A Theoretical Analysis for Sustainability Function of SRI Fund Organizations : A Sustainable Framework of London Mechanism

Hiroshige TANAKA

Professor of Faculty of Economics, Chou University, Higashinakano 742-1,Hachioji-city, Tokyo 192-0393, JAPAN.

Abstract

Sustainable environmental management requires well conditioned cooperation and participation of multi stakeholders. We must develop and improve some mechanisms to promote cooperation and participation of multi stakeholders. I investigate here some devises to facilitate the cooperation. In particular, using the theoretical model of Tanaka(2004) I demonstrate that a financial function of SRI can prompt sustainable environmental management effectively.

1. Introduction

Globalizing economic activities and decentralization of government might appear commonly in many advanced countries. Many environmental and social problems require betterment with voluntary contributions of many agents of government, firms, residents and NPO. Sustainable development of communities could be achieved by a cooperation or voluntary participation of multi stakeholders[1]. By effective cooperation of stakeholders corporations or non-profit organizations could achieve sustainable management and contribute to improve social welfare. Since many stakeholders seek self interests, probably contributions of many stakeholders are deficient and out of balanced to promote sustainability.

[1] Nyssens (2006) indicates problems on multi-goal and multi-stakeholder organizations.

We must investigate incentives of voluntary contributions and devise a sustainable scheme to foster and to facilitate them. In this essay, we consider the mechanism which SRI organization improves sustainability by stimulating activities of CSR. The author has published many theoretical and empirical papers written in Japanese regarding to sustainable corporate local governance[2]. In this essay, it is demonstrated that a theoretical model of Tanaka (2004) regarding to CSR could explain some functions of SRI fund organizations.

2. A theoretical model of CSR and SRI

For sustainable management firms should perform social responsibility in economic, environmental and social aspects. CSR (Cooperate Social Responsibility) is a key concept to perform sustainable management. We must investigate theoretical frame work of CSR and make clear policies or methods to control sustainable managements[3]. In 2002 the City of London proposed the London Principles[4] for the sustainable development. In this view, financial function in market has been suggested to contribute sustainable development guided by the London Principles. In this essay, using the theoretical model developed by Tanaka (2004) we demonstrate that a SRI scheme could improve activities of CSR.

The model of CSR is explained in the first. We investigate CSR activities of a particular firm[5]. The firm decides the goals at the first. It produces goods and services to pursue them. x denotes the total value of outputs. Net benefit such as profit is evaluated by the firm and represented by $\Pi(x)$. The firm pays t_i such as environmental costs and contribution to the local communities for stakeholder i to survive in well managed relationship between n stakeholders. Total payment for stakeholders t is defined by

$$t = \sum_{i=1}^{n} t_i .$$

Stakeholder i observes the influence of the firm and evaluates $V_i(x, t_i)$ for

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[2] Tirole(2001) develops theoretical investigation of corporate governance.
[3] Barrow(2006) explains total framework of environmental management for sustainability.
[4] Corporation of London (2006) ,*Financing the Future* reports the London Principles in some detail.
[5] This part summarizes theoretical investigation developed in (2007).

the production activity x and payment t_i for stakeholder i. The firm could not obtain the accurate information of evaluation $V_i(x,t_i)$ by i. We refer $V_i(x,t_i)$ for a pair (x,t_i) to external evaluation by stakeholder i. The total value of external evaluation is expressed by

$$\sum_{i=1}^{n} V_i(x,t_i).$$

It is assumed that the payment t_i improves external evaluation $V_i(x,t_i)$. The inequality $\frac{\partial V_i}{\partial t_i} > 0$ is satisfied. It is supposed that the stakeholder i sets ideal evaluation value V_i^* but the target could not be achieved. This assumption is expressed by

$$V_i^* > V_i(x,t_i).$$

As the value of $V_i^* - V_i(x,t_i)$ increase, stakeholder i will require the firm to improve $V_i(x,t_i)$ more positively. If the firm does not make better i's evaluation, it might suffer social sanctions such as suit by residents, boycott of consumers and enforcement of a tightened regulation. $V_i^* - V_i(x,t_i)$ indicates social cost evaluated by i. The firm is obliged to pay a part of social cost as $c_i(V_i^* - V_i(x,t_i))$ with a positive coefficient c_i. c_i means risk indicator of sustainability for i. As c_i increases, the firm becomes to suffer greater risk for sustainable management regarding to i. We confirm straightforwardly that

$$\frac{\partial c_i\{V_i^* - V_i(x,t_i)\}}{\partial t_i} = -\frac{c_i \partial V_i}{\partial t_i} < 0$$

is satisfied. The firm decreases the risk with i by payment t_i. We conclude that organizing scheme or standard to induce firms to increase t_i is an appropriate method to promote CSR. Maintaining t_i appropriately makes effort on sustainable management for many firms.

Stakeholders have complicated interests with the firms. Stakeholders are classified into two types. The stakeholders whose evaluation is increasing function of x are named as positive stakeholder. On the contrary, the

negative stakeholders are defined to have decreasing functions of x. The firm could cooperate positive stakeholder relatively easy. It's cooperation with negative stakeholders seems unavoidable but not to proceed simply.

The firm seeks to obtain accurate information of the total value of external evaluation for sustainable management. It must pay large amount of costs and efforts. As many parts of the external evaluation are obtained by stakeholders, we construct communication mechanism, for example monitor, audit, between the firms and stakeholders. Well maintained communications prompt sustainable management. The firm could estimate δ percent of $\sum_{i=1}^{n} V_i(x,t_i)$. Although δ does not improve it's profit directly, δ implies the function of communication between the firm and stakeholders. So, δ is referred to altruistic coefficient in this essay. δ is a efficient indicator for sustainable management. In the network community, each stakeholder i contributes y_i to improve altruistic the coefficient δ[6]. The total contribution is represented by $y(=y_1+\cdots+y_n)$. δ is increasing function of y,

$$\frac{d\delta(y)}{dy}>0. \qquad (1)$$

We assume that a fund of SRI k is represented by y_k[7]. The fund makes effort to induce other stakeholders to enforce the firm moving into sustainable management. It is assumed that for the stakeholder j agrees with the SRI the inequality

$$\frac{dy_j}{dy_k}>0. \qquad (2)$$

is obtained. For stakeholder j who is indifferent to the SRI fund the equality

$$\frac{dy_j}{dy_i}=0 \qquad (3)$$

is satisfied. When we consider the role of SRI, we should make clear how y_i influences other $y_j(i\neq j)$. The object function of net social benefit for

[6] Tanaka(1998) considers operational aspect of altruistic concept.
[7] Tanaka(2005) attempts to apply the CSR model of Tanaka to financial projects.

sustainability is written by

$$\delta(y)\sum_{i=1}^{n}\{V_i(x,t_i)-y_i\}. \qquad (4)$$

The formulation defined by Tanaka(2004) is applicable to investigation on SRI fund. The object function for sustainable management is expressed by

$$NB=\Pi(x)+\delta(y)\sum_{i=1}^{n}\{V_i(x,t_i)-y_i\}-t-\sum_{i=1}^{n}c_i(V_i^*-V_i(x,t_i)),\ 1\geq\delta\geq 0. \qquad (5)$$

The firm seeking sustainable management determines $x,t_1,\cdots,t_n$ to maximize the Net Benefit (NB). The first order conditions of maximization are written by

$$\frac{\partial\Pi}{\partial x}=\sum_{i=1}^{n}-(\delta+c_i)\frac{\partial V_i(x,t_i)}{\partial x},\quad i=1,\cdots n, \qquad (6)$$

$$1=(\delta+c_i)\frac{\partial V_i}{\partial t_i}, i=1,\cdots,n. \qquad (7)$$

Equations of (6) show that the share of positive and negative stakeholders could influence the activity of the firm. Notice that (7) is transformed into

$$\frac{1}{\delta+c_i}=\frac{\partial V_i}{\partial t_i}, i=1,\cdots n, \qquad (8)$$

and $\frac{\partial V_i}{\partial t_i}$ is suppose to decreasing with t_i. It is conclude that an increment of risk indicator c_i or altruistic coefficient δ lowers value of (8) and increases payment t_i for stakeholder i.

3.A linier approach and positive activity of SRI fund

Empirical approach of this model analysis is stated as follows[8]. Simplify the explanation, we consider the case that two stakeholders exist. It is assumed that stakeholder 1 funds and manages an organization of SRI and that 2 agrees with 1 to cooperate the organization. To develop empirical approach, let us employ linier approximations. $a,b,e_{11},f_1,g_{11},e_{12},g_{12},e_{21},f_2,g_{21},e_{22},g_{22}$ are assumed to be constants. The values could be estimated by positive investigations.

[8] Following explanation corrects appropriately some misprints of the original expression of Tanaka(2007)pp.20-23. The conclusion of Tanaka(2007) is verified to hold in this English version.

$$\frac{d\Pi}{dx} = ax + b$$

$$\frac{\partial V_1}{\partial x} = e_{11}x + f_1 t_1 + g_{11}$$

The marginal effect of altruistic effect of SRI expenditure is approximated by

$$\frac{d\delta}{dy} = h .$$

The effect of SRI fund scheme is investigated as follows. Differentiating (6) and (7) with regard to y_1, (9), (10), (11) are derived.

$$\left\{a + \sum_{i=1}^{2}(\delta + c_i)e_{i1}\right\}\frac{dx}{dy_1} + (\delta + c_1)f_1\frac{dt_1}{dy_1} + (\delta + c_2)f_2\frac{dt_2}{dy_1} = -h\left(1 + \frac{dy_2}{dy_1}\right)((e_{11} + f_1)x + (f_1 + e_{12})t_1 + g_{11} + g_{12})$$

(9)

$$(\delta + c_1)f_1\frac{dx}{dy_1} + (\delta + c_1)e_{12}\frac{dt_1}{dy_1} = -h\left\{1 + \frac{dy_2}{dy_1}\right\}(f_1 x + e_{12}t_1 + g_{12}) \qquad (10)$$

$$(\delta + c_2)f_2\frac{dx}{dy_1} + (\delta + c_2)e_{22}\frac{dt_2}{dy_1} = -h\left\{1 + \frac{dy_2}{dy_1}\right\}(f_2 x + e_{22}t_2 + g_{22}) \qquad (11)$$

The determinant is transformed simply into as follows.

$$= \begin{vmatrix} a + \sum_{i=1}^{2}(\delta + c_i)e_{i1} & (\delta + c_1)f_1 & (\delta + c_2)f_2 \\ (\delta + c_1)f_1 & (\delta + c_1)e_{12} & 0 \\ (\delta + c_2)f_2 & 0 & (\delta + c_2)e_{22} \end{vmatrix} \qquad (12)$$

$$= (\delta + c_1)(\delta + c_2)\begin{vmatrix} a + \sum_{i=1}^{2}(\delta + c_i)e_{i1} & f_1 & f_2 \\ (\delta + c_1)f_1 & e_{12} & 0 \\ (\delta + c_2)f_2 & 0 & e_{22} \end{vmatrix} \qquad (13)$$

$$= (\delta + c_1)(\delta + c_2)D . \qquad (14)$$

D is defined by

$$D = \begin{vmatrix} a + \sum_{i=1}^{2}(\delta + c_i)e_{i1} & f_1 & f_2 \\ (\delta + c_1)f_1 & e_{12} & 0 \\ (\delta + c_2)f_2 & 0 & e_{22} \end{vmatrix} .$$

The determinant is transformed as follows.

$$\begin{vmatrix} a + \sum_{i=1}^{2}(\delta + c_i)e_{i1} & -h(1 + \frac{dy_2}{dy_1})(A + B) & (\delta + c_2)f_2 \end{vmatrix}$$

$$= \begin{matrix} (\delta + c_1) f_1 & -h(1+\frac{dy_2}{dy_1})A & 0 \\ (\delta + c_2) f_2 & -h(1+\frac{dy_2}{dy_1})B & (\delta + c_2) e_{22} \end{matrix}$$

$$= h(1+\frac{dy_2}{dy_1})(\delta + c_2) \begin{vmatrix} a + \sum_{i=1}^{2} (\delta + c_i) e_{i1} & -(A+B) & f_2 \\ (\delta + c_1) f_1 & -A & 0 \\ (\delta + c_2) f_2 & -B & e_{22} \end{vmatrix} \qquad (15)$$

$$\equiv h(1+\frac{dy_2}{dy_1})(\delta + c_2) D_1 \qquad (16)$$

D_1 is defined by

$$D_1 = \begin{vmatrix} a + \sum_{i=1}^{2} (\delta + c_i) e_{i1} & -(A+B) & f_2 \\ (\delta + c_1) f_1 & -A & 0 \\ (\delta + c_2) f_2 & -B & e_{22} \end{vmatrix} .$$

Employing Cramer's rule, (17) is derived.

$$\frac{dt_1}{dy_1} = \frac{h(1+\frac{dy_2}{dy_1})}{(\delta + c_1)} \frac{D_1}{D} . \qquad (17)$$

Similarly, we could investigate the interactions between the firm and stakeholder 2.

$$= \begin{vmatrix} a + \sum_{i=1}^{2} (\delta + c_i) e_{i1} & (\delta + c_1) f_1 & -h(1+\frac{dy_2}{dy_1})(A+B) \\ (\delta + c_1) f_1 & (\delta + c_1) e_{12} & -h(1+\frac{dy_2}{dy_1})A \\ (\delta + c_2) f_2 & 0 & -h(1+\frac{dy_2}{dy_1})B \end{vmatrix} \qquad (18)$$

$$= h(1+\frac{dy_2}{dy_1})(\delta + c_1) \begin{vmatrix} a + \sum_{i=1}^{2} (\delta + c_i) e_{i1} & (\delta + c_1) f_1 & -(A+B) \\ (\delta + c_1) f_1 & (\delta + c_2) e_{22} & -A \\ (\delta + c_2) f_2 & 0 & -B \end{vmatrix} \qquad (19)$$

Using the notation

$$D_2 = \begin{vmatrix} a+\sum_{i=1}^{2}(\delta+c_i)e_{i1} & f_1 & -(A+B) \\ (\delta+c_1)f_1 & e_{22} & -A \\ (\delta+c_2)f_2 & 0 & -B \end{vmatrix}$$

and Cramer's rule, (20) is derived.

$$\frac{dt_2}{dy_1} = \frac{h(1+\frac{dy_2}{dy_1})}{(\delta+c_2)}\frac{D_2}{D} \qquad (20)$$

Noticing (17) and (20), we argue the two conclusions. First, as the marginal value of altruistic coefficient h and the influence of SRI organization increase, the activity of SRI organization y_1 stimulates the firm to tackle CSR programs more seriously. Second, as δ, c_1, c_2 are contained in D, D_1, D_2 the effect on $\frac{D_1}{D}, \frac{D_2}{D}$ is not analyzed completely. The following conclusion is effective partially. Considering the first term of (20), we conjecture that to lower the risk coefficient of society improves the effect of activity of SRI organization.

4. SRI and external evaluation

Activities of CSR are classified into negative activities t_i to lower the risk of sustainability and positive activities y_i improve sustainability of the society. Stakeholder 1 is supposed to maximize external evaluation

$$\delta(y)\sum_{i=1}^{n}\{V_i(x(y),t_i(y))-y_i\}. \qquad (21)$$

Using the notation $W=\sum_{i=1}^{n}\{V_i(x,t_i)-y_i\}$, the optimal solution y_1 is obtained by differentiation (21) with y_1 and satisfies

$$(1+\sum_{i=2}^{n}\frac{y_i}{y_1})\left\{\frac{d\delta}{dy}W+\delta(y)\sum_{i=1}^{n}\left(\frac{\partial V_i}{\partial x}+\frac{\partial V_i}{\partial t_i}\right)-\delta(y)\right\}=0$$

The elasticity of payment of stakeholder is sated by $\varepsilon=\frac{y}{\delta}\frac{\partial\delta}{\partial y}$. The first order condition of independent variable y_i is expressed by

$$\varepsilon = \frac{y}{W}(1-\sum_{i=1}^{n}\left(\frac{\partial V_i}{\partial x}+\frac{\partial V_i}{\partial t_i}\right)) \quad . \tag{22}$$

When stakeholders contribute sustainability of community positively, the optimal contribution is determined by W and ε. The rate of positive social contribution to total external evaluation depends on indirect effect of x and t_i,

$$\sum_{i=1}^{n}\left(\frac{\partial V_i}{\partial x}+\frac{\partial V_i}{\partial t_i}\right). \tag{23}$$

Considering (23), to enlarge positive contribution we should reform external evaluation scheme to function effectively.

5.Concluding remarks

Sustainable environmental management is a target for firms and communities. Although this target is commonly shared by multi stakeholders, the stakeholders seek multi goals. In order to construct sustainable community we must investigate the totally constituted incentive mechanism to attain the target. In this essay, we consider a scheme which prompts firms to the stakeholder more serious and efficient. It is demonstrated that SRI funds could serve the function. Since this is only one part of the total sustainability mechanism, we must investigate remaining problems such as evaluation indicators, standards, participation schemes.

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