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North American Journal of Economics and Finance

journal homepage: www.elsevier.com/locate/najef

The causality direction of the corporate social responsibility – Corporate financial performance Nexus: Application of Panel Vector Autoregression approach

Woon Leong Lin^{a,*}, Siong Hook Law^b, Jo Ann Ho^a, Murali Sambasivan^{b,c}^a Faculty of Economics and Management, Universiti Putra Malaysia, Selangor, Malaysia^b Taylor's Business School, Taylor's University, Lakeside Campus, Subang Jaya, Selangor, Malaysia^c Thiagarajar School of Management, Madurai, India

ARTICLE INFO

JEL classification:

C13
C18
G32
M21

Keywords:

Corporate Social Responsibility
Corporate Financial Performance
Panel Vector Autoregression
System GMM
Panel Granger Causality

ABSTRACT

This study is an attempt to model the bidirectional linkages between corporate social responsibility (CSR) and corporate financial performance (CFP) by using the prospective and retrospective approaches. A panel data set for 100 of the Fortune Most Admired Companies was used to study the relationships. Moreover, 1000 firm-year observations were examined between the sample periods of 2007 and 2016. A new methodology known as Panel Vector Autoregression (Panel VAR) approach using the Generalised Method of Moments (GMM) was used in this study. The salient findings are: (1) better financial performance of firms lead to a better CSR engagement and (2) better CSR need not necessarily lead to superior CFP. A strong and substantial negative impact has been observed on CSR and the three CFP measures, namely, return on equity, return on assets, and return on invested capital. This finding has consistency with the trade-off hypothesis. This hypothesis posits that when firms are “being socially responsible”, they will have a tendency to experience minimised shareholder wealth and lower profits, which restricts the socially responsible investments.

1. Introduction

For over three decades, scholars have shown great interest in corporate social responsibility (CSR) as seen from various management perspectives, including instrumental stakeholder theory, cost perspective, reputation theory, agency theory, and resource-based view (RBV) (Muller & Kraussl, 2011). Most of the focus of present empirical literature has been on the exact feature of the relationship between CSR and corporate financial performance (CFP). Since the first publication of the studies of Bragdon and Marlin (1972) and Moskowitz (1972) (Margolis & Walsh, 2003), more than 100 studies have been performed to empirically examine the association between CSR and CFP. However, the inconsistent outcomes for the relationship between CSR and CFP are still very much unclear (Margolis & Walsh, 2003; Ullmann, 1985; Waddock & Graves, 1997; Wang, Dou, & Jia, 2016). Some studies have posited that the firm's performance can be improved by being socially responsible (Lev, Petrovits, & Radhakrishnan, 2010; Surroca, Tribó, & Waddock, 2010). Nonetheless, it has also been posited by other studies that there are no improvements in the performance of the firm (Aupperle, Carroll, & Hatfield, 1985; Graves & Waddock, 2000). Furthermore, empirical studies conducted recently have investigated

* Corresponding author at: Fakulti Ekonomi Dan Pengurusan, Universiti Putra Malaysia, 43400 Upm Serdang, Selangor, Malaysia.
E-mail address: linwoonleong@gmail.com (W.L. Lin).

<https://doi.org/10.1016/j.najef.2019.03.004>

Received 23 April 2018; Received in revised form 10 December 2018; Accepted 5 March 2019

Available online 07 March 2019

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Table 1
Theories that discuss the relationship between CSR and CFP.

Causal sequence	Theory	Remarks
(+) 	The Instrumental Stakeholder Theory	Focuses on the relationship between stakeholder management practice and the belief that the claims of important stakeholders (e.g. claims for improved CSR) have contributions to the predominant corporate execution objectives (Donaldson & Preston, 1995; Jones, 1995). The relationships among bilateral stakeholder managements serve as systems for checking and implementation that make sure that managers do not redirect consideration from a broad range of hierarchical objectives related to money. Furthermore, managers have the capacity to increase their adaptation's proficiency in relation to the external demands (Jones, 1995) and based on different stakeholders (Orlitzky et al., 2003)
(-) 	Trade-off Theory	This is the position of neoclassical economists who believe that socially dependable conduct will result into several financial advantages while the different costs will lessen the benefits and the wealth of the shareholder (Waddock & Graves, 1997). Organisations only have one social duty, which is to earn a profit while building benefits. CSR expansion pointlessly increases their expenses and lowers their profit (Friedman 1970)
(+) 	Slack Resources Theory	Better CFP could probably increase the accessibility of financial resources. Furthermore, it is a CSR determinant that could improve the ability of a firm to invest their resources into areas that are more socially capable, such as employee relations, community and society, or the environment (Waddock & Graves, 1997; Preston & O'Bannon, 1997)
(-) 	Managerial Opportunism Hypothesis	Managers that possess a fleeting viewpoint, because of remuneration plans, for example, will work hard to trade out when their monetary performance is admirable. When they are not performing commendably, managers will tend to hide it by vigorously shifting focus into CSR (Preston & O'Bannon, 1997)
(+/-)  CFP (+/-)	Positive/Negative Synergy Hypothesis	The bilateral causality relationship states that CSR leads to CFP and vice versa. Positive synergy (Waddock & Graves, 1997). Negative synergy (Preston & O'Bannon, 1997)

Source: (Author, 2017).

nonlinear relationships and stated that CSR does not collectively produce favourable outcomes for every firm at all times (Brammer & Millington, 2008; Wang, Choi, & Li, 2008) (Table 1).

Researchers have been able to identify several reasons for the inability to achieve a consensus regarding how enhanced social performance influences financial performance. Seen from a theoretical perspective, the main concern is the mismatch in stakeholders (Wood & Jones, 1995), lack of definitions for vital terms, and inadequacies in the theories (Ullmann, 1985). There is also a concern for “the conceptual determinants of CSR, and consequently the theoretical expectations of the CSR-CFP relationships” (Brammer & Millington, 2008, p. 1326), and the boundaries of CSR (Barnett, 2007). Similarly, the mixed findings have been seen to be responsible for the various operational failings, such as differences in methodology and operation in defining social and financial performance (Griffin & Mahon, 1997). It was also observed that there was a failure to control specific vital variables that were believed to have a direct effect on firm performance, such as risk, industry affiliation, asset, age (Cochran & Wood, 1984), advertising expenditure investments (McWilliams & Siegel, 2000), and research and development (R&D).

Furthermore, there could be a relationship between good managerial practice and good social performance. In turn, this could result in strong financial performance. For example, it was discovered by Cheng, Collins, and Huang (2006) that firms that possess strong shareholder rights have a tendency to have a cost of equity capital that is lower than competing firms. This reinforces the idea that financial performance can be improved by lessening the agency problems between stakeholders and managers. It was discovered by Ferreira et al. (2008) that large firms reap benefits in the form of positive long-run stock performance after quality management certification. This implies that for large companies, the bottom line is not enhanced by good managerial practice.

It is suggested by the empirical evidence that there is a virtuous circle. According to Waddock and Graves (1997), Orlitzky, Schmidt, and Rynes (2003) and Hillman and Keim (2001), increasing CSR improves financial performance and vice versa. McGuire, Sundgren, and Schneeweis (1988) have argued that the accounting-based performance measures and stock returns of the previous years are related to current CSR measures. However, a past record of good social performance has no influence on a firm's current financial performance. The creation of this “virtuous cycle” is due to the fact that no convincing answer still exists on whether CSR offers the firms some expanded benefits or vice versa. Since society and business have been in an endless cycle of lack of trust among partners (Porter & Kramer, 2011), organisations will naturally ask “if the 'good thing' brings about financial gains”.

Since finding a general CSR-CFP relationship is not yet possible and CSR approaches vary across jurisdictions, a specific context needs to be considered. The current study aims to extend CSR literature by laying out the differences between the Prospective and Retrospective approaches based on causality, which previous studies have disregarded. A Retrospective approach is used to measure the influence of past financial performance on Fortune magazine's current CSR rating. Alternatively, the Prospective approach measures how CSR rating will affect future financial performance. Despite the fact that a correlation exists between the CSR rating and the future financial performance variables, the variables of future performance are not obtained from the rating agency's decision. Thus, even though the rating agency of Fortune magazine rates companies partially based on their financial performance in the past, the agency cannot control the future performance of the companies they have given ratings too. This study, therefore, presents an improved and more solid comprehension of the direction of causality between CSR and CFP. Moreover, the bi-directional logic, which very few earlier studies have adopted, has been utilised in this research.

The methodological technique used in this research involves the conduct of an empirical examination for the relationship between previous CSR ratings and financial and accounting performance in the future (a prospective approach). It also examines the influence of financial and accounting performance of year $t - 1$ on year t 's CSR ratings (a retrospective approach). The bi-directional temporal logic used by [Waddock and Graves \(1997\)](#) has been followed and Fortune's Most Admired Companies database has been used. The main goal of this paper is to provide a quantification of the Granger-causal relationship between the CSR and CFP of the firm and to study the nexus of the CSR and CFP, particularly to determine if there is an idealistic virtuous cycle. For the most part, the theories involved in this study have been tested using the GMM approach so that the Panel Vector Autoregressions (Panel VAR) model can be estimated as well. Different econometric models have been used to confirm the shift causality. These models analyse both the reversed association between CSR and CFP and the effect of CSR on CFP. It is also vital to determine if the CSR-CFP causality has more prominent time lapses and is more grounded.

America's most admired companies, during the 2007–2016 periods, were analysed to test the reverse and direct relationship between CSR and CFP. Our results reveal that the CSR of a firm, proxied by the CSR scores given by Fortune, has a negative effect on future financial performance. The results indicate that the financial results from the previous year can be used to explain the adoption of CSR management techniques in the following year. Our results are considered robust to alternative estimation approaches.

This paper is structured as follows: Section 2 discusses in detail the theoretical foundation that encompasses the theories that were used to develop the study theories of CSR-CFP causality; Section 3 presents the data; Section 4 discusses the empirical methodology in detailed; Section 5 contains the discussion for the baseline results and offers various robustness analyses; and the concluding remarks can be found in the final section.

2. Literature review

2.1. The relationship between CSR and CFP

Even though earlier studies have generally failed to consider the simultaneous bidirectional relationship between CFP and CSR, they still offered proof of the one-dimensional relationship that exists between these two factors, which is also referred to as the influence of CSR investments on economic performance. It was concluded by a majority of earlier studies that CSR investments produce a better economic performance. For instance, it was suggested by [Stanwick and Stanwick \(1998\)](#), [King and Lenox \(2002\)](#) and [Al-Tuwaijri et al. \(2004\)](#) that enhanced environmental performance also improves overall financial performance. Among the different kinds of CSR, their focus was mainly on environmental investments. On the other hand, CSR has been defined by some studies using integrated CSR indices or multiple dimensions such as CSR ratings or a dummy variable. For instance, it was demonstrated by [Brammer, Brooks, and Pavelin \(2006\)](#) that corporate social performance, when expressed as the activities that are related to the natural environment, community, and employment issues, has a beneficial effect on financial performance. In a similar manner, CSR performance was defined by [Balabanis et al. \(1998\)](#) based on the treatment of ethnic minority employees, dimensions of women's position, and philanthropy and environmental actions. They were able to demonstrate that some of these CSR activities improve the economic performance of a firm through CSR disclosure. However, for total CSR activity, the dummy variable was used by [Cochran and Wood \(1984\)](#). They also suggested that firms conducting CSR activities are more likely to have better performance in certain financial indices. There are numerous other definitions that were used by studies that investigated the effect of CSR on economic performance ([Pava and Krausz, 1996](#); [Peloza and Papania, 2008](#); [Nelling and Webb, 2009](#); [Surroca, Tribó, & Waddock, 2010](#)). Although the definition of the CSR in the literature varies greatly, there is an assumption in all these studies that corporate economic performance can be determined by CSR investments and that the level of the investment can be exogenously determined.

However, [Waddock and Graves \(1997\)](#) have claimed that an inverse relationship may exist between these two constructs. In other words, the economic performance of a firm may also affect its CSR investment level. Overall, firms that have high profitability are able to invest more in CSR compared to firms with lower profits. If there is a presence of this inverse relationship, studies need to control the endogeneity of CSR investments in order to develop a model of economic performance. However, a large percentage of earlier studies, including the previously mentioned studies, failed to take this issue into consideration. Even a few studies that take note of this issue, such as the studies done by [Waddock and Graves \(1997\)](#), [Siegel and Vitaliano \(2007\)](#) and [Surroca et al. \(2010\)](#) have conducted a separate investigation of every causal relationship during the analysis part. This approach fails to take into consideration the potential simultaneous occurrence. As a result, it can potentially generate biased results. Therefore, so far, there has been no sufficient investigation on the bidirectional relationship between economic performance and CSR investments.

The focus of this paper is on examining the prospective efficacy of earlier CSR ratings in terms of accounting and financial performance in the future (an approach that the current study refers to as Prospective) and Reciprocally, the effect that financial and accounting performance of year $t - 1$ has on the CSR ratings of year t (an approach that the current study refers to as Retrospective). We are employing panel VAR System GMM to estimate the relationship. Therefore, this study will adhere to the bi-directional approach that was used by [Waddock and Graves \(1997\)](#) and [Bénassy-Quéré et al. \(2018\)](#). In Hypothesis 1, there is an assumption of the existence of a positive relationship between CFP and CSR. Hypotheses 2 and 3 emphasise on other performance variables – ROE and ROIC.

2.2. Firm performance measurement and panel VAR

The vector autoregression (VAR) methodology treats all variables in a system of multiple time series as endogenous and is thus appropriate to our empirical application. This technique was introduced by [Sims \(1980\)](#) and has been widely used primarily in

macroeconomics. By allowing for unobserved individual heterogeneity, inherent in panel data, the panel VAR method, developed by Holtz-Eakin, Newey, and Rosen (1988), has been utilized mainly in the literature of financial economics (e.g., Love and Zicchino, 2006, and Love and Ariss, 2014). So far, there is a lack of panel VAR study that looks at the relationships between different firm performances and CSR practices, which is the topic of this paper. To a very limited extent, our paper is related to the study by Kang et al. (2016) that applies structural panel VAR (SPVAR) to estimate the relationship between CSR and firm performance. They suggested that firms that engage in CSR are likely to benefit financially from their CSR investments. Moreover, they did not find support for the slack resources mechanism. They used KLD data as their CSR rating, although the KLD data has been used extensively in existing research and the CSR measures are based on somewhat subjective rather than objective evaluations. Our study instead focuses on firm performance in terms of change in CSR rating by using Fortune' AMAC (America's Most Admired Companies). Anderson, Hyun, and Warsame (2014) also find that there are bi-directional relationships between them; a positive influence of CSR on firm performance and negative influence of firm performance on CSR by applying panel VAR.

Another relevant study is Chollet and Sandwidi (2018). They instigate the virtuous circle between corporate social performance and the firm's risk. More specifically, they show that a firm's good social and governance performance reduces its financial risk and thereby reinforces its commitment to good governance and environmental practices. Finally, Zhang, Lundgren and Zhou (2015) find that environmental performance and energy efficiency are integrated and environmental performance has a positive impact on current energy efficiency, and vice versa. However, their study does not examine the dynamic linkage, and the causality is pre-determined in the panel VAR GMM model.

2.3. Ratings and subsequent performance (“Prospective” Approach)

On the whole, this study explores the motivating factors that form the foundation of CSR practices. These motivating factors might either be receptive to a pragmatic and opportunist marketing setup or, alternatively, to a kind of social motivating factor that bears no direct monetary equivalent. By its very nature, a firm may carry out CSR practices for attaining an enhanced performance. Such practices can also generate expenses for which it's not easy to determine benefits. In the end, a more nuanced approach emphasises these potential drivers of CSR. The demands that consumers impose to motivate CSR practices. These customers are progressively influencing environmental and ethical values. In order that a firm achieves a competitive edge that the market demands, it is inevitable to fulfil customer demands so as to sustain sales and market share. In this scenario, the main motivating factor for CSR investment is a strategic defensive logic. Thus, firms that invest in CSR are generally capable of keeping their consumers and maintaining sales turnover. In contrast, firms that do not invest in CSR generally have a smaller market share. If considered from a traditional marketing viewpoint, which distinguishes a firm from its competitors, the motivating factor of CSR practices is an offensive policy which aspires to extend its market share and increase its profits. In this context, one of the components of the marketing policy can be the CSR rating. As a result, an increased CSR investment may be expected to generate an increased sales turnover. All these reasoning leads to Hypothesis 1, which studies how the CSR ratings affect the overall turnover of the firms.

As per the theorem of the “good management theory” developed by Waddock and Graves (1997), firms anticipate that their financial performance (i.e., ROE, ROA and return on sales) will be positively influenced by CSR ratings. Hypothesis 1 analyses this principle in the context of AMAC with performance variables. Moreover, these performance variables are connected to intermediary amounts that emerge directly from the yearly accounts and are less likely to be erroneous.

Hypothesis 1: Performance measures of the company (ROA, ROE and ROIC) for year $t + 1$ are positively associated with Fortune's rating of the company for year t .

2.4. Prior performances and ratings (“Retrospective” Approach)

As per on the “slack management theory” developed by Waddock and Graves (1997), the CSR ratings are positively influenced by accounting performance (i.e. ROA, ROE and ROIC). Furthermore, hypothesis 2 was developed to analyse Hypothesis 1 from the AMAC context. The “slack management theory” mentions that a positive relationship exists between CSR and CFP. Unlike the instrument stakeholder theory, this theory proposes a different direction of causation. Furthermore, it is hypothesised by the slack resources theory that the quantity of resources that the management devotes to CSR activities is based on how accessible the resources are and whether they are not necessary for other purposes. Thus, organisational slack can be characterised as a buffer or cushion of potential or real resources that could conceivably be used for CSR activities (Bourgeois, 1981; Ferrier, 2001). Therefore, it has been posited by theorists of slack resources that organisations demonstrating financial performance will have accessible assets that allow the company to set aside resources into CSR. Since these resources, financial or otherwise, are required to improve CSR, having a connection between those two is natural. This notion was best verbalised by Jensen (1986) when he suggested that management which has cash that is more than the needs are more likely to invest this free cash in such a way that it can go against the goal of maximising the firm's value i.e., waste it from an economic standpoint. From this point of view, better CFP will bring about better CSR (Waddock and Graves (1997)).

Hypothesis 2 Fortune's CSR rating for year t is positively related to corporate financial performance variable for the year $t - 1$.

3. Data and considerations of control variables

3.1. Sample selection

This paper conducts an analysis of the relationship between CFP and CSR by using information from an examination of the World's Most Admired Companies list. This study is based on top 100 firms that met the following criteria: (1) They were listed among the 323 "World's most admired companies" in the February 2017, issue of Fortune (These were 2016 ratings since Fortune surveys are conducted during the fall of the year prior to publication of the issue containing the ratings). (2) These firms have been 10 years consecutively listed in the fortune list starting from 2007. (3) Their financial data from the 2007–2016 periods were available on the DataStream database.

This list has been distributed by Fortune magazine annually since 1983. For this investigation, the instruments were obtained using the list from Fortune Global Most Admired Companies¹. The study was used the longitudinal perceptions of 100 of the most admired organisations globally for a period of ten years, starting from 2007 to 2016. The current study made use of concrete econometric techniques in order to address the modelling issues that were previously encountered in literature. Data analysis was conducted using Panel Vector Auto Regression to establish the notion of the relationship and a Panel Granger Causality Test was performed to determine the direction of causality between CSR and CFP.

3.2. Corporate social responsibility

Ensuing Luo and Bhattacharya (2006), the CSR aspect mentioned in Fortune Magazine's AMAC article was used to measure CSR. The choice of using the Fortune magazine survey was done for a number of reasons. First, testing of this measure was done in several management and marketing studies. Its validity and reliability are also well-documented. Second, the AMAC data set encompasses a wide range of firms, which ensures generalizability and satisfactorily matches DataStream firm financial data (e.g. Fombrun, Gardberg, & Sever, 2000; Hammond & Slocum, 1996; Luo & Bhattacharya, 2006). Third, it presents data which can be compared across an extended period of time. Fourth, the number of respondents is much higher in comparison to other ratings. Fifth, respondents only rate firms within an industry that is familiar to them. They can directly access internal industry and firm information, which is especially critical in the field of corporate social responsibility, where incomplete and inconsistent information is often obtained from annual reports and other official documents (Bowman & Haire, 1975). The verification for the realisation of the analysis is taken from empirical works exploring other aspects of the survey conducted by Fortune (Chakravarthy, 1986; McGuire, Schneeweis and Branch, 1987). These research works found that the findings of the Fortune survey of the monetary performance of companies are highly correlated with stock-market-based and accounting-based performance measures. Major changes in the ranking of a firm are often linked to specific events, such as performance changes, product changes, or lawsuits (Fortune, 2017). The Fortune social responsibility evaluators are different than other ratings in that the subjects are selected as they have a specific industry-related knowledge rather than being specifically knowledgeable or concerned about corporate social responsibility. The Fortune magazine data has the advantage that it is provided by presumably well-informed managers of the listed companies (Gössling, & Vocht, 2007). Consequently, their interpretation and definition of social responsibility might differ from others with a specific concern in the matter. Nevertheless, Wartick (1987) observed that the Fortune survey had a connection to membership of the IMA (Issues Management Association). This indicates that the survey results might lean in the side of CSR.

Beginning in 2001, the Fortune magazine released an annual rundown of "America's Most Admired Companies." The selection process begins with the top 1000 U.S. organisations (including any outside organisations that are stationed in the United States) that are ranked based on revenue (Fortune, 2017). Next, these organisations are organised based on the commercial industry in order to come up with a list that has 64 businesses (Fortune, 2017). To generate this list, every fall, Fortune and the study firm Hay Group² would choose and ask 3700 specialists (e.g. outside directors, executives, and financial analysts) to provide a ranking for the companies within their industry. The score of the firm is calculated for each of the following characteristics: quality of products or services; quality of management; innovation; financial soundness; value as a long-term investment; ability to attract, keep, and develop talented individuals; environmental and community responsibility; and utilisation of corporate assets, which is rated from zero (poor) to ten (excellent) based on eight attributes. However, the KLD scores are dichotomous (1 for strength, -1 for weakness) while each Fortune category is assigned a rating from 0 to 10. In other words, even if KLD assigned a CSR rating through a summation of the strengths and weaknesses, it would not have the precision of a Fortune measurement. For example, two companies both rated +1 by KLD might have significantly different measures on the same criterion according to the Fortune rating.

The firms will then be ranked based on overall score, which is referred to as the "Fortune reputation rating". This rating is processed as an equally weighted normal of the companies' scores for the eight categories. The results of the study are presented in an article that is released in the first quarter of the following year (Fortune, 2017).

¹ <http://fortune.com/worlds-most-admired-companies/>

² http://www.haygroup.com/us/best_companies/index.aspx?id=1705. Since 1997, Hay Group has partnered with FORTUNE to identify and rank the Most Admired Companies.

3.3. Corporate financial performance

The assessment of financial performance is conducted using three accounting indicators (Return on Equity (ROE), Return on Asset (ROA), and Return on Invested Capital (ROIC)). Generally, these accounting indicators are often used as a component of the investigations of the link between financial performance and corporate social responsibility (Waddock & Graves, 1997; Griffin & Mahon, 1997; Preston & O’ Bannon, 1997; Park, Lee, & Kim, 2014; Platonova, Asutay, Dixon, & Mohammad, 2016; Tuppara, Arminen, Pätäri, & Jantunen, 2016). On the other hand, measurement of the ROA was done using the ratio of the annual net profit to the average total assets, while ROE is determined by the net profit after the ratio of the preferred dividends to the average total equity for the two previous years has been determined. ROIC is determined by subtracting the dividends/sum of debt and equity from the net income. ROA and ROE are performance measures that are accounting based (earnings obtained from the capital (assets) invested regardless of firm size). On the other hand, a business’ ROIC tries to measure the return that is gained on the capital allotted for an investment. Generally, firms have to be mainly dependent on retained income in order to increase their capital. Gropp and Heider (2010) observed that the firms with the most profits have a tendency to possess more capital concerning assets. Furthermore, these firms exhibit invert causality in the relationship between CSR and operational profitability. Furthermore, CSR is considered endogenous in this case.

4. Methodology

4.1. Regression model used in the Prospective analysis is as follows (Model 1)

The methodology previously utilised by Waddock and Graves (1997) and Quéré, Nouyriat and Baker (2018) was followed. This methodology was applied to a sample of AMAC. This study uses many vigorous financial standards of profitability and also systematically associates them to overall assets. The initial stage of this research follows a Prospective approach that aims at examining how a firm’s future performance would be influenced by the CSR practices (as suggested by CSR ratings). In the Prospective approach, the CSR rating determined by Fortune rating is the independent variable. Based on the present empirical literature, modelling of the relationship of CSR-CFP was performed in the bivariate framework using the following structure as the basis.

$$\text{Corporate Financial Performance} = (\text{Corporate Social Responsibility}) \tag{1}$$

Based on the information presented above, long-term equilibrium relation and direction of causality were examined using techniques that handle cross-sectional dependence. The departure of the point of the panel data analysis depends on the linear and direct panel data regression model. This is demonstrated below since it investigates whether or not the firm’s performance for year $t + 1$ can be determined by the firm’s CSR rating in the year t .

Model 1:

$$CFP_{it+1} = \alpha + \beta CSR_{it} + \mu_i + \varepsilon_{it,i=1,2,\dots,N;t=1,2,\dots,T} \tag{2}$$

4.2. Regression model used in the Retrospective analysis is as follows (Model 2)

Alternatively, the Retrospective method calculates the influence of financial performance in the past on the CSR rating in the present. The CSR rating is the outcome of the firm’s choices based on its assessment. Hence, even if the Fortune survey rates firms partly on the basis of their past financial performance, the survey has no influence over the future performance of these firms. In the Retrospective method, the CSR ratings assigned by Fortune are made up of dependent variables. On the other hand, the explanatory variable is composed of the financial and accounting performance variables. The approach proposed by Waddock and Graves (1997) and Quéré, Nouyriat and Baker (2018) was used on a sample of AMAC firms which were evaluated by Fortune.

The evaluation of the influence of accounting and financial performance on CSR ratings allows assessing the objectivity of the assessment procedure. Favourable past performance does not necessarily mean favourable CSR ratings in the present if the performance is achieved by cost-saving methods that are unethical or go against human or environmental criteria. The Retrospective approach uses factors like risk, accounting performance; market capitalisation and stock return data, of the respective firms. These are the same as the factors used in the Prospective approach. Despite this, the current regression model is different than the previous regression model (Model 1), because it examines whether or not the firm’s CSR rating for year t can be determined by the firm’s performance in the year $t - 1$.

Model 2:

$$CSR_{it} = \alpha + \beta CFP_{it-1} + \mu_i + \varepsilon_{it,i=1,2,\dots,N;t=1,2,\dots,T} \tag{3}$$

Here, CFP_{it} and CSR_{it} stand for the model’s dependent (ROA, ROE and ROIC) and independent variables (Fortune’s CSR rating), respectively. The coefficients for the model (α and β) that was specified in (model 1 and 2) do not have any subscripts because they will be kept constant for all the tests and units. Lastly, ε_{it} represents the panel data model’s error term in equations 1 and 2. Assuming that there are no variations among the information frameworks for the cross-sectional measurement of N , one can evaluate the model (1) and (2) using the pooled OLS technique and while utilising a typical steady for every cross-section (Asteriou & Hall, 2007). For the panel data model in (1) and (2), the error term is critical because it determines if one can estimate the panel data model with fixed or random effects. The assumption for a fixed effects model is that the error term has a non-stochastic variation over i and t .

Table 2
Studies Examining the Relationship between CSR and CFP.

Author and Year	Relationship	Causality	Methodology
Cochran and Wood (1984)	Insignificant	No causality	Ordinary Least Square(OLS)
Ullmann (1985)	Insignificant	No causality	OLS
Wokutch and Spencer (1987)	Positive	CFP → CSR	OLS
Mcguire et al. (1988)	Positive	CFP → CSR	OLS
Aupperle and Pham (1989)	Insignificant	No causality	Survey Instrument
Waddock and Graves (1997)	Positive	CSR → CFP	OLS
Wright and Ferris (1997)	Negative	CSR → CFP	Event study
Teoh, Welch and Wazzan (1999)	Insignificant	No causality	Event study
Moore (2001)	Negative	CFP → CSR	OLS
Orlitzky et al. (2003)	Positive	Bilateral	Meta-Analysis
Barnett and Salomon (2006)	Positive	CSR → CFP	OLS
López, Garcia, and Rodriguez (2007)	Negative	CSR → CFP	OLS
Donker, Poff, and Zahir (2008)	Positive	CSR → CFP	OLS
Scholtens (2008)	Positive	CFP → CSR	Lagged OLS
Neilling and Webb (2009)	Insignificant	No causality	Fixed Effect
Bellevance (2009)	Negative	CSR → CFP	OLS
Chen and Wang (2011)	Positive	CSR → CFP	Multivariate Linear Regression
Soana (2011)	Insignificant	No causality	Correlation Methodology
Schreck (2011)	Positive	No causality	Two-Stage Least Squares (2SLS)
Fu, Zhu, and Sarkis (2012)	Negative	CSR → CFP	2SLS
Anderson et al. (2014)	Positive	Bilateral	Panel Var
Lundgren and Zhou (2017)	Positive	Bilateral	Panel Var
Kim et al. (2015)	Positive	CSR → CFP	OLS
Nakamura (2015)	Positive	Bilateral	Three-Stage Least Squares (3SLS)
Tuppura et al. (2016)	Mixed	Mixed	Granger Causality Test
Kang, Germann & Grewal (2016)	Positive	Bilateral	structural Panel Var
Chollet & Sandwidi (2018)	Positive	Bilateral	Panel Var

Source: (Author, 2018).

Alternatively, in a random effects model, one assumes that the error differs stochastically. Therefore, model types similar to (1) and (2) can be estimated with the use of a pool object.

4.3. Panel Vector Autoregression model

The causality effect may also be a great reason for all mixed relations between CFP and CSR. For instance, reverse causality implies that it is unclear on whether CSR leads to CFP, or the other way around. Using time lags is a good way to address the problems of reverse causality and endogeneity. All the dependent variables being studied have to be lagged dependent variables. These problems can be solved using lagged variables since causality is incapable of running against time. This paper re-examines the inquiry of whether CSR can improve CFP and/or vice versa. The main difference of this study when compared to the literature presented in Table 2 is the emphasis on controlling the heterogeneity in order to give the causal relationship a limitation.

Obtaining estimation for the relationship between CFP and CSR is a challenging task because the endogenous and exogenous factors have influences on each other. Determining the effect of one factor over another and analysing the impacts of various factors are difficult. This study addressed this issue by using Panel VAR. One can estimate the Panel VAR using a package of programs that conduct the estimation in STATA 14. This procedure was developed by [Abrigo and Love \(2016\)](#)³. The basis of this program is the framework for a Generalised Method of Moments (GMM). Panel VAR is a type of model that is highly relevant to the concurrent condition model. Furthermore, it can be used to empirically differentiate the transmission mechanisms of macroeconomic and financial variables to economic activity. Using orthogonal response functions (impulse response function, which will be referred to hereafter as IRF) addresses the previously discussed and specified issue. As a rule, one variable's reaction (e.g. CSR) may generate a shock in another variable (e.g. an accurate assessment, estimation, and evaluation of CFP can be obtained by keeping the basic model's every single other variable consistent and by disregarding their progressions (shock)).

This study makes use of the Panel VAR modelling using information from the period of 2007 to 2016 to illustrate the interactions between corporate financial performance (CFP) and corporate social responsibility (CSR). The estimation of Panel VAR helps integrate VAR's advantages (one can assume that all variables are endogenous) and the advantages of utilising panel data. Thus, it makes it possible to evaluate the firm's individual heterogeneity ([Love & Zicchino, 2006](#)). Thus, we have assessed three Panel VAR models – ROA-CSR model, ROE-CSR model, and ROIC-CSR model – to illustrate the parameters of the model and test if the models' coefficients satisfy the hypothetical desires and suppositions. All the arrangements have been inferred using the Thomson Reuters DataStream to procure the accurate database. Furthermore, STATA 14 was used to lead the experimental exercise

³ Abrigo & Love (2016) use the first generation GMM estimator suggested by Anderson & Hsiao (1982) to deal with the Nickell bias (Nickell, 1981).

Panel VARs have a structure that is indistinguishable from VAR models. In other words, all factors are considered endogenous and related. However, a cross-sectional measurement is also integrated into the portrayal (Canova & Ciccarelli, 2013). The Panel VAR models illustrated in (3) can be mutually evaluated with the fixed effects or could also be evaluated independently of the fixed effects after they undergo a few transformations using ordinary least square (OLS).

$$Y_{i,t} = Y_{i,t-1}A_1 + Y_{i,t-2}A_2 + Y_{i,t-p+1}A_{p-1} + Y_{i,t-p}A_p + X_{i,t}B + \mu_i + e_{i,t} \tag{3}$$

$i \in \{1, 2, \dots, 100\}, t \in \{2007, \dots, 2016\}$

where $Y_{i,t}$ represents the (1xk) vector for the dependent variables; $X_{i,t}$ represents a (1xl) vector for the exogenous covariates; μ_i and $e_{i,t}$ are (1x1) vector of the dependent variable-specific panel fixed effects and the idiosyncratic errors, respectively. Furthermore, the (kxk) matrices $A_1, A_2, \dots, A_{p-1}, A_p$ and the (l x k) matrix B represent parameters that need to be estimated. It is assumed that the innovation possesses the following characteristic: $E[e_{i,t}] = 0, E[e'_{i,t}e_{i,t}] = \Sigma$ and $[e'_{i,t}e_{i,t}] = 0$ for all $t > s$. The previously mentioned parameters may be jointly estimated with fixed effects or independently estimated without the fixed effect after utilising the equation-by-equation ordinary least squares (OLS) to transform them. However, the existence of the lagged dependent variables on the system of equations' right-hand side would bias the estimates d even if the N is large (Nickell, 1981)⁴. Furthermore, even if the bias nears zero as T increases, the simulations conducted by Judson and Owen (1999) revealed that a significant bias was present even when T = 30.

A study by Abrigo and Love (2016) confirms that the equation-by-equation GMM estimation method generates predictable Panel VAR estimates. They also showed that efficiency gains may be achieved if the model is evaluated as a system of equations (Holtz-Eakin et al., 1988). They made the assumption that the regular set of $L \geq kp + 1$ instruments is provided by the row vector $Z_{i,t}$, where $X_{i,t}$ and $\in Z_{i,t}$ are equations that are indexed using a number in superscript. Their proposal was the following panel VAR model that was transformed based on Eq. (1). However, they presented it in a more compact structure:

$$Y_{i,t}^* = Y_{i,t}^* A + e_{i,t}^*$$

$$Y_{i,t}^* = [Y_{i,t}^{1*} Y_{i,t}^{2*} \dots Y_{i,t}^{k-1*} Y_{i,t}^{k*}]$$

$$Y_{i,t}^* = [Y_{i,t-1}^{1*} Y_{i,t-2}^{1*} \dots Y_{i,t-p+1}^{1*} Y_{i,t-p}^{k*} X_{i,t}^*]$$

$$e_{i,t}^* = [e_{i,t}^{1*} e_{i,t}^{2*} \dots e_{i,t}^{k-1*} e_{i,t}^{k*}]$$

$$A' = [A' A'_2 \dots A'_{p-1} A'_p B']$$

Suppose that the observations are stacked over panels and then stacked over time. The following generates the GMM estimator.

$$A = (\bar{Y}^* Z \bar{W} Z \bar{Y}), (\bar{Y}^* Z \bar{W} Z' Y^*) \tag{5}$$

Where \bar{W} represents a (LxL) weighting matrix that is assumed to be symmetric, non-singular and positive semi-definite. If we assumed that $E[Z'e] = 0$ and the rank $E[(\hat{Y} \hat{Z}')] = kp + 1$, one can get a consistent GMM estimator. Furthermore, the weighting matrix \bar{W} may be chosen for efficiency maximisation (Hansen, 1982). The basic impulse-response function Φ_i is processed by modifying the modelled equation as an infinite-order vector moving-average, such that Φ_i presents the vector moving average parametric values.

$$\Phi_i = \begin{cases} I_k, i = 0 \\ \sum_{j=1}^i \Phi_{i-j} A_j, i = 1/2 \end{cases} \tag{7}$$

As the instabilities $u_{i,t}$ correlate simultaneously, stochastic shocks to single variables have a tendency to be supplemented by shocks in others, preventing an inference to explanations involving causality. Nevertheless, the imposition of Cholesky⁵ ordering enables decomposition $\Sigma_e = P'P$, wherein P similarly denotes lower-triangular matrices. Disturbances may then be orthogonalised as $P^{-1}e_{i,t}$ (with covariance matrix $P^{-1}\Sigma_e(P^{-1})' = I_k$), transforming them moving average parameters into orthogonalised impulse-response values, $\Phi_i P$. In this manner, shocks to single variables will separately produce dynamic responses in every other variable of the model. Impulse-response values are obtained together within 5% and 95% percentile bounds, which are modelled via Monte Carlo simulation modelling involving 200 to 1000 repetitions. Consequently, where zero lines emerge outside confidence bands, the evidence is present of statistically meaningful responses to inflicted shocks.

Similarly, stable conditions are necessary for forecast-error variance decomposition (FEVD). Confidence intervals can be analytically developed or estimated through a variety of re-sampling methods. FEVD measures of the influence of innovation are represented through variable k upon variable i (Lutkepohl, 2005)⁶. This technique provides measurements of the fractional error in forecast variable i following h intervals, which can be attributed to orthogonal innovation as denoted by variable k. Therefore, FEVD is continually based on the selection of P, entailing specific orderings as well as lags on every relevant variable, for the initial variable

⁴ The Nickell bias disappears, if $T \rightarrow \infty$. However, for small T various studies confirm that the bias is severe (Phillips & Sul, 2007).
⁵ see Love and Zichino (2006)
⁶ As described in Lütkepohl (2005), if every eigenvalue in A(l) is less than 1 in modulus, than B(l) will satisfy the stability condition and be invertible.

Table 3
Descriptive statistics variable.

	(1)	(2)	(3)	(4)	(5)
Variables	N	mean	Std.dev	min	max
CSR	1,000	6.852	0.675	4.210	8.800
ROA	1,000	7.466	5.501	-23.040	30.760
ROE	1,000	24.520	35.060	-221.100	527.900
ROIC	1,000	13.460	10.310	-40.450	71.540
Lncsr	1,000	1.920	0.101	1.437	2.175
Lnroa	961	1.818	0.837	-2.996	3.426
Lnroe	954	2.960	0.794	-1.772	6.269
Lnroic	963	2.397	0.868	-2.996	4.270

Table 4
Correlation matrix.

	lncsr	lnroa	lnroe	lnroic
lncsr	1			
lnroa	0.6715***	1		
lnroe	0.8718***	0.6941***	1	
lnroic	0.2081***	0.6022*	0.1517***	1

Notes: Symbols ***, **, and * represent significance at a 1%, 5% and 10% level, respectively.

concurrently necessarily influences every other variable. In the instance of the first order, profitability measures are treated as the most exogenous, conversely, diversification measures are treated as most endogenous (Campa & Kedia, 2002; Villalonga, 2004). Orderings may be sensitive in such cases wherein high residual correlations are present. In this study, we implemented STATA 14 programmes as applied by Abrigo and Love (2016), in order to approximate Panel VAR models⁷. They had proposed Helmert transformations for resolving the problem of orthogonality⁸. Collaborative assessment of the modelled equation system allows for uncomplicated tests of the cross-equation hypotheses. Wald testing of parametric values may be applied in accordance with GMM estimations of A (Eq. 5) and associated covariance matrices. Granger Causality Testing of hypotheses that hold every coefficient on lag present in variable m to be jointly zero, within equations for variable n, may be conducted similarly with the use of these tests.

5. Empirical findings

5.1. Andrews-Lu model selection procedure

Table 3 presents a range of descriptive statistics, while we report the correlation coefficients in Table 4. It is worth noting that all CFP variables exhibit a significant correlation with the CSR. Selection tests can be carried out by following the approach of (Roodman, 2009). Among the significant assumptions that must be established is the strength of the GMM estimator, if every instrument in the system was to be regarded as exogenous. In the case of over-identification, the Hansen J-Test (Hansen, 1982)⁹ is automatically dismissed from the GMM framework.

Andrews and Lu (2001) proposed the application of Bayesian information criteria (MMSC-BIC) as well as Hannan-Quinn information criteria (MMSC-HQIC). Akaike information criteria (MMSC-AIC) cannot meet their standard of consistency given its positive, even asymptotic, probability of selecting for an overly-limited, over-identified set of constraints.

Selection measures were calculated by utilising first-to-third-order panel VAR sets, with instrumented usage of the initial five lags of CSR and CFP, as depicted in Table 5. The findings show the first-order panel VAR to be favoured among the three models subject to testing in accordance with the criteria set by Andrews and Lu (2001) as well as that of Abrigo and Love (2015). This is with reference to moment and model selection criteria (MMSC) and overall coefficient of assurance (CD). First order is picked, for it presents minimum values for MBIC, MAIC, and MQIC. While there is an additional requirement to constrain the Hansen's J statistic, the procedure cannot correct for degrees of freedom as described in the moment and model selection criterion of Andrews and Lu. The scheme poses a requirement for the values of moment conditions to be larger than the values of the associated endogenous variables.

⁷ A Stata program, built by Love and Zicchino (2006) allows the estimation of Panel VAR model and the calculation of impulse-response functions. In this paper we use an improved version (Abrigo and Love, 2016).

⁸ $y_{i,t+1}^{\perp} + 1 = c_{i,t}(y_{i,t} - 1/T_{i,t} \sum_s > t y_{i,s})$. Where $c_{i,t} = \sqrt{T_{i,t}/(T_{i,t} + 1)}$. This transformation is suggested by Arellano & Bover (1995) to minimize data losses due to data gaps.

⁹ Roodman (2009) provides an excellent discussion of GMM estimation in a dynamic panel setting and its applications using Stata. Readers are encouraged to read his paper for a more detailed discussion of this topic.

Table 5
Panel VAR's optimal moment and model selection criteria selection.

Model	Lag	CD	J	J pValue	MBIC	MAIC	MQIC	Obs	Panel
1 (Inroa)	1	0.9429330	14.97051	0.2430532	-57.45527	-9.029490	-28.17323	418	98
	2	0.9422449	12.00712	0.1508867	-36.27674	-3.992885	-16.75537		
	3	0.9341541	5.381627	0.250332	-18.7603	-2.618373	-8.999618		
2 (Inroe)	1	0.9402087	12.93099	0.3740769	-59.37941	-11.06901	-30.17448	414	96
	2	0.9380572	8.922391	0.3488853	-39.28454	-7.077609	-19.81459		
	3	0.9339645	4.441722	0.3495137	-19.66174	-3.558278	-9.926767		
3 (Inroic)	1	0.9617511	11.66722	0.4727624	-60.75856	-12.33278	-31.47652	418	97
	2	0.960204	10.36650	0.2402386	-37.91735	-5.633501	-18.39599		
	3	0.9529467	6.419736	0.6991850	-17.72219	-1.580264	-7.961509		

Table 6
Eigenvalue stability condition.

Model	Eigenvalue		Modulus
	Real	Imaginary	
1(Inroa)	0.4482904	-0.2178071	0.4984016
	0.4482904	0.2178071	0.4984016
2(Inroe)	0.4712684	0	0.4712684
	0.4144685	0	0.4144685
3(Inroic)	0.4778287	0.2469247	0.5378588
	0.4778287	-0.2469247	0.5378588

Remark: All the eigenvalues lie inside the unit circle. Panel VAR satisfies stability condition.

The outcomes of this testing, along with post-estimation testing, validate the first-order model to be more stable than that of other potential systems. Given the analytical criteria, the first-order panel VAR shows a fit with an identically specified set of instruments derived previously, via GMM estimations.

5.2. Stability of Panel VAR modelling

Generally, the moduli of all eigenvalues of every estimated models are established as standardised conditions for the stabilities of panel VAR sets. Both Brüggemann and Lütkepohl (2006) and Hamilton (1994) implicated VAR stability in every instance wherein every modulus in the companion matrices returned values lower than one. Panel VAR stability implies an invertible as well as infinite-order vector moving-average interpretation.

At that point, the stability condition is examined for the evaluated panel VAR model. Empirical studies are involved with the impact of exogenous changes occurring in each endogenous variable due to various factors associated with the panel VAR system. The chart listing the eigenvalue as well as a table showing results verify the stability of the estimation. As shown in Table 6, each eigen value's modulus is completely less than 1; the assessments satisfy the condition of the eigenvalue stability. In Fig. 1, determination of the chart choice has offered a diagram of the eigenvalues that include the complex component of the y-axis and has genuine segments of the x axis. The figure below reveals visually that these eigenvalues are well within the unit circle. The stability condition for the CFP and CSR panel is satisfied through VAR. For this relationship, the dynamic matrix comes confirms these of Granger Causality Wald Test.

5.3. Panel VAR and Granger Causality Test

Table 7 demonstrates that the coefficients in the Panel VAR exhibit by employing "GMM-style" instruments for CFP and CSR in association with three different sets of panel data, namely model 1 (ROA-CSR), model 2 (ROE-CSR) and model 3 (ROIC-CSR). For CFP, three proxies are selected to examine the robustness, including ROE, ROA and ROIC. In these models, all variables fall under first stands out and can be managed as endogenous. Abrigo and Loves (2015) confirm that the Panel VAR drops with time from the estimation of any perception that lacks information. Since yearly financial data and CSR index were not observed in all years for most admired global firms in the subsample, the number of observations dropped progresses with the lag order of variable that was included as instruments. At the 5% level for model 5, 10% for model 2 and 10% for model 3, we found a negative and significant relationship to exist, amongst CFP and CSR. In any case, we indicate a negative effect cast by the CSR on CFP, which is equivalent to -2.559, -3.066 and -2.284 for Models 1, 2 and 3, respectively. This outcome confirms that CSR influences CFP in a negative manner. These findings were predictable and were consistent with that of the trade-off theory. The result is backed with support and at the same time confirms the Trade-off Hypothesis (Friedman, 1962, 1970; Vance, 1975). Also, firms may sometimes face a trade-off

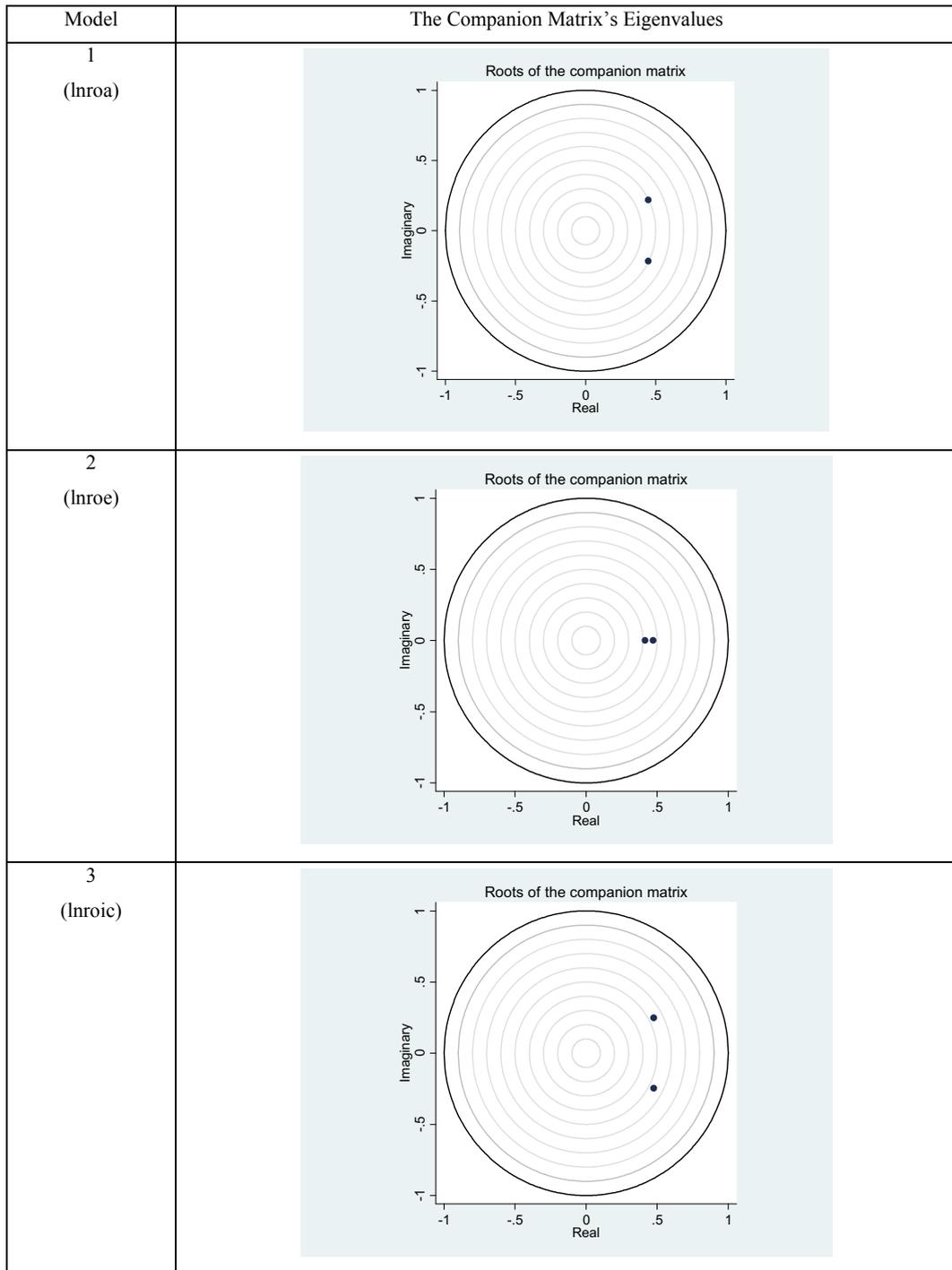


Fig. 1. Graph of eigenvalue within the unit circle.

between financial performance and social responsibility, and therefore pursuing socially responsible activities could turn out to be expensive, decreasing equity returns and average financial performance (see e.g. [Aupperle et al., 1985](#); [Ullmann, 1985](#)).

On the other hand, the results signified the possibility for the existence of an opposite bi-directional causal connection amongst CFP and CSR, which exhibited a significant positive influence of CFP on CSR (at the 1% level for Model 1 and 3 while 10% level for model 2). These three models suggest the existence of an opposite directional relation from CFP to CSR, which was similar to the previous findings that CFP will result in better CSR ([Waddock & Graves, 1997](#)). The slack resource theory could clarify this relationship, which proposes that the level of resources allotted by the management for CSR exercises is driven by the availability of

Table 7
Main Results of 2-Variables Panel VAR Model.

	Model 1		Model 2		Model 2	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Inroa	Incsr	Inroe	Incsr	Inroic	Incsr
Inroa _{t-1}	0.379*** (0.100)	0.0204*** (0.00788)				
Incsr _{t-1}	-2.559** (1.270)	0.517*** (0.131)	-3.066** (1.274)	0.680*** (0.130)	-2.284* (1.233)	0.511*** (0.123)
Inroe _{t-1}			0.205** (0.0924)	0.0181* (0.0106)		
Inroic _{t-1}					0.445*** (0.125)	0.0272*** (0.00926)
Observations	733	733	726	726	735	735
Number of panels	100	100	100	100	100	100

Note: The standard errors are reported in parentheses which are p-values. ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Table 8
Bivariate Granger Causality Test.

Model	Null Hypothesis	Observations	Chi ²	p-value
Model 1 (Inroa)	CSR does not Granger Cause ROA	733	4.058	0.044
	ROA does not Granger Cause CSR	733	6.702	0.010
Model 2 (Inroe)	CSR does not Granger Cause ROE	726	5.792	0.016
	ROE does not Granger Cause CSR	726	2.926	0.087
Model 3 (Inroic)	CSR does not Granger Cause ROIC	735	3.430	0.064
	ROIC does not Granger Cause CSR	735	8.624	0.003

resources that are not needed for various purposes. Our findings are consistent to those of (Martínez-Ferrero & Frías-Aceituno, 2015; Marc Orlitzky, Schmidt, & Rynes, 2003; Tupura et al., 2016) that employ the known dynamic strategy. The outcomes suggest the existence of bi-directional relationships between CFP and CSR in Models 1, 2 and 3. Thus, our study puts forward the significance of considering the bidirectional relationship between CFP and CSR.

Table 8 presents the overall results obtained with the Granger Causality Wald Test. The findings indicate that at 95% confidence interval, CSR does Granger cause CFP denoted by ROA, ROE and ROIC can be rejected. Similarly, at 95% confidence interval, CFP does Granger cause CSR can also be rejected. Based on this outcome, concerning financial performance, one can confirm that the causal relationship is bi-directional associated with corporate social responsibility. The findings show that the causality between the two endogenous variables runs from CFP to CSR. Thus CSR is determined by CFP.

5.4. Forecast error Variance decomposition (FEVD) and impulse responses function (IRF)

This paper determined the inferred IRF and FEVD as presented by Abrigo and Love (2016) to get the causal ordering. The study employs 200 Monte Carlo simulations for calculation of IRF confidence intervals. For the FEVD estimates, confidence intervals and standard errors were similar, which are available upon request and are not mentioned here. In Table 9, based on FEVD estimates, based on the FEVD estimates, we see that as much as 51% of variation in CSR in our example can be explained by ROA. We can observe that CSR can describe as much as 10% of the variation in ROIC, but 20% of variation in ROE can be explained CSR.

Conversely, CSR can be correspondingly explain future ROA, ROE, and ROIC only at 13%, 18% and 12%.

The IRF results are presented in Fig. 2. Each element presented demonstrates (i) the responses of CSR to a 1% shock in CSR; (ii) the responses of ROA, ROE, and ROIC to a 1% shock in CSR; (iii) the responses of ROA, ROE, and ROIC to a 1% shock in ROA, ROE, and ROIC; and (iv) the responses of CSR to a 1% shock in ROA\ROE\ROIC.

IRF can be used to examine the interactions among variables in a vector autoregressive model. They are representatives of the reactions of the variables when the system is hit by shocks. As depicted in Fig. 2, when a single positive standard deviation element is added to other variables, the impulse response calculations generate interesting repercussions from the variables. Even though a value is assigned to the significance of the reaction of each variable, whenever all other variables are exposed to a positive shock, the reaction of ROA, ROE, and ROIC on CSR are deemed to have greater application in this research. This is because this study focuses on determining the effects if any, that CSR has on corporate financial performance (ROE, ROA, and ROIC). Based on the impulse response graph, ROA, ROE and ROIC had a similar response to a positive shock on CSR given the range of positive values and without the assumption of negative values. When a positive shock is introduced to CSR, it immediately generates a reaction from ROA, ROE, and ROIC. They display a notable variation in the initial five quarters. The fluctuation deteriorates somewhere only after the 10th quarter and equilibrium is observed after quarter 10. This is an indication that if a positive shock is given to the CSR of a firm, there is

Table 9
Forecast error variance decompositions.

	Impulse	Variable		Impulse	Variable		Impulse	Variable
	Inroa	lncsr		Inroe	lncsr		Inroic	lncsr
Inroa			lnroe			Inroic		
0	0	0	0	0	0	0	0	0
1	1	0	1	1	0	1	1	0
2	0.9350374	0.0649625	2	0.9013160	0.0986840	2	0.9467512	0.0532488
3	0.8894152	0.1105848	3	0.8366278	0.1633722	3	0.9041396	0.0958604
4	0.8729138	0.1270862	4	0.8109598	0.1890402	4	0.8868390	0.1131610
5	0.8690548	0.1309452	5	0.8024210	0.1975790	5	0.8825319	0.1174681
6	0.8685089	0.1314910	6	0.7998440	0.2001560	6	0.8819752	0.1180248
7	0.8684894	0.1315106	7	0.7991167	0.2008834	7	0.8819938	0.1180061
8	0.8684951	0.1315049	8	0.7989212	0.2010788	8	0.8820024	0.1179976
9	0.8684925	0.1315075	9	0.7988705	0.2011295	9	0.8819909	0.1180090
10	0.8684900	0.1315100	10	0.7988577	0.2011423	10	0.8819827	0.1180173
lncsr			lncsr			lncsr		
0	0	0	0	0	0	0	0	0
1	0.0002585	0.9997415	1	0.0155390	0.9844610	1	0.0000522	0.9999478
2	0.0242197	0.9757802	2	0.0146749	0.9853250	2	0.0447805	0.9552195
3	0.0421525	0.9578475	3	0.0183622	0.9816378	3	0.0793424	0.9206576
4	0.0491710	0.9508290	4	0.0204046	0.9795954	4	0.0935918	0.9064083
5	0.0509403	0.9490598	5	0.0212019	0.9787981	5	0.0972421	0.9027579
6	0.0512171	0.9487828	6	0.0214657	0.9785342	6	0.0977402	0.9022598
7	0.0512333	0.9487668	7	0.0215446	0.9784554	7	0.0977313	0.9022687
8	0.0512311	0.9487689	8	0.0215667	0.9784333	8	0.0977238	0.9022762
9	0.0512319	0.9487681	9	0.0215726	0.9784274	9	0.0977327	0.9022672
10	0.0512329	0.9487671	10	0.0215741	0.9784259	10	0.0977395	0.9022605

Note: FEVD standard error and confidence intervals are based on 200 Monte Carlo simulations.

an immediate response from the CFP. The magnitude of response continues to reduce over time until it restores the equilibrium after year 10.

It must be noted that the variables in this research (ROA, ROE, and ROIC) have displayed some resemblance as far as their reaction, when a positive shock is exerted on the main variable (CSR) is concerned. This does not coincide with the expectation of the study that CFP has a positive relationship to CSR, though several downward trends were detected. Therefore, given all the other things being equal, a negative effect on CSR should lead to a negative response from CFP. The second of the main similarities demonstrated by the ROA, ROE and ROIC response to positive shocks on CSR is the restoration of equilibrium levels after quarter 10, which corresponds to a five-year horizon. This reflects the long-term association between firm performance and CSR.

In terms of the observed trend for the responses of performance measures to a shock applied in CSR, this study posits that it agrees with the findings of the negative relationship between CSR and the performance of the firms that were most admired (both long – and short-term), as well as the causality relationship established between firm performance and CSR. This was also noted as a response to a negative shock to CSR. This corroborates the theoretical expectation that the performance of a firm is expected to have a negative response to the implementation of a CSR program.

Interpretations of the impulse response were carried out on the premise that error terms are not associated. The outcomes demonstrate the impulse response functions of CSR, given the innovative activities in CFP with regards to the trio of models, i.e. ROA-CSR, ROE-CSR, as well as ROIC-CSR. In terms of levels, the IRF plot shows (for model 1, 2 and 3) that a negative shock on firm performances (ROA, ROE and ROIC) leads to an increase of CSR engagement, which implies an inward bending CSR engagement and firm performance in the model 1, 2 and 3. It is also noteworthy that current shock in firm performance has positive yet short-lived impacts on CSR engagement. The effect of current shock on firm performance, on the other hand, has a persistent positive impact on future performance.

The results demonstrate that there are adverse responses between CFP and CSR shocks. Such a finding suggests definite associations among CSR and CFP, implying causal directions from CFP towards CSR. This reinforces the slack-resource hypothesis, which holds that companies possessing slack resources that are potentially obtainable from stronger financial performances may be freer to make greater investments in CSR activity. Confidence intervals do however widen subsequently within two years. The responses of CSR to CFP are therefore positive and time-based, given the widened confidence interval. The finding suggests adverse relationships between CSR and CFP, with causality trending from CSR to CFP. At least over short-term periods, the outcome agrees with the hypotheses on trade-offs.

6. Conclusion

The aim of this study has been to prospectively assess the effect that CSR ratings have on the accounting returns of companies that are given such ratings. Measurement of the performance was done using different accounting return variables for year $t + 1$, such as

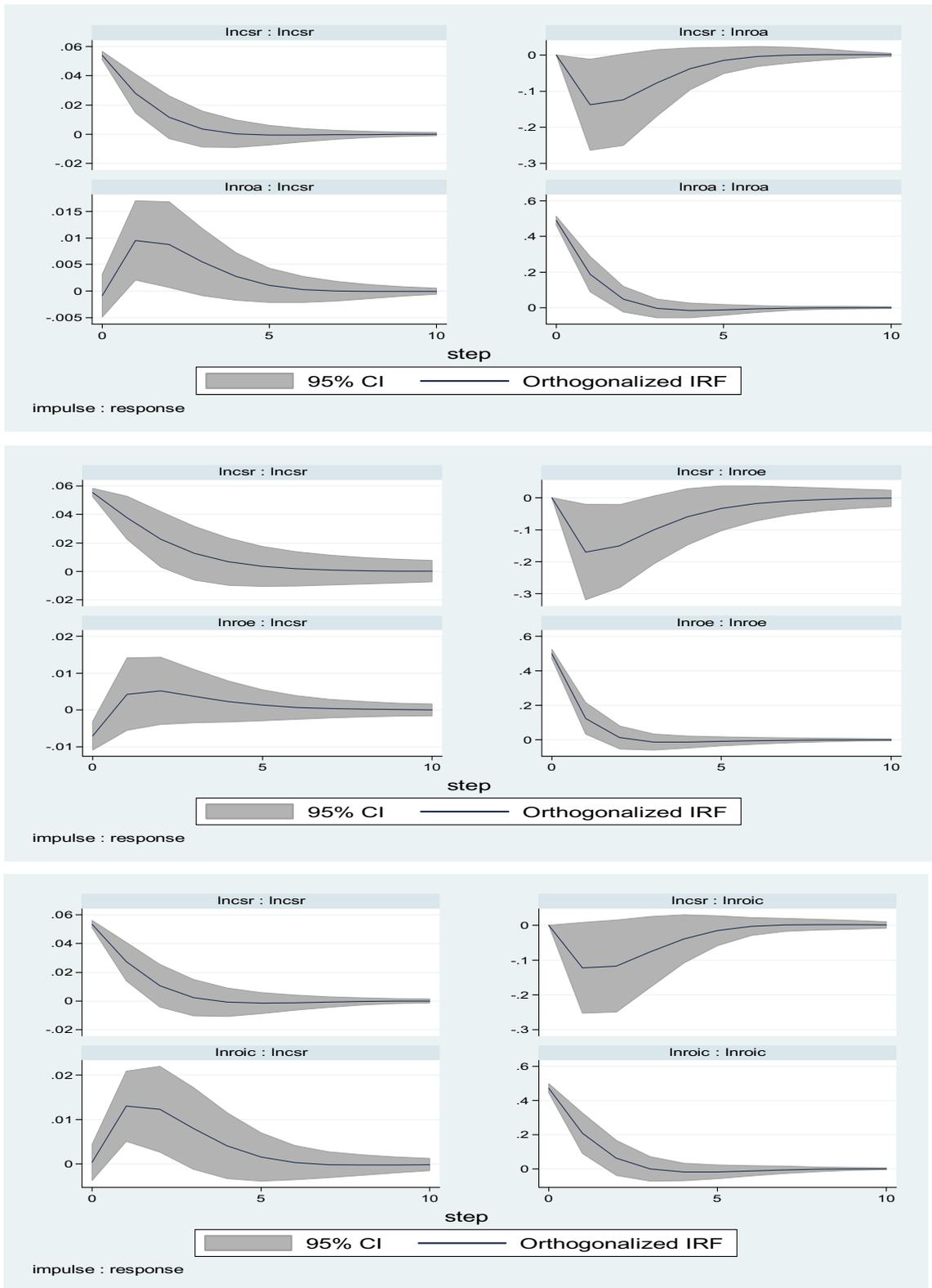


Fig. 2. Functions of impulse responses.

ROE, ROA, and ROIC (CSR rating year and one year subsequent). It also utilised a second approach to assess the effect of performance in year $t - 1$ on the CSR ratings that were given in year T (previous performances and CSR rating).

For the retrospective approach, the key results are as follows: Using the results of the Granger causality analysis, it can be said that ROE, ROA, and ROIC conduct Granger-cause CSR. In a similar manner, it can be inferred that CFP offers Granger-causation and definite effect from CSR. The findings of the study also reveal that higher CSR ratings are achieved when the market capitalisations of the companies are greater. Thus, this analysis of AMAC firms confirms the existence of a major side effect which corresponds to the results generated by Stanwick and Stanwick (1998). However, it is surprising that this was not observed in a systematic way in other researches. For instance, in the retrospective approach, Waddock and Graves (1997) were not able to get statistically important outcomes. This observation is known as the theory of “political visibility”, wherein larger firms have a higher investment in CSR as they have a greater visibility. Large companies refer to companies that have the most following in both the general public and the financial community. Corporate social behaviour that is seen to contradict the public interest may lead to negative publicity and bring about greater regulation. Thus, this theory of “political visibility” is more significant than simply the “reputation of a firm” which was studied in initial works. In such a case, if the firm is deliberately unethical, it eventually has to become ethical when its size introduces it to socio-political pressures. The firm then necessarily has to become more aware of its ethical behaviour.

For the prospective approach, as far as the AMAC is concerned, this research does not confirm the “virtuous circle” concept by Waddock and Graves (1997), which takes the AMAC research as its basic framework. Orlitzky et al. (2003) too gave a confirmation to this concept. The results of this study indicate that CSR negatively affects CFP which, in turn, has a strong negative relationship to subsequent CSR ratings. If the circle highlighted is also a kind of positive feedback, it does seem to improve accounting or stock market performance. Instead, it only amplifies the CSR rating. As a matter of fact, an improved CSR rating in the past is linked to future CSR spending that simultaneously influences stock returns and accounting results. In turn, this decrease in the performance measures has a contribution towards the improvement of CSR ratings subsequently given by the agency. Given this positive feedback, the “sacrifice” that the stockholders agreed to would be acknowledged by the rating agency through a higher CSR rating in the future.

The research appears to validate the trade-off proposition that views corporate social responsibilities as having adverse influences on the financial performances of firms. This proposition was presented by Friedman (1970), acknowledging assertions that the only societal responsibility of firms is to improve their profitability. In these terms, the proposition challenges theories of virtuous circles, i.e. there are affirmative, mutually reinforcing relationships between corporate societal responsibilities and financial performances (Waddock & Graves, 1997). Based on this hypothesis, the more elevated a firm’s CSR level, the lower its CFP (Salzmann, Ionescu-Somers, & Steger, 2005). Furthermore, whenever firms are actively engaged in societal and environmental issues, added costs are sustained that diminish the profitability of these institutions. The position of firms in unfavourable situations is paralleled in those that are not engaged in CSR issues. From this viewpoint, CSR appears to have negative effects on CFP (Moore, 2001; Vance, 1975).

This research aims to be a part of this literary database and aid in the following manner. Firstly, earlier studies have failed to notice the variations between a Prospective and a Retrospective approach as far as causality is concerned. A Retrospective methodology is required to calculate how the current CSR rating assigned by Fortune is affected by the financial performance in the past. Alternatively, the Prospective methodology can be used when the effect of current CSR rating would be used to calculate the financial performance in the future. Even if a relationship exists between the CSR rating and the prospective financial performance variables, the prospective performance variables are not an outcome of the decision which has been taken by the rating agency. Therefore, even though the Fortune survey rates firms partially based on their financial performance in the past, it has no control over the performance of these firms in the future. Thus, it can be said that this research generates a clearer and more concrete understanding of the correlation of causality between CSR and CFP. It is also to be noted that the two-directional approach used in this research is seldom used in prior studies.

Second, seen from a methodological standpoint, the relationship between CSR and CFP has been determined using a Panel VAR estimation strategy. This method is remarkable because it constructs instruments for the endogenous variables. Doing so, allows our econometric approach to address concerns of endogeneity among the performance variables. It also allows for the testing of any direct connection from CFP to CRP and vice versa. The inconsistency of the simple OLS estimator is well known because the unobserved individual effect has a correlation with the lagged dependent variables and the other regressors’ (probably unknown) subsets. Thus, we have considered the model’s GMM estimation. GMM estimation was chosen because it is consistent and more efficient compared to other consistent estimators (Garcia-Castro, Ariño & Canela, 2010; Miguel et al., 2005). Particularly, the high efficiency of the GMM estimator stems from the fact that it makes it possible to use all of the models’ right-hand side variables that are lagged at least twice as instruments. It was demonstrated that these independent variables’ lagged values as instruments did not have any correlation with the error term during the derivation of the estimator (Arellano & Bond, 1991; Blundell & Bond, 1998). Furthermore, they contain information about the variable’s current value, since often there is a delay between an individual’s decision and that decision’s realisation.

In addition, the subjective simultaneity between CFP and CSR are accounted for. Specifically, a Panel Vector Autoregression (Panel VAR) approach (Holtz-Eakin et al., 1988; Love and Zicchino, 2006; Abrigo and Love, 2016) has been utilised, where a system of equations that considers the variables (e.g., CFP and CSR) as endogenous are simultaneously estimated. However, this endogeneity alters the fundamental connection between CSR and CFP and thus has to be corrected in order to determine the real relationship between these variables. In this context, Panel VAR is used to account for the possible bi-directional causality between CFP and CSR. Second, the dynamic connection between CSR and CFP has been examined. As observed, the relationship between CFP and CSR investment is a process that occurs over a certain period of time, which imposes a dynamic instead of a static context. Therefore, any study that focuses on the long-run or steady-state relationship between these variables cannot be accomplished with just a partial understanding of this multi-layered relationship. Equally, our dynamic analysis allows us to observe CSR and CFP as they develop

over time. Specifically, the results obtained from the Panel VAR model make it possible to develop impulse response functions (IRF) that demonstrate one variable's time path (e.g., CSR) after an orthogonal shock involving another variable (e.g., CFP). Consequently, we are able to identify and notify the whole dynamic process from the variable's initial shock to its long-run steady-state.

The research raises matters about changes that should be effected in CSR, in order to attain more salient “shared values”, suggesting the consideration of essential stakeholder interests as well as completely shaping partnerships among different local actors. It is not to undertake the safeguarding of the environment wherein firms operate, but to recognise that firms must improve their performance by securing the appreciation and respect of allies. Through these principles, firms can produce economic value-added by enhancing societal values. The presumption is that this can lead to new means of establishing new types of virtuous circles that can transform capitalism.

6.1. Limitation

Some constraints are present in this research. First, sample sizes are sufficient given the method utilised in this research, but the findings cannot be generalised industry-wide. Nevertheless, the key focus of this research is not about CSR practices and applicability within particular industries, but about demonstrating statistically the causal associations among CSR and CFP. Second, the research does not regard existing industrial specificities in terms of CSR within the analyses, irrespective of whether particular CSR measurements of CSR apply better in certain industries. The public's awareness of CSR challenges has also risen. It is possible that relationships between CSR and CFP have changed within this interval, and further intervals would have led to dissimilar findings. Although the existing database cannot enable checks for robustness in this regard, a further research possibility may be found in partitioning the available information according to dual sets, to enable examination of the causal relationships between the intervals.

Funding

The fund is sponsor by Universiti Putra Malaysia

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.najef.2019.03.004>.

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