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Environmental, Social and Governance and the Efficiency of Government-linked Companies in Malaysia

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Abstract: *Environmental, social and governance (ESG) are non-financial performance indicators that help determine financial performance. This study, motivated by the increasing awareness of various stakeholders about the importance of ESG disclosure, explores the impacts of ESG on firm efficiency of government-linked companies (GLCs) in Malaysia from 2006 to 2012. The ESG disclosure is based on the Sustainalytics ESG Research data available in Bloomberg while data development analysis (DEA) is used to estimate firm efficiency. This study found that GLCs focused more on governance disclosures, followed by social and environmental aspects. Governance improved firm efficiency, but social and environmental factors had no similar effects. In conclusion, this study provided insight on ESG initiatives which are useful for stakeholders when making financial and investment decisions.*

Keywords: Environmental, Social and Governance (ESG), firm efficiency, data envelopment analysis, government-linked companies
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1. Introduction

Environmental, Social and Governance (ESG) have become an important consideration for investors due to their effects on risk- return profile of their portfolio. People often use the term "sustainability" or the acronym ESG when discussing socially responsible investment (SRI). The Financial Times Lexicon describes ESG as "a generic term used in capital markets and used by investors to evaluate corporate behaviour and to determine the future financial performance of companies." (ESG, n.d.). Specifically, ESG indicators are created to capture additional dimensions of corporate performance, which are not reflected in accounting data (Bassen & Kovacs, 2008). Thus, this kind of information is getting gradually more included into corporate communication (Arvidsson, 2010; Ihlen, 2008). The ESG is also known as *'extra-financial' information that helps investors make investment decision* by better assessing their of risks and opportunities (Bassen & Kovacs, 2008). Not only are ESG initiatives key indicators of the non-financial firm performance, but they are also commonly used to assess competencies of a company's management as well as to support risk management (Galbreath, 2013).

Studies (for example, Bachoo, Tan & Wilson, 2013; Bebchuk, Cohen & Wang, 2013; Clark, Feiner & Viehs, 2015; Servaes & Tamayo, 2013; Wang, Lul Kweh & Lai, 2014) have extensively examined the effects of ESG on financial performance; however, the results have been mixed and thus, inconclusive. The question also remains on how to measure performance. The current study will attempt to address all these. Single-dimensional measures of corporate performance such as return on assets (ROA) are subject to interpretation and thus may not be sufficient to measure firm performance (Feroz, Kim & Raab, 2003). In contrast, data envelopment analysis (DEA), a mathematical-programming method that incorporates multiple variables (Cooper, Seiford & Tone, 2006), provides a comprehensive performance measure. Various attributes can be evaluated simultaneously to calculate an efficiency score for a decision-making unit (DMU). In other words, DEA provides a holistic performance evaluation that provides information on aggregated activities (Homburg, 2001; Yeh, 1996). Regardless of the inconclusive findings and weaknesses in measuring firm performance, studies have shown that if a company has good sustainability management, its operating costs would be low which would ultimately increase its efficiency in the long term (Bachoo et al., 2013).

This empirical study aims to examine the impact of ESG disclosure on efficiency of firms in Malaysia. The question of whether individual components of ESG affect performance will be analysed to provide insights for the Malaysia government to attain the main goal of the New Economic Models (NEM). This is in particular as Malaysia aims to attain a developed

country status premised on good governance and sustainability. Consistent with the government's aspiration in the Economic Transformation Programme (ETP) to be a high-income nation, this study considers a contemporary measure of financial performance which is multidimensional. The relationship between ESG and financial performance is studied in a holistic manner, viewing ESG as a whole and by each dimension of performance.

The next section of this paper provides a literature review of ESG in Malaysia, while the following section discusses methodology and data collection. The fourth section discusses main findings while the final section concludes the study.

2. Literature Review

2.1 ESG initiatives in Malaysia

Investopedia (n.d.) outlines 'Environmental, Social and Governance (ESG) Criteria' as follows:

> The Environmental, Social and Governance (ESG) Criteria is a set of standards for a company's operations that socially conscious investors use to screen investments. Environmental criteria look at how a company performs as a steward of the natural environment. Social criteria examine how a company manages relationships with its employees, suppliers, customers and the communities where it operates. Governance deals with a company's leadership, executive pay, audits and internal controls, and shareholder rights. Investors who want to purchase securities that have been screened for ESG criteria can do so through socially responsible mutual funds and exchange-traded funds.

The ESG initiative has risen dramatically as a public concern in many countries, including Malaysia and in the latter, ESG is still relatively new even though Bursa Malaysia Berhad launched an ESG index for public-listed companies in December 2014. Vision 2020 is Malaysia's aspiration to become a developed nation by 2020. According to the National Economic Advisory Council (NEAC, 2010), in 2020, the country will be characterised as market-led, well-governed, regionally integrated, entrepreneurial, and innovative. In achieving Vision 2020, the government under the leadership of Najib Razak, has underlined four main policies, namely 1Malaysia concept "Rakyat first, performance now", Government Transformation Programme (GTP), New Economic Model (NEM), and the 10th Malaysia Plan (which covers period between 2011 and 2015).

2.2 *Stakeholder theory and the link between ESG and performance*

Stakeholder theory can be used to examine the link between ESG (or its components) and a firm's performance (Humphrey, Lee & Shen, 2012; Ruf, Muralidhar, Brown, Janney & Paul, 2001). Stakeholder groups include internal, external, and environmental constituents. Like shareholders, other stakeholders may place demands on the firm (Ruf et al., 2001). The ESG disclosure by the company is due to demand from stakeholders. Previous studies have shown that stakeholder theory was a framework for analysis in which managers provide information to their stakeholders. In addition, stakeholders can monitor the performance of a company which would ultimately help managers to focus on their financial goals and that managers have a fiduciary relationship with their stakeholders by being responsible for the welfare of their shareholders (Orlitzky, 2013). Freeman (2010) claimed that by prioritising multiple stakeholder interests, companies can achieve good performance. This is because different interests can yield better company performance.

Under the fast-changing business environment, companies without SRI (socially responsible investment) may face problems such as decline in reputation, loss of customer loyalty and sales, and loss of intellectual capital. In other words, good ESG performance may create intangible benefits by minimising costs and solving potential conflicts with stakeholders. Ultimately, such companies will enjoy continuous support from stakeholders such a consumers and investors who value ESG in business. This means that top management of a company has to consider ESG when making business decision. The growing number of ESG reports is an example of companies incorporating ESG into their business practices (Lee & Saen, 2012).

Number of studies have examined the relationship between various aspects of ESG and firm performance in Malaysia. The focus of the review is on (1) the scope of investigation, (2) sample used, (3) measurement of variables, and (4) the findings. A lot of studies were reviewed, however, we believe that we have covered a sufficient number of important journal articles. A full list of studies reviewed is available in Table 1.

Of the 31 studies reviewed, 15 examined the influence of firm performance on ESG (i.e., ESG as the dependent variable), 15 studies examined the influence of ESG on firm performance (i.e., ESG as the independent variable), and one study which examined both relationships.

Table 1: Prior studies examining the association between ESG and FP in Malaysia (FP influences ESG)

No	Author(s)	Sample	ESG component	ESG measure	Firm performance	Findings
1	Amran et al. (2012)	100 PLCs (35 members of sustainability networks; 65 conveniently selected from several industries)	Environment	• Annual report and sustainability report disclosures 2009 • GHG disclosure (5 items, max: 12)	Lag return on assets	Positive and significant
2	Esa & Anum Mohd Ghazali (2012)	27 GLCs	CSR	• Annual report disclosures 2005 & 2007 • Categories: human resource, value-added, environment, community, & product • 21 items (1,0 scoring)	Profit before tax over total assets	Positive but not significant
3	Othman S., Darus & Arshad (2011)	117 PLCs from industrial products, properties, and plantation sectors (random)	ESG	• Annual report disclosures 2007 • Categories: citizenship (community & environment), workplace, and governance (marketplace) • 40 items (0-2 scale; max: 80)	Profit after tax over total assets (control variable)	Positive and significant
4	Sheikh Abu Bakar & Ameer (2011)	333 PLCs (6 sectors); only 131 reporting companies selected for further analysis	CSR	• Annual report disclosures 2007 • Readability score - using Flesh Reading Ease and Bullfighter composite index	• Earnings before tax over total assets • Tobin's q	Positive and significant
5	Wan Abd Rahman, Mohamed Zain & Yahaya Al-Haj (2011)	44 GLCs	CSR	• Annual report disclosures 2005-2006 • Categories: human resource, community, marketplace, & environment • 16 items (Number of sentences)	Net profit after tax over sales	Positive but not significant

Table 1: (Continued)

No	Author(s)	Sample	ESG component	ESG measure	Firm performance	Findings
6	Abd. Rahman, Yusoff & Wan Mohamed (2009)	Top 56 disclosing PLCs	Environment	• Annual report disclosures 2006 • Classified into detailed, superficial, and both	Net income over assets (high, medium, and low)	Not significant
7	Elijido-Ten (2009)	40 companies reported on the environment (79 firm-year observations)	Environment	• Annual report disclosures 2000-2001 • 19 items (0-3 scoring; number of sentences)	Average return on assets	Negative but not significant
8	Heaney (2009)	161 PLCs	Governance	• Year of analysis: 2000-2002 • Board size • Board independence	Book to market ratio	• Insignificant • Board size: Year 2000 (+)
9	Muhamad Shahmimi, Yahya & Mahzan (2009)	159 PLCs (random)	Governance	• Annual report disclosures 2006 • Disclosure index (1,0 scoring)	Net profit margin	Positive but not significant
10	Othman et al. (2009)	Top 56 Shari'ah-approved PLCs	(Islamic) ESG	• Annual report disclosures 2004-2006 • Categories: Finance & investments, products and services, employees, society, environment, & corporate governance • 43 items (1,0 scoring)	Profit before tax	Positive but not significant
11	Shakir (2008)	81 PLCs from the properties sector	Governance	• Year of analysis: 1999-2005 • Block ownership (≥5%)	• Tobin's q • Market value	• Tobin's q (-) • Market value (+)

Table 1: (Continued)

No	Author(s)	Sample	ESG component	• ESG measure	Firm performance	Findings
12	Amran, Ling & Sofri (2007)	Top 100 companies (PLCs)	Social	• Amount of cash donation for 2004 • 65 companies – collected from a previous study; 35 – from annual report/website	Profit before tax	Positive but not significant
13	Mohamad Ariff, Kamil Ibrahim & Othman. (2007)	95 companies in the Corporate Governance rating	Governance	• Classified into top and bottom 50%	Net profit margin	Positive but not significant
14	Mohd Ghazali (2007)	87 Composite Index non-financial companies	CSR	• Annual report disclosures 2001 • 22 items (1,0 scoring)	Profit before tax over total assets	Positive but not significant
15	Haniffa & Cooke (2005)	139 non-financial PLCs (stratified)	CSR	• Annual report disclosures 1996 and 2002 • Categories: community, environmental, employee, product/ service, & value-added • 41 items (1,0 scoring; number of words)	Earnings after tax over total equity (control variable)	Positive and significant
16	Ahmad et al. (2003)	299 PLCs (randomly-selected)	Environment	• Annual report disclosures 1999 • Incidence (report/not)	Profit over assets	Positive but not significant

In terms of the components of ESG - environment, social, and governance - investigated, we can observe few trends. First, the studies were largely focused on one or two aspects of ESG, with the exception of Othman R., Thani & Ghani (2009) and Othman S., Darus & Arshad (2011). Second, most of the studies looking at the impact of ESG on firm performance focused the governance aspect. The influence of environment (Eng Ann, Zailani & Abd Wahid, 2006; Koe Hwee Nga, 2009) and social/CSR practices (Ramasamy Ting & Yeung, 2007; Saleh, Zulkifli & Muhamad, 2011) on firm performance is under-researched.

2.3 Measurement of firm performance

There is an apparent problem in the measure of financial performance. Previous studies used, inter alia, return on assets (Amran et al., 2012; Esa & Anum Mohd Ghazali, 2012; Othman, S. et al., 2011), Tobin's q (Amran N.A. & Ahmad, 2011; Sheikh Abu Bakar & Ammer, 2011; Ibrahim & Samad, 2011); return on equity (Ibrahim & Samad, 2011; Koe Hwee Nga, 2009; Saat, Karbhari, Heravi & Nassir, 2011), stock market return (Ponnu & Ramthandin, 2008; Ramasamy et al., 2007; Saleh et al., 2011); and net profit margin (Mohamad Ariff, Kamil Ibrahim & Othman, 2007; Muhamad, Shahmimi, Yahya & Mahzan, 2009). Using these measures, however, undermines the fact that financial performance is multidimensional. Therefore, this study uses the DEA technique to evaluate firm’s financial performance.

Literature review suggests that existence of a firm relationship between ESG (or its components) and business performance remains to be established (Abd. Rahman et al., 2009; Esa & Anum Mohd Ghazali, 2012; Wan Abd Rahman et al., 2011). Studies that examine the impact of ESG on firm performance (Koe Hwee Nga, 2009) found that ISO 14000[1] adopters have significantly better ROE. However, this relationship was absent when using sales and market capitalisation as the proxies for financial performance. Additionally, Ponnu and Ramthandin (2008) found that companies with higher corporate governance rating have better ROE only when weighted rating score was used (but not when using the raw score) and the rating had no impact on the holding period return of the sample companies. This implies that different measures could produce different outcome.

3. Description of Methodology

3.1 Data collection

Data for this study was obtained from the Sustainalytics ESG Research database (available in Bloomberg). Bloomberg grades companies based on

their disclosure of quantitative and policy-related ESG information. Data is secondary because first, it is easily accessible from databases; second, we believe that companies would disclose information should they perceive the information is important for the stakeholders to make decisions. In this regard, we assume that disclosure, to a large extent, equates the actual practice. Third, previous studies have also used secondary data (Amran A. et al., 2012; Esa & Anum Mohd Ghazali, 2012; Wan Abd Rahman et al., 2011; Ponnu & Ramthandin, 2008; Saleh et al., 2011).

This study surveyed 387 GLCs in Malaysia, covering a period between 2006 and 2012. The GLCs are Malaysian listed companies with 20% equity shares held by government-linked investment companies (GLICs) (Zin & Sulaiman, 2011).

The GLICs are the investment arms of Malaysian government. There are currently seven of them: Employees Provident Fund (EPF), Khazanah Nasional Bhd (Khazanah), Kumpulan Wang Amanah Pencen (KWAP), Lembaga Tabung Angkatan Tentera (LTAT), Lembaga Tabung Haji (LTH), Menteri Kewangan Diperbadankan (MKD), Permodalan Nasional Bhd (PNB) (PCG, 2012).

Our study focuses on the impacts of ESG on Malaysian GLCs. Esa and Anum Mohd Ghazali (2012) and Wan Abd Rahman et al. (2011) examined the association of ESG and firm performance among GLCs, however, their sample is small with 27 and 44 companies respectively.

3.2 Methodology

A two-stage approach is adopted in answering the research questions. In the first (1) stage, we estimated efficiency performance of our sample companies using DEA. In the second (2) stage, we performed regression analysis to examine the impact of ESG on efficiency performance. Good management theory was applied to support this proposition that "by engaging in ESG initiatives, companies can improve their financial performance" (Fauzi, 2009); other theories include porter hypothesis (Wagner, Schaltegger & Wehrmeyer, 2001), stakeholder theory (Saleh et al., 2011), and stewardship theory (Koe Hwee Nga, 2009).

3.2.1 Performance measure: Data Envelopment Analysis (DEA)

The DEA, a widely used linear-programming-based composite tool, is developed by Charnes, Cooper and Rhodes (1978) and extended by Banker, Charnes and Cooper (1984).[2] It is a mathematical technique comparing multiple inputs and outputs of decision-making units (DMUs) for measuring relative DMUs' efficiency and allowing the identification of benchmarking. Instead of using merely uni-dimensional ratios and other individual financial

variables, IC indicators such as human capital and structural capital can be accommodated so that possible interactions between them can be captured to derive efficiency scores using DEA (Feroz et al., 2003).

Specifically, a DEA study aims to project the inefficient DMUs onto the production frontiers, whereby a researcher can opt for either input-oriented or output-oriented direction. The former refers to the objective to proportionally reduce the input amounts with the output amounts held constant at the present level, and the reverse is for the latter. Since the sample companies have the discretion to determine the input amounts (such as staff costs, debt capital, equity capital) but not the output amounts (such as profit and market value), this study applies the input-oriented models.

3.2.2 *Truncated Regression Model*

Note that efficiency scores range from zero to one. As the truncated regression technique is able to offset the bias involved in estimating such parameters, this study adopted truncated regression proposed by Simar and Wilson (2007) to examine the impact of exogenous factors on operating efficiency and ESG score. In the regression analysis, we will run truncated regression for Equation (1). The following regression models are estimated:

$$EFF_{it} = \alpha_0 + \alpha_1 ENV_{it} + \alpha_2 SOC_{it} + \alpha_3 GOV_{it} + \alpha_4 FSIZE_{it} + \alpha_5 FLEV_{it} + \alpha_6 MTB_{it} + \alpha_7 OCF_{it} + \varepsilon$$

where:

EFF_{it}	=	The input-oriented BCC DEA efficiency score in year *t*.
ENV_{it}	=	The percentage of environmental-related disclosures of firm *i* at period *t*.
SOC_{it}	=	The percentage of social-related disclosures of firm *i* at period *t*.
GOV_{it}	=	The percentage of governance-related disclosure of firm *i* at period *t*.
$FSIZE_{it}$	=	The natural logarithm of total assets of firm *i* at period *t*.
$FLEV_{it}$	=	The ratio of the sum of short-term and long-term borrowings to total assets of firm *i* at period *t*.
MTB_{it}	=	The ratio of market value to book value of firm *i* at period *t*.
OCF_{it}	=	The ratio of operating cash flow to total assets of firm *i* at period *t*.

4. Empirical Results

Table 2 presents the descriptive statistics of dependent variable and explanatory variables. The average of environmental score (ENV) in the sample is 1.484. The mean of social score (SOC) is 2.863, and the mean of governance score (GOV) is 34.606. Among the three pillars of ESG, governance seems to have the largest amount value, followed by social aspects. This suggests that the firms disclosed GOV information more than SOC and ENV. It is also noteworthy that the standard deviation of GOV and SOC are relatively high compared with the ENV. Meanwhile, the mean firm size is approximately 9.185, while the mean of firm leverage is about 0.229.

Table 3 shows the Pearson correlation coefficients in a two-tailed setting. GOV is significantly and positively related to efficiency (EFF). This means that firms' performance is increased when they disclose information on the GOV. There was a significantly positive correlation between governance (GOV) and ESG. From this study, we can see among the three pillars of ESG, firms are most likely to disclose GOV information because they believe it enhances their efficiency. Other correlation coefficients are lower than 0.5. The maximum value of untabulated variance inflation factors (VIF) is about 2.0. These results suggest that there is no multicollinearity problem for multivariate analysis.

Table 4 reports the outcomes of the regression analysis. The models are significant at the 0.01 significance level. The result shows that environment (ENV) has a negative relationship with efficiency (EFF) and the coefficient is significant. While previous studies that focus on environment issues found positive results between environment and firm efficiency (Al-Najjar & Anfimiadou, 2012; Derwall, 2007; Sinkin, Wright & Burnett, 2008), this study argues that the focus of GLCs could be the reason for the negative association. Specifically, the government may promote more spending on protecting the environment through GLCs. The coefficient of social (SOC) is positive and insignificant and this finding is similar with Filbeck, Gorman & Zhao (2009). Statman and Glushkov (2009) and Core, Guay and Rusticus (2006) found that governance does not affect firm performance. Meanwhile, this study shows the coefficients of governance (GOV) are negative but only significant in the Tobin regression. These suggest that the SOC and GOV of ESG generally do not enhance firm performance. The Enron debacle has had profound implications on its stakeholders such as the managers (e.g., subjected to class action lawsuits), employees (lost their jobs and retirement savings), investors (suffered from the significant drop in the stock value, i.e. from USD90 in 2000 to nearly worthless), creditors (unpaid debts), the auditing firm (Arthur Anderson is now defunct), competitors (decline in the stock values of energy trading companies), business firms at large (decline in public confidence), and governmental agencies (due to ineffective

enforcement mechanism) (Culpan & Trussel, 2005). Firm size (FSIZE), market to book (MTB) and operating cash flow (OCF) are positively related to EFF but the coefficient of MTB is insignificant. However, firm leverage (FLEV) has a significantly negative association with efficiency.

4.1 Discussion

This study aims to create greater awareness on ESG practices among companies in Malaysia. The findings showed that the Malaysian government is playing a pro-active role in ensuring the adoption of ESG initiatives by the corporate sector. This is captured in its initiative in launching the Government-linked Companies Transformation Programme (GLCTP) (the GLCTP is a 10-year plan launched in May 2004). By promoting investment in ESG, Malaysia will be able to attract more foreign direct investments or investors who value sustainability in business. This is in tandem with the 10th Malaysia Plan (2011-2015) which is internally driven, externally aware. This awareness will subsequently promote growth in private sector investments. This study is very important to many stakeholders in helping them improve the living standard and quality of life in many ways (from the perspective of environmental, social, and governance) as contained in the 10th Malaysia Plan through income and capacity building programmes, strengthening the social safety net and addressing the needs of the disadvantaged groups. By focusing on the individual aspect of ESG element, this study concludes that ESG-related disclosures may worsen business performance. In line with the stakeholder theory, ESG disclosures by companies in Malaysia could be due to demand from stakeholders. No significantly positive effect of such disclosures can be found in its infancy stage.

Table 2: Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev
EFF	0.541	0.472	1	0.020	0.336
ESG	54.475	30.165	100.000	9.211	40.668
ENV	1.484	0	49.612	0	5.554
SOC	2.863	0	60.938	0	9.166
GOV	34.606	48.214	73.214	0.103	21.829
FSIZE	9.185	9.227	13.369	4.633	1.667
FLEV	0.229	0.210	0.659	0	0.166
MTB	3.967	1.796	157.392	0.303	10.352
OCF	0.092	0.062	0.752	-0.117	0.116

Table 3: Correlation matrix

Probability	EFF	ESG	ENV	SOC	GOV	FSIZE	FLEV	MTB	OCF
EFF	1								
ESG	0.0216	1							
ENV	-0.0037	-0.1478***	1						
SOC	-0.0136	-0.2059***	0.8862***	1					
GOV	0.1185**	0.1925***	-0.0720	-0.0894*	1				
FSIZE	-0.0968*	0.0945*	0.0385	0.0857*	0.4354***	1			
FLEV	-0.2367***	-0.0974**	0.0352	0.0262	-0.0956**	0.1952***	1		
MTB	0.2341***	0.1399***	0.1992***	0.1121**	-0.0524	-0.1622***	0.0467	1	
OCF	0.3574***	0.07705	0.2297***	0.1236**	-0.1676***	-0.4277***	-0.1327**	0.6252***	1

Notes: *, ** and *** are statistically significant at the 10%, 5% and 1% levels respectively.

Table 4: Regression results (Dependent variable: EFF)

Variable	OLS		Tobit	
	Coefficient	**Prob.**	**Coefficient**	**Prob.**
C	0.3323**	0.0194	0.2488***	0.0005
ENV	-0.0096*	0.0772	-0.0154*	0.0641
SOC	0.0030	0.4500	0.0053	0.3592
GOV	-0.0596	0.5218	-0.0457***	0.0003
FSIZE	0.0245*	0.0810	0.0363	0.5561
FLEV	-0.4153***	0.0027	-0.5392***	0.0004
MTB	0.0015	0.4792	0.0152	0.3959
OCF	1.0845***	0.0000	1.1873***	0.0000
Adjusted R-squared	0.1697			
F-statistic	12.2726***			
Log likelihood			-218.127	

* Statistical significance at the 10% level.
** Statistical significance at the 5% level.
*** Statistical significance at the 1% level.

5. Conclusion

This paper examined the impact of ESG on efficiency of GLCs in Malaysia between 2006 and 2012. Data on the ESG disclosure was obtained from the Sustainalytics ESG Research database available in Bloomberg. The study found that GLCs focus more on governance disclosures, followed by social and environmental disclosures. The regression analyses showed that governance is positively associated with firm efficiency, but social and environmental factors have no similar effect. In summary, this study provided an insight on ESG initiatives of GLCs in Malaysia highlighting the important ESG components for financial and investment decisions.

There are limitations in this study. The companies sampled are GLCs and the findings cannot be generalised to all companies in Malaysia. It would be interesting to carry out a similar study that examines other companies in Malaysia to strengthen the results of this study. Second, the Sustainalytics ESG Research is used to test ESG reporting. Future studies may perform content analyses to look at other companies in Malaysia which have ESG initiatives. A comparative study can also be undertaken.

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Notes

1. The ISO 14000 is a series of environmental management standards developed and published by the International Organization for Standardization (ISO) for organisations. It provides a guideline or framework for organisations that need to systematise and improve their environmental management efforts.
2. Readers are encouraged to read Charnes et al. (1978) and extended by Banker et al. (1984) for further details on the DEA technique.

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