression analyses was conducted. For this part of the analysis, the signal breaches in technical indicators were regressed against partitioned individual categories of the *CSR* index, namely, the environmental, energy, human resource, products and customers and

community involvement components of the aggregated *CSR*D index. Please refer to [Appendix A](#) for details of the five individual categories. Within the environmental category, findings closely resemble main results shown in [Table IV](#). Specifically, the coefficients on  $MACD_i$  is positive and significant ( $t$ -statistics 2.465; see [Table V](#) Column I). Regression results associated with the level of human resource and products and customers disclosure are also highly similar to the main results ( $t$ -statistics 2.044 and 2.635; see [Table V](#) Columns III and IV, respectively). Relative to other *CSR* categories, the influence of technical indicator signal breaches appears more pronounced with respect to energy firms ( $t$ -statistics 2.836; see [Table V](#) Column II). In summary, additional analyses indicates that environmental, energy, human resource and products and customers are the key categories of *CSR*D that are driving the main results in [Table IV](#).

*Alternative measure – independent variable.* An alternative proxy is used to determine whether main results are robust to the choice of technical indicator utilised. Consistent with past literature ([Chiang et al., 2012](#); [Chong et al., 2010](#); [Coe and Laosethakul, 2010](#); [Tung and Quek, 2011](#)), we use the *Chande's TrendScore* as an alternative. The *Chande's*

**Table V** Disaggregated disclosure categories and influence of technical indicator signal breaches ( $N = 100$ )

Variables expected	Significance	Column I (environmental)		Column II (Energy)		Column III (human resource)		Column IV (products and customers)		Column V (community involvement)	
		$\beta$	$t$ -stat	$\beta$	$t$ -stat	$\beta$	$t$ -stat	$\beta$	$t$ -stat	$\beta$	$t$ -stat
Intercept	?		-3.705**		-3.543**		-3.299**		-2.512**		-4.736**
$MACD_{i,t}$	+	0.220	2.465†	0.262	2.836**	0.174	2.044*	0.211	2.635**	0.092	1.140
$FSize_{i,t}$	+	0.323	2.717**	0.295	2.399**	0.279	2.469**	0.056	0.522	0.364	3.413**
$SqrtAge_{i,t}$	+	-0.038	-0.444	-0.022	-0.244	-0.116	-1.413	-0.065	-0.837	0.099	1.270
$ROA_{i,t}$	+	0.106	1.213	0.073	0.811	0.265	3.178**	0.169	2.147*	-0.048	-0.612
$Lev_{i,t}$	+	0.113	1.252	0.074	0.792	0.231	2.694**	0.243	3.001**	0.155	1.914*
$Industry_{i,t}$	?	0.105	1.196	0.027	0.292	0.132	1.568	0.295	3.734**	0.071	0.900
$BSize_{i,t}$	?	0.082	0.765	0.094	0.850	0.008	0.077	0.276	2.872**	0.216	2.239*
$Blnd_{i,t}$	+	0.147	1.544†	0.167	1.695*	0.109	1.199	0.250	2.920**	0.149	1.744*
$Duality_{i,t}$	-	-0.148	-1.640†	-0.082	-0.876	-0.155	-1.803*	-0.089	-1.102	-0.144	-1.772*
$Big\_4_{i,t}$	+	-0.110	-1.238	-0.113	-1.237	0.041	0.487	0.041	0.518	-0.033	-0.409
Summary											
Adjusted $R^2$			0.304		0.231		0.355		0.399		0.433
F statistic			5.328**		3.979**		6.446**		7.559**		8.574**
(significance)											
Observations			100		100		100		100		100

Notes:

$$Comp\_CSRDisc_i = \beta_0 + \beta_1 MACD_i + \lambda_1 FSize_i + \lambda_2 SqrtAge_i + \lambda_3 ROA_i + \lambda_4 Lev_i + \lambda_5 Industry_i + \lambda_6 BSize_i + \lambda_7 Blnd_i + \lambda_8 Duality_i + \lambda_9 Big\_4_i + \epsilon_{it} \quad (6)$$

where \*\*, \*, † = 1, 5 and 10% significance with one-tailed significance level where direction of sign on coefficient predicted, otherwise, two-tailed;  $Comp\_CSRDisc_i$  = corresponding individual categories of the *CSR*D (environmental, energy, human resource, products and customers and community involvement) score of firm  $i$  in 2011 being tested in isolation in separate regression;  $MACD_i$  = sum of the number of times in 2011 that the  $MACD$  indicator for the stock of firm  $i$  provides a bullish/bearish moving crossover signal (i.e. bullish crossover–short-term moving average cuts long-term moving average from below; bearish crossover–short-term moving average cuts long-term moving average from above);  $FSize_i$  = natural logarithm of the market capitalisation of firm  $i$  at the end of 2011;  $SqrtAge_i$  = square root of the number of days from the time of incorporation of firm  $i$  till the end of 2011;  $ROA_i$  = the ratio of the net earnings after income tax, depreciation and interest of firm  $i$  for 2011 divided by the total assets of firm  $i$  at the end of 2011;  $Lev_i$  = the ratio of total liabilities of firm  $i$  at the end of 2011 divided by the total assets of firm  $i$  at the end of 2011;  $Industry_i$  = an indicator variable where firm  $i$  is scored 1 if classified under *SGX* industry sector classification to be from the manufacturing sector at the end of 2011, otherwise, scored 0;  $BSize_i$  = number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;  $Blnd_i$  = number of individuals sitting on the board of directors of firm  $i$  at the end of 2011 classified as independent directors divided by the total number of individuals sitting on the board of directors of firm  $i$  at the end of 2011;  $Duality_i$  = an indicator variable where firm  $i$  is scored 1 if the same individual occupies the roles of chairperson of the board and CEO at the end of 2011, otherwise, scored 0;  $Big\_4_i$  = an indicator variable where firm  $i$  is scored 1 if the external auditor that signed the audit report for financial statements in 2011 is a  $Big\_4$  audit firm (i.e. Deloitte, E&Y, KPMG or PwC), otherwise, scored 0;  $b_{k|k}$  = coefficients on the independent and control variables;  $b_0$  = intercept term; and  $\epsilon_{it}$  = error term

*TrendScore* is a “trend” indicator that makes a quantitative and qualitative determination of the strength and direction of a market movement by comparing the current closing price of the security to the previous closing prices for the prior 20 trading days (Chande and Kroll, 1993). *Chande’s TrendScore* indicator values oscillate from a range of  $-10$  to  $+10$ . A value of  $-10$  implies a strong downward trend in the security’s stock price and a signal to *sell*. Conversely, a  $+10$  value suggests a strong upward trend and a signal to *buy*. Consistent with Chande and Kroll (1993), we measure *Chande’s TrendScore* (denoted as  $TScore_i$ ) as sum of the number of times during 2011 that *Chande’s TrendScore* indicator for the stock of firm  $i$  indicates a strong upward (i.e. score of  $+10$ ) or downward (i.e. score of  $-10$ ) trend. Equation (3) is used to test the association between *CSR*D and *Chande’s TrendScore* trading indicator:

$$CSRDisc_{i,t} = \beta_0 + \beta_1 TScore_{i,t} + \lambda_1 FSize_{i,t} + \lambda_2 SqrtAge_{i,t} + \lambda_3 ROA_{i,t} + \lambda_4 Lev_{i,t} + \lambda_5 Industry_{i,t} + \lambda_6 BSize_{i,t} + \lambda_7 Blind_{i,t} + \lambda_8 Duality_{i,t} + \lambda_9 Big_4_{i,t} + \varepsilon_{jt} \quad (3)$$

Regression result using *Chande’s TrendScore* to measure breaches in technical trading indicators is reported in Table IV Column II. Table IV Column II indicates that the coefficient on  $TScore_i$  is positive and statistically significant ( $t$ -statistics 2.844). The positive and significant association between the extent of *CSR*D and number of technical indicator signal breaches associated with the *Chande’s TrendScore* is consistent with expectations. This result provides further support that *CSR*D is likely to increase when the number of signal breaches from technical indicators increases.

Finally, additional analyses were also undertaken to test the robustness of the main results to alternative measures of the control variables used in the main analysis. Specifically, alternative measures for firm size (i.e. log of sales), firm risk (i.e. return on equity and current ratio), board of director characteristics (i.e. dichotomous measures for board size and independence) and audit quality (i.e. auditor specialisation) were used. The use of the alternative control variable measures did not significantly alter main results.

## Conclusion

In this paper, we examine whether there is any association between the level of technical indicator signal breaches and the level of *CSR*D among the top 100 publicly listed Singaporean firms in 2011. Using legitimacy theory as the underpinning theoretical framework, it is postulated that if the share price of publicly listed firms is subjected to greater price movements resulting from a higher number of technical indicator signal breaches, this will lead to greater levels of *CSR*D by firms. Specifically, it is argued that as the number of technical indicator signal breaches increases, stakeholders (in particular investors) develop concerns about the future viability of the firm. Accordingly, management will be incentivised to disclose more *CSR*-related information to legitimise the firm’s standing with stakeholders and to provide assurances to these stakeholders and preserve the firm’s continued operations.

Findings from this paper indicate a positive and significant association between the number of technical indicator signal breaches for a firm and the level of *CSR*D. Furthermore, findings provide insightful evidence on the category of *CSR* that corporate management are most concerned about. Findings show that firms with greater volatile stock prices provide greater *CSR* information, especially in the environment, energy, human resources and products and customers categories. Results are robust to alternative measures of *CSR*D, technical trading indicators and other control variables. Overall, results suggest that, where there is volatility in the stock market, management tend to disclose more information, perhaps to legitimise their operations to reduce investor’s doubt about the performance of the firm.

Findings add to the growing literature on the association between *CSR*D and other measures of stock performance (e.g. stock liquidity), specifically within the Singaporean context, and have clear implications for regulators, corporate boards, investors and

researchers. Results indicate that 21 per cent of *CSRD* items are disclosed by firms in their annual reports. Regulators thus need to strengthen regulatory requirements and implement stricter guidelines on *CSR* reporting to encourage greater *CSRD* by firms. Results also suggest that when there is uncertainty in the stock market (resulting from volatility), management may use *CSRD* as legitimising tool to restore investor confidence. Findings show that firms with greater stock price volatility provide more *CSR* information relating to items in the environment, energy, human resources and products and customers but not on the community involvement categories. Results, therefore, suggest that regulators need to strengthen disclosures on *CSR* so that firms report *CSR* information across all areas without any underlying motive of using *CSRD* as a shield to protect their reputation. Findings can thus aid regulators revise and strengthen the existing *CSRD* guidelines among listed firms on the *SGX* to ensure greater transparency and improve the overall integrity of the *CSRD* process. An additional implication to investors is that investors should not rely mainly on *CSRD* when making investment decisions.

Although this paper has various strengths, it is not without limitations. First, for the purpose of this paper, only signal breaches from two technical trading indicators are considered in estimating stock price movements. Although it is tempting to consider signal breaches from other technical analysis indicators (e.g. breadth, volume-based, oscillators) in our analysis, such an undertaking is beyond the scope of this paper. Second, the collection of *CSRD* information is based solely on annual reports and within the context of a single country. To determine the generalisability of the findings from this paper, future research in other jurisdictional settings should be conducted and analysis across other time periods would also provide additional insights.

## Notes

1. Whether to buy or sell a share.
2. Technical trading indicators are mathematically based technical analysis tools that traders and investors use to analyse the past and predict future price trends and patterns (Rodriguez-Gonzalez *et al.*, 2011).
3. The broad term *CSRD* is used in this study to take into consideration all aspects of *CSR* reporting, not only disclosures pertaining to the environment and society.
4. Entities from the initial sample list that were not listed (or had securities traded) continuously during the firm's 2011 financial year period were also excluded.
5. In the context of the Singapore capital market, larger firms by market capitalisation generally trade more actively both in terms of daily volume averages and average days traded per year. Prior research (Clark and Gibson-Sweet, 1999; Gamerschlag *et al.*, 2011; Hackston and Milne, 1996) also suggests that larger firms are likely to face greater legitimacy pressures. Consequently, larger firms are more likely to voluntarily disclose more information including those relating to *CSR*.
6. This trading platform is regarded one of the leading independent security trading Internet portals covering the Singapore capital market (Ng, 2010).
7. The VESAD index adopted in our study closely reflects the GRI index by incorporating all of the measures of *CSR* suggested by the GRI index. Specifically, consistent with the GRI index, the VESAD index has five main categories, namely, environment, energy, human resources, products and customers and community involvement. However, the VESAD index is more comprehensive than the GRI index, encompassing 101 items compared to the GRI index which has 70 items. For a full discussion on the selection of items comprising the VESAD checklist and a detailed justification for the selection of the respective items, refer to Williams (1998).
8. The VESAD disclosure index is based solely on the reporting of voluntary information. Whilst noting the VESAD disclosure index is adopted in its original form, an examination of existing regulations in Singapore was undertaken to ensure items comprising the noted index were still voluntary. As all checklist items remained voluntary and were still deemed to provide a comprehensive coverage of *CSR* issues, the original checklist is adopted without modification.



9. It is assumed for purposes of this study that each item of the VESAD instrument is applicable to each sample firm. Whilst it is acknowledged that this assumption may not necessarily apply, the assumption is utilised to minimise researcher subjectivity biases that may arise if the researchers attempt to determine which items are and are not applicable.
10. However, to ensure that there is no multicollinearity, an additional test of calculating the variance inflation factors (VIF) for all variables where the bivariate correlations exceed the value of 0.500 was carried out. Results indicate that all VIF factors are well below the tolerance values of 10, indicating that multicollinearity is not an issue in the analyses (Hair *et al.*, 1998).
11. Given that there are 100 firms in the sample, the percentage of firms disclosing practically equals the frequency of disclosure given that the latter consists of 101 potential disclosure items.

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## Appendix 1

**Table A1** Frequency of individual *CSR*D items (*N* = 100)[11]

<i>Item name</i>	<i>Frequency of disclosure</i>
<i>Category 1 – Environment</i>	
<i>General environmental considerations</i>	
Statement of the corporation's business operations on environmental pollution pertaining to the following	
Noise	3
Air	15
Water	7
Visual quality	2
<i>Statement if the capital, operating and research and development expenditures and activities of the environmental pollution by the firm with respect to the following</i>	
Noise	3
Air	21
Water	11
Visual quality	4
<i>Environmental policy</i>	
Actual statement policy	20
Statements of formal intentions	34
Statements indicating that firm will undertake certain measure to curb environmental pollution and other such damage or what the firm does	23
<i>Environmental audit</i>	
Reference to environmental review, scoping, audit, assessment including independent dent attestation	15
<i>Environment – product and process-related</i>	
Waste(s)	26
Packaging	4
Recycling	30
Products and product development	20
Land contamination and mediation	4
<i>Environmental financially related data</i>	
Reference to financial/economic impact	14
Investment and investment appraisal	3
Discussion of areas with financial/economic impact	9
Discussion of environmental – economic interaction	20
<i>Sustainability</i>	
Any mention of sustainability	54
Any mention of sustainable development	55
<i>Environmental aesthetics</i>	
Designing facilities harmonious with the environment	28
Contributions in terms of cash or art/sculptures to beautify the environment	1
Restoring of historical buildings and structures	4
Landscaping	14
<i>Environmental – other</i>	
Involvement in schemes	23
Undertaking environmental impact studies to monitor the firm's impact on the environment	13
Receiving awards related to programmes or policies of firm	31
Protection of the environment	52
Environmental education	26
<i>Category 2 – Energy</i>	
Conservation of energy in the conduct of business operation	44
Using energy more efficiently during the manufacturing process	15
Utilising waste materials for energy production	10
Disclosing energy savings resulting from product recycling	14
Discussing the firm's efforts to reduce energy consumption	36

*(continued)*

**Table AI**

<i>Item name</i>	<i>Frequency of disclosure</i>
Disclosing increased energy efficiency of products	15
Research aimed at improving energy conservation programme	9
Voicing the firm's concern about the energy shortage	1
Disclosing the firm's energy policies	19
<i>Category 3 – Human resources</i>	
<i>Health and safety</i>	
Reduction and/or elimination of pollutants, irritants or hazards in the work environment	7
Promotion of employee safety and physical or mental health	39
Disclosure of accident statistics	14
Compliance with health and safety standards and regulations	25
Receiving a health and safety award	18
Establishment of a safety department/committee/policy	19
Conducting research to improve work safety	11
Information/education/training of employees on safety and health-related matters	30
Reference to health and safety law and/or inspectorate	10
<i>Employment of minorities or women</i>	
Recruiting or employing racial minorities and/or women	13
Disclosing and percentage or number of minority and/or women employees in the workforce and/or in the various managerial levels	11
Establishing goals for minority representation in the workplace	3
Programmes for the advancement of minorities in the workplace	1
Employment of other special interest groups	4
Disclosures about internal advancement statistics	6
Proposals, plans or initiated actions for equal opportunity, racial equality and sexual equality	15
<i>Employee assistance/benefits</i>	
Provision for the assistance or guidance of employees who are in the process of retiring or redundancy	8
Provision for low health-care services	9
Provision for staff accommodation/housing ownership schemes	3
Provision for recreational activities/facilities	29
<i>Employee profiles</i>	
Indication of the number of employees in the firm and/or at each branch/subsidiary	31
Relevant statistics on the staff such as length of service and age	81
Providing the occupations/managerial levels involved	95
Providing the geographical disposition of staff	16
Information detailing the experience and qualifications of staff required	95
<i>Employee morale and relations</i>	
Detailing information on the management's relationships with subordinates in an effort to improve job satisfaction and employee motivation	26
Providing information on the stability of workers' jobs and firm future	59
Information on the availability of a separate employee report	0
Details of awards for effective communication with employees	3
Supply of information about the communication of details to employees on management styles and management programmes that may directly affect the employees	27
<i>Industrial relations</i>	
Reporting on the firm's relationship with trade unions and/or workers	31
Information on strikes, industrial actions/activities and the resultant losses in terms of time and productivity	3
Information on how industrial action was reduced/negotiated	2
<i>Employee – other</i>	
General improvements in the working conditions	17
Information on the restructuring of any element of the organisation/branches that affect the staff in any way	2
Closure of any element of the organisation with resultant redundancies and/or relocation/retraining schemes undertaken by the firm to retain staff	4
Information and statistics on staff turnover	8
Details about support for day-care, maternity and paternity leave	4

*(continued)*

**Table A1**

<i>Item name</i>	<i>Frequency of disclosure</i>
<b>Category 4 – Products and customers</b>	
<i>Product development</i>	
Information on developments related to the company's products including its packaging	38
Information on any research projects established by the organisation to improve its products in any way	42
<i>Product safety</i>	
Disclosing that products meet applicable safety standards	19
Details on schemes to make products safer	18
Conduction of research on safety of firm's products	9
Disclosure of improvements or more sanitary procedures in the processing and preparation of products	4
Information related to the safety of firm's products purchased	9
<i>Product – other</i>	
Information on the quality of the firm's product as reflected in prizes/awards received	49
Verifiable information that that quality of the firm's product has increased	42
<i>Consumer information</i>	
Disclosing of customer safety practices	12
Customer complaints	7
Specific consumer relations (over and beyond "our duty to the consumer")	38
Provision for disabled, aged, etc. customers	9
Provision for difficult-to-reach customers	16
<b>Category 5 – Community involvement</b>	
Donations of cash, products or employee services to support established non-government-based community activities, events, organisations, education and the arts	63
Summer or part-time employment of students or disabled	14
Sponsoring public health, sporting or recreational projects	43
Aiding medical research	3
Sponsoring educational conferences, seminars or art exhibits	27
Funding scholarship programmes or activities	29
Supporting national pride/government-sponsored campaigns	40
Supporting the development of local industries or community programmes and activities	59

### About the authors

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