Quantile Causality between Corporate Social Responsibility and Corporate Performance

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Abstract

This study adopt quantile causality approach to explore the possibility of a causal relationship between corporate social responsibility (CSR) and firm value under different quantile of corporate social responsibility (CSR) and firm value, using the CSR Index created by Chen and Hung (2013). The results show that CSR holds a two-way influence toward firm value, meaning that the effect CSR has on a firm is correlated with the firm’s value. A firm with relatively low value can benefit immensely from emphasizing social responsibility, whereas when a firm makes an effort to enhance its value, it will not necessarily enhance engagement in CSR at the same time, owing to a crowding out effect.

Keywords: Corporate social responsibility, Quantile regression, Firm value
1. Introduction

As investors show greater concern for sustainable corporate development, it has also become a coveted goal for firms. Corporate social responsibility (hereunder referred to as CSR) has been gaining ever more attention from firms, investors and society at large. When a firm engages in social responsibility, is there any noticeable impact on the firm’s value? What kind of other effects, if any, does CSR bring? As of yet, the literature has not been able to provide any definitive answers. Furthermore, few studies have explored whether firms are willing to put forth effort in performing CSR when the firm seeks to increase its value.

Preston & O’Bannon (1997) have ventured the following hypotheses regarding the relationship between CSR and corporate performance: First, the social impact hypothesis, which is based on stakeholder theory, assumes a positive correlation between stakeholder expectations of a firm and the firm’s financial performance (Freeman, 1984). Second, trade-off hypothesis assumes that CSR exerts negative effects on corporate financial performance, thus the cost of social responsibility may diminish the firm’s profits and as well as the wealth of shareholders. Third, positive synergy hypothesis presumes that when businesses take on ethical duties toward social welfare, their corporate performance will get better, and therefore such businesses obtain more resources that can be put toward social responsibility. This is a positive cycle for firms and society (Allouche & Laroche, 2005). Fourth, negative synergy hypothesis assumes that taking social responsibility on might have a negative effect on a firm’s performance, thus curtailing its further investment in social welfare.

Chen, Hung and Lee (2014, 2015) seem to have proved otherwise: according to their research results, a firm with relatively low value can benefit immensely from taking CSR on as an intangible asset to the firm, whereas when a high-valued firm takes on social responsibility, the effect of CSR on firm value enhancement is decreased. This suggests that for a firm with higher value, CSR does not help much in enhancing firm value. On the other hand, when the CSR efforts are relatively low, a moderate increase in firm value does little to boost CSR due to a crowding out effect; yet when involvement in CSR increases, increasing firm value paves the way for the firm to engage in even greater social responsibility.

Therefore this paper proposes that a differing causal relationship exists between firm value and CSR among various conditional quantiles. It follows that the conditional distribution provided by quantile regression will prove to be a more workable tool for testing non-abnormal distribution, as Leider (2012) suggested, rather than using mean distribution by least regression (Leider, 2012).

2. Methodology
2.1 Non-parametric Granger Causality Test

The non-parametric causality method developed by Granger considers two time series and determines whether one causes the other. Yet such causality might be composed of different quantiles and thus demonstrates differing causal relationships (Lee and Yang, 2012). According to Hong et al. (2009) the Granger causality test produces a more robust result. Balciilar et al. (2014) defined the Granger causality quantile as follows:

1. $x_t$ Does not cause $y_t$ in the $\theta$-quantile with respect to $\{y_{t-1}, ..., y_{t-i}, x_{t-1}, ..., x_{t-j}\}$ if
   \[ Q_\theta(y_t | y_{t-1}, ..., y_{t-i}, x_{t-1}, ..., x_{t-j}) = Q_\theta(y_t | y_{t-1}, ..., y_{t-i}) \]
   (1)

2. $x_t$ Is a Granger cause $y_t$ in the $\theta$-quantile with respect to $\{y_{t-1}, ..., y_{t-i}, x_{t-1}, ..., x_{t-j}\}$ if
   \[ Q_\theta(y_t | y_{t-1}, ..., y_{t-i}, x_{t-1}, ..., x_{t-j}) \neq Q_\theta(y_t | y_{t-1}, ..., y_{t-i}) \]
   (2)

Where $Q_\theta(y_t | A)$ is the $\theta$th conditional quantile of $y_t$ given $A$ which depends on $t$ and $0 < \theta < 1$.

Let’s consider $\{x_t, y_t\} = \{\text{Tobin}'s, CSRI\}$, with Tobin’s as the proxy variable of firm value, while CSRI serves as the index for CSR.

$X_{t-1} \equiv (x_{t-1}, ..., x_{t-i}), Y_{t-1} \equiv (y_{t-1}, ..., y_{t-j}), Z_{t-1} \equiv (y_{t-1}, ..., y_{t-i}, x_{t-1}, ..., x_{t-j}), V_t = (X_t, Z_t)$. $F_{x_t | Z_{t-1}} = F_{x_t | Z_{t-1}}(y_t | Z_{t-1})$ and $F_{y_t | Z_{t-1}} = F_{y_t | Z_{t-1}}(y_t | Y_{t-1})$ stand for the conditional probability of $Y$ under $Z_{t-1}$ and $Y_{t-1}$ respectively. Therefore they can be used to announce the null hypotheses of definitions (1) and (2):

\[ H_0 = P \left\{ F_{y_t | Z_{t-1}}(Q_\theta(y_t | Y_{t-1}) | Z_{t-1}) = F_{y_t | Z_{t-1}}(Q_\theta(Z_{t-1}) | Z_{t-1}) \right\} = 1 \]

(3)

\[ H_1 = P \left\{ F_{y_t | Z_{t-1}}(Q_\theta(y_t | Y_{t-1}) | Z_{t-1}) \neq F_{y_t | Z_{t-1}}(Q_\theta(Z_{t-1}) | Z_{t-1}) \right\} < 1 \]

(4)

If the evidence is against the null hypothesis ($H_0$), there is a causality, and vice versa. Jeong et al. (2012) reduced the problem of irrelevancy in all the tests for quantile causality by using $D = \{\varepsilon_t \cdot E(\varepsilon_t | Z_{t-1}) f_Z(Z_{t-1})\}$ as a distance measure, where $\varepsilon_t$ is the regression error term and $f_Z(Z_{t-1})$ is the marginal density function of $Z_{t-1}$. The regression error $\varepsilon_t$ arises because the null hypothesis in (3) can only be true if $E[I(y_t \leq Q_\theta(Y_{t-1}) | Z_{t-1})] = \theta$ or equivalently $I(y_t \leq Q_\theta(Y_{t-1})) = \theta + \varepsilon_t$, where $I(\cdot)$ is the indicator function. Jeong et al. (2012) identified the distance function as
\[ D = E \left[ \left\{ F_{Y|Z_{t-1}}(Q_\theta(Y_{t-1})|Z_{t-1}) - \theta \right\}^2 f_\theta(Z_{t-1}) \right] \]  

(5)

Where \( D \geq 0 \) and the equality holds if and only if the null hypothesis \( H_0 \) in equation (3) is true, while \( D > 0 \) holds under the alternative \( H_1 \) in equation (4). Additionally, Jeong et al. (2012) specified that the feasible kernel-based test statistic based on \( D \) takes the following form:

\[ \hat{D}_T = \frac{1}{T(T-1)h^2} \sum_{t=1}^{T} \sum_{s=t}^{T} K\left( \frac{Z_{t-1} - Z_s}{h} \right) \hat{\epsilon}_t \hat{\epsilon}_s \]  

(6)

Where \( T \) denotes the number of all data, \( K(\cdot) \) is the kernel function with bandwidth \( h \), and \( \hat{\epsilon}_t \) is estimated from the unknown regression error of \( \epsilon_t = I\{y_t \leq \hat{Q}_\theta(Y_{t-1}) - \theta\} \) where \( \hat{Q}_\theta(Y_{t-1}) \) is an estimate of the \( \theta \)-th conditional quantile of \( y_t \) given \( Y_{t-1} \). \( \hat{Q}_\theta(Y_{t-1}) \) can be estimated by the nonparametric kernel method as \( \hat{Q}_0(Y_{t-1}) = \hat{F}_{Y|Y_{t-1}}^{-1}(\theta|Y_{t-1}) \) .

\[ \hat{F}_{Y|Y_{t-1}}(Y_t|Y_{t-1}) \] is the Nadarya-Watson kernel estimator given by

\[ \hat{F}_{Y|Y_{t-1}}(Y_t|Y_{t-1}) = \frac{\sum_{s=t}^{T} L\left( \frac{Y_{t-1} - Y_s}{h} \right) I(Y_s \leq Y_{t-1})}{\sum_{s=t}^{T} L\left( \frac{Y_{t-1} - Y_s}{h} \right)} \]  

(7)

With the kernel function \( L(\cdot) \) and bandwidth \( h \).

3. Data Analysis

The data were obtained from listed companies during the 2010 to 2011 period. The data regarding CSR was gleaned from the CSR index compiled by Chen and Hung (2013). Data frequency is annual. The financial reporting data was derived from the TEJ, and actual corporate value was denoted as Tobin’s \( q \). A total of 772 companies and 1487 annual reports were employed. Cross-sectional information from both of the 2 year time-series were pooled over the 772 companies to estimate the predictability of the coefficients. Descriptive statistics are shown in Table 1.

| Table 1: Summary of statistics for listed, Taiwan-based companies, 2010-2011, N=1487 |
|---|---|---|---|---|---|---|---|
|     | Mean | Max. | Min. | Std. | Sk. | K. | J-B |
| Tobin’s \( q \) | 1.223 | 5.820 | 0.460 | 0.546 | 2.960 | 16.463 | 13400.470*** |
| CSRI | 12.215 | 24.000 | 0.000 | 3.733 | 0.145 | 3.610 | 28.222*** |

**Note:** Std. denotes standard deviation, SK. denotes the skewness, K. denotes the kurtosis and J-B denotes the Jarque-Bera test for normality. ** And *** indicate significance at the
5% and 1% level, respectively. $H_0: SK.=0, K.=3$ (normality).

**Figure 1:** Test statistics with respect to different quantiles for firm value to CSR causality

![Figure 1](image1.png)

**Figure 2:** Test statistics with respect to different quantiles for CSR to firm value causality

![Figure 2](image2.png)

### 4. Results

Figures 1 and 2 show that (1) when a firm has relatively low value, CSR initiatives may boost prestige and intangible assets, thereby enhancing firm value. On the other hand, CSR initiatives play only a minor role in boosting the value of a firm if the company already has higher firm value. (2). When engagement in CSR is low, the enhancement of firm value does not necessarily lead to an increase in CSR, perhaps owing to a crowding out effect, whereas if engagement in CSR is high, an increase in firm value helps to motivate the company to make continued CSR efforts.

This paper utilized the quantile Granger causality method proposed by Jeong et al., (2012) to explore the two-way causality between the CSR of listed companies in Taiwan and firm value. The solid lines in Figures 1 and 2 denote standardized statistics under different dependent variable quantiles, whilst the dotted lines=1.96 implies a significance level of 5%.
Therefore from Figure 1 and 2, we can clearly see causality between CSR and firm value in each conditional quantile. Figure 1 shows the causal relationship between firm value and CSR under various conditional quantiles of CSR. When the equation $\tau = 0.25 \ 0.45 < \tau < 0.85$ is true, the causality of firm value and CSR becomes apparent, which suggests higher involvement in CSR is correlated with higher firm value, and higher firm value then gives rise to better involvement in CSR. A crowding out effect is also demonstrated. This phenomenon suggests that a newly founded company only thinks about making money, and cares less about social responsibility. Only when a firm puts considerable effort into enhancing firm value does it also perform ethical duties for social welfare. Figure 2 shows the causality between firm value and CSR under each conditional quantile of firm value. When $\tau < 0.70$, CSR exerts a noticeable effect on firm value, which suggests that a firm with lower firm value can turn to CSR initiatives in an effort to enhance firm value. This validates the idea that an enterprise can be protected with a corporate social responsibility shield; therefore, a low value firm may take the CSR initiatives to boost value.

5. Conclusion

Corporate social responsibility affects firms in very different ways since only low value firms get a significant boost in firm value from performing CSR. The two-way influences of CSR and firm value may vary in accordance with firm value and the way a company performs social welfare duties. A lower-valued firm might see a remarkable benefit from taking on corporate social responsibility. Some firms will put forth little CSR effort owing to a crowding out effect, despite their need to enhance firm value. This validates the idea that a social enterprise needs intervention from the public sector or other resources from society.

References


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\[^1\] \(\tau\) represents the quantiles (considered quantiles 0.10 – 0.90 with 0.05 increments).


