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A Theoretical Model for Dividend Policy

Jun Jiang
Mahidol University International College
Financial Risk Manager (FRM) GARP
Chartered Wealth Manager (CWM) AAFM
Program Director of Finance
Business Administration Division
Mahidol University International College
999 Buddhamonthon 4 Rd.
Nakhonpathom 73170, Thailand
aaronjiangbkk@gmail.com

ABSTRACT

Interactive determinations, featured in the corporation's investing, financing and operating activities, explicitly lead firm's decision ambiguity of payout policy as the result of benefit pursuit and competing among investors, agencies, and firm's decision making. The study initiates and develops theoretical decision model through consolidating the segmented optimal decisions of, shareholders, agencies, and firms, recognizing the capital structure, tax effects, cash flows allocation effects, and executives' utility optimality. It results the constructive implications for the implementation of payout policy, which consist of, equity capital turnover rate, taxes, cost of capital, and sustainable growth rate, and so on.

Keywords: *Payout Policy, Capital Structure, Agency Problem, Tax Effects*

1. INTRODUCTION

In addition to the irrelevant-dividend theory contributed by Miller and Modigliani (1961), Bhattacharya (1979) showed the fallacy of "the bird in the hand" theory, in which an investor considers future capital gain as uncertainty and prefers current dividend, and Miller and Rock (1985) explored the dividends as a signal tool to investors by agencies, both as the result of information asymmetry. Pertaining to this signaling effect, the results from Pettit (1972), Fudenberg and Tirole (1995), not only demonstrated substantial information conveyed by dividend change announcements but also implied this is substantially more than implication in earning announcements. Additionally, Asquith, Mullins and David (1983), Denis, Denis and Sarin (1994), Benartzi, Michaely and Thaler (1997), Nissim and Ziv (2001), continued to support those findings by demonstrating that dividend changes provide information about the level of profitability. Nevertheless, prior mentioned findings do not assure the consensus over practice. The test from Watts (1973) suggested only trivial implications are conveyed to market participants by dividend announcement, which means, future earnings changes conveyed by unexpected dividend changes are very small. Liu, Szewczyk and Zantout (2008) reported no compelling evidence of a post-dividend-reduction or post-dividend-omission price drift.

Recognizing the contradictions, it is explicitly evident that managers of firms prefer dividend distribution as a tool for pleasing shareholders under asymmetric information, which simultaneously causes shareholders' inequality of cash inflows due to differential marginal tax which is generally considered as higher than the tax for capital gain. Consequently, shareholders do not definitely welcome dividend distribution. In addition, if an executive is the one who decides the payment of dividends and bears the responsibility of operation for generating sustainable growth of wealth, and a shareholder is the one who receives and consumes the payment of dividends and therefore decides the form of investments through debt or equity, it is worthwhile screening the relationship between and respective roles of managers and shareholders, and it is also valuable to see how the firm with the differential features is operated by executives for the purpose of sufficiently supporting dividend policy. First, one school of thought attributes to the characters of a firm such factors as, the economic size and profitability of the firm by Fama and French (2000), ownership and control structure of the firm by Aivazian, Booth and Cleary (2003), Gugler and Yurtoglu (2003), Lee and Xiao (2004), strong governance or a substitute for weak governance by Officer (2006), and the level of protection to shareholders by Pinkowitz, Stulz and Williamson (2006). Second, from the viewpoint of agent problems, dividends may be useful in reducing the agent management costs, which is considered as the evidence by Easterbrook (1984) for the phenomenon that firms simultaneously pay out dividends and raise new funds in the capital market. Continuing from that consideration, with the payment of dividends taken away from retained earnings, there is a high possibility of

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forcing the firm to raise capital through debt, which in turn enhances monitoring effects on managers. Furthermore, Bhattacharyya (2003), and Bhattacharyya, Mawani and Morrill (2008) sensed low-quality and high-quality managers are different in terms of retaining and investing a firm's earnings and dividend payments. Third, caused by differentiated marginal rate, Elton and Gruber (1970), Litzenberger and Ramaswamy (1980), Miller and Scholes (1982), Bernheim (1991), Chetty and Saez (2007) and Desai and Dharmapala (2007) explored that high dividend tax and relatively low capital gains tax cause a clientele effect on the shareholders, either significantly or non-significantly.

Consequently, the study stands on the assumption that, dividend policy results from interactions and overlapped influences from a firm's operations and financing leverage, agent problems between executives and shareholders, the reactions from shareholders with differentiated marginal tax rates, and differentiated levels of information possessions, combined with other comprehensive factors such as opportunities of investment, the capital structure of the firm and the level of ownership protection enhanced by law. It initiates non-isolated considerations into a synthesized model for further development of the dividend theory, in which, by admitting trading into the model, the Pareto-dominant valuation schedule and critical propositions were derived from the objective function, through the incorporation of interactions among financial leverage and share repurchases, taxes and transaction costs, agent problems and asymmetric information. Under a synthesized hypothesis, financial leverage facilitates firms shielding tax expenses and changing future cash flows. It is probably the most rational strategy for reducing financial costs if the firm can generate more benefits from borrowing than interest expenses that should be paid for debt. Meanwhile, principals consider cost from financial leverage as enhancing power for monitoring executives, especially at a higher degree of asymmetric information. On the other hand, executives are optimizing their utility by maximizing the surplus part of wage income after the deduction of costs of efforts they paid, in which wage income is mainly determined by free cash flows and/or dividends that are generated for principles. It should be recognized that wage levels with other compensation packages are designed correspondingly to the performance report of the agent. Although the performance report does possess numerous indications or ratios from all aspects of the firm, we simply believe that the dominating factor for evaluating performance is the generating of free cash flows for principals or shareholders contributed by the agent or managers. Of course, the free cash flows are not purely under the control of the agent but also the external and internal opportunities of investment. External factors for opportunities such as price change are more determined by the macro level of the economy. Internal factors such as productivity are partially determined by the manager if the turnover of mangers is low.

2. THE MODEL DEVELOPMENT

Theoretically, the study assumes two periods of operation for current time and future time. Firms can decide not only the output but also the way of finance including borrowing and additional equity which raises capital for firms to support production and dividend payments. The cash availability raised by these financial sources influences the output of the future period and hence revenue of the future term. Firm j decides the output y_0^j at the beginning of the first period, which contributes the first part of cash availability for the end of the first term, say time 0, and at the end of that period, the amount of borrowing B^j with transaction costs T_B is incurred. The transaction cost in turn causes the actual amount received from borrowing minus the contracted amount. T_B can be the cost representing all kinds of expenses incurred in the issuing of bonds or commitment of borrowing, such as brokerage fees, deposit balance, office expenses for contracting and procedures of debt raised. Alternatively, the firm j can issue additional equity $\tilde{e}^j$ to support the necessities of future production y_s^j and dividend payment D_0 in period 0 or distribute capital gains to shareholders in the form of share repurchases. Therefore, positive $\tilde{e}^j$ means additional shares issued and negative one indicates equities repurchased back. Similar to debt, share repurchases and share issuing can both cause the incurrence of transaction costs represented by T_e affecting the amount of capital received from issuing and capital paid for repurchasing. The cash flow of firm j for the current period is as follows:

$$X_0^j = p_0 y_0^j + (1-T_B)B^j + (1-T_e)\tilde{e}^j - D_0^j \qquad (1)$$

Where p is the price, vector is the states of contingency. Due to uncertainty, the prices of different commodities change differently in each state of economy. Firm j can decide on a production plan that specifies input and output vectors $y_s^j \in R^L$ in each state $s \in S$. The study assumes output y will be constrained by cash flow availability. In other words, the firm's acquisition of cash flows by issuing more debts or more stocks or reducing cash flows by repurchasing stocks and distributing cash dividends back to shareholders will both

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impact the output of future time, say state of s. In order to support the needs of cash flows for production, the firm must guarantee sufficient availability of cash by either borrowing or issuing new stocks, or from past period generated cash flows. Moreover, considering external opportunities, the firm decides the output according to the market situation, say prices of input and output. Internally, the firm makes an output plan in line with the capacity of the firm, such as efficiency of productivity of itself and efforts of the agent. For this capacity, the study considers productivity of the firm, such as organization efficiency, as the result of exogenous technology in the economy and efforts paid by executives. By defining technology as A and efforts of executives as E, we can let $\delta = \ln(AE)$ indicate efficiency or productivity of operations of the firm.

Consequently, y is a function of productivity, efforts and cash flow availability, as follows:

$$y^j = f(\delta, X) = f(A, E, X) \quad (2)$$

As the study will explain later, E is the efforts paid by executives under asymmetric information or agent problems. E can be high or low due to the executives' personal utility maximization plan and degree of agent problems. The study makes a hypothetical scenario that executives or agents have the capacity to observe the level of agent problems through the contract and governance. The executives perform the service in accordance with what they observed from the corporate system. High level of agent problems means more concentration paid on maximization of dividends. Less severe asymmetries means more focus on the maximization of the cash flows of the two periods.

There is no doubt about the difference between the output of current time and future time due to cash flow availability and financial activities. At the beginning of the operation, the firm's finance resources are purely from the originally invested capital of principals. The firm will not have the opportunities to raise capital from more diversified sources until the end of the current period. It is understandable that a small and initiated firm has difficulties in other forms of finance, such as debt and attracting more investors. Consequently, the followings are output functions for present and future.

$$y_0 = \delta \ln(\theta) + \tilde{\varepsilon}_0 \quad (3)$$

$$y_s = \delta \ln(\theta + p_0 \delta \ln(\theta) + (1 - T_B)B + (1 - T_e)\tilde{e} - D) + \tilde{\varepsilon} \quad (\delta = \ln(AE)) \quad (4)$$

In which, for the present time period, the output of the firm is determined by original investment made by principals or say shareholders at the beginning of time zero, the original investment or cash flow contributed by principals is represented by θ. The output isn't merely determined by the availability of cash flows. Another factor that also jointly impacts the output of the firm is the efficiency of operations, which is the function of technology of the firm and the effort from the manager. The study does not differentiate between the productivity function of the two periods due to rigidity of contract between the agent and principal.

The study also keeps the technology static over the two periods. It expresses some changes in the output function of the future period in which the cash flow availability has been changed by output performance in the present time and finance decisions at the end of the current time. With different finance policies that the firm implements, the cash flow is reduced or increased by more or less debt and equity issued, as well as dividend policy at the end of the current period. Pertaining to this part, we simply assume the efficiency at the present time is constant and does not come from the dividend policy at the end of the current period. It is rational to consider the current period's effort from managers confirmed by recruiting contract for better understanding of future effort influenced by dividend policy as our prior interest. The dividend at the end of the current period will impact the efficiency of the future term by channels of finance generating and agent problems.

In the future period, the firm conducts production activities as well. But unlike in the current period, the firm needs to pay back debt borrowed with an interest return of r_s under a certain level of corporate tax saving of τ_B. In terms of dividend, beside certain changes of dividend payment, the firm faces large or small dividend payments that are wholly attributed to increased or decreased equity in period 0. This certain change of dividend g is promised and planned by the firm or you can say that the agent is reliably considered to maintain constant growth of the dividend with positive signs. Then, cash flow for firm j at state of s in the future term is as follows:

$$X_s^j = p_s y_s^j - [1 + r_s(1 - \tau_B)]B^j - D_0^j(1 + g^j)(1 + \tilde{e}^j) \quad (5)$$

The output included in equation (5) is expressed by equation (4). Also, at end of the future period, the cash flow from the first period X_0^j and cash flow from the second period X_s^j will be distributed back to shareholders. In

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this study, Xs is the revenues from operating after reception or distribution of finance cash flows. More of Xs in the total of both periods means more terminal value will be received by shareholders.

One of the valuations to what really matters for market capitalization is the discounted cash flow approach according to Miller and Modigliani (1961). Our principal assumption is founded on the maximization of discounted cash flows that determines the wealth with continuity of holding or sale for capital gains by shareholders or principals. A little adjustment for that assumption is focused around the contexts of cash flows impacted by dividends or other financing policies assuming only revenues relate to the dividend policy and not the cost of operations. In other words, we simply assume the operation costs as constantly determined for both current and future periods, which means revenues generated by efficiency and cash availability and financing policies including dividend policy are our research interests. It is possible that operating costs also impact the movements of dividend results. We do not reject that assumption. But we do prefer priority of clarifying the major factors before conducting relevant research.

The firm j has the primary goal of maximizing the cash flows generated for shareholders including in the first period (current) and second period (future) from both operating revenues and financial cash flows. The Value of the firm is simply determined by cash flows that can be generated according to the theory of corporate valuation:

$$\begin{aligned} V_j &= (X_0^j + D_0^j) + (\frac{1}{1+r})\left(\frac{1}{1+\tilde{e}^j}\right)\left[X_s^j + D_0^j(1+g^j)(1+\tilde{e}^j)\right] \\ &= \left[p_0 y_0^j(p_0,\delta^j) + (1-T_B)B^j + (1-T_e)\tilde{e}^j\right] + \\ &\left(\frac{1}{1+r}\right)\left(\frac{1}{1+\tilde{e}}\right)\left\{p_s y_s^j(p_s,\delta^j) - \left[1+r_s(1-\tau_B)\right]B^j\right\} \end{aligned} \quad (6)$$

In equation (6), according to the needs for production given efficiency δ and price p_s, the firm decides on extra debt B, additional share issuing $\tilde{e}$, and dividend distributions. Instead of expressed in total, the firm's value is indicated by value per share or earning per share assuming that original ownership is one unit. Therefore, with more extra shares issued, less value per share calculated is given to constant sales income. This will help us to see how the more or fewer shares issued or repurchased explicitly dilute or antidilute earning per share (EPS) for shareholders. Because the amount of borrowing and extra repurchase or reissuing are assumed solely to service dividend payments and production needs, any dividend decision made in period one does affect financing by debt or equity in period zero and also cash availability for production of the future period. If the non parts of extra capital issued are for maintaining dividend payment, the formula (6) is probably inconsistent with the irrelevance hypothesis. This study is looking for the answer among dividend, debt, and reissuing or repurchase of shares, so equation (6) assumes debt and share repurchase or resale are not only for matching production needs but probably also for maintaining dividend payments at least partially, accompanied by either cost of increased interest payment, or benefit from saving tax and improved monitoring effects. Increased debt increases efforts paid by executives and accordingly leads to output increases, in which this effect is initiated from D to E and to y implied in $\delta(A, E(D))$. That is the partial reason why many firms raise capital by borrowing at the same time as making dividend payments. Therefore, the value of the firm can be rewritten as follows:

$$\begin{aligned} V_j &= (X_0^j + D_0^j) + (\frac{1}{1+r})\left(\frac{1}{1+\tilde{e}^j}\right)\left[X_s^j + D_0^j(1+g^j)(1+\tilde{e}^j)\right] \\ &= \left[p_0 y_0^j(p_0,\delta^j(A,E(D))) + (1-T_B)B^j(D_0^j) + (1-T_e)\tilde{e}^j(D_0^j)\right] + \\ &\left(\frac{1}{1+r}\right)\left(\frac{1}{1+\tilde{e}^j(D_0^j)}\right)\left\{p_s y_s^j(p_s,\delta^j(A,E(D_0^j))) - \left[1+r_s(1-\tau_B)\right]B^j(D_0^j)\right\} \end{aligned} \quad (7)$$

In equation (7), the extension of equation (6), the impacts from dividends are expressed not only in the channel of the financial part but also in the efficiency of operations due to efforts contributed by agents. First of all, with a different dividend policy, the financial policy of debt and equity show uncertainty. Overall, the dynamic combination of dividend, debt and equity determines cash availability for production. Also, with a different dividend policy, the change of productivity implies there are certain impacts on the performance of managers and agents through efforts. Those two channels converged into a central consequence which is the value of the firm or wealth for principals.

It is worth remembering that discount rate r adopted is Weighted Average Cost of Capital (WACC) or cost of capital which is regularly applied to the firm's valuation based on cash flows. It means financial strategy changes lead to WACC changes. When the firm increases equity finance, corresponding debt finance needs will be declining. As a consequence, the weighted average cost of capital will be changed due to respective weight

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changes in the capital structure. In addition, if financial costs change due to the circumstances of market change, the weighted average cost capital is led to change as well. Nevertheless, the cost of debt is relatively less than the cost of equity in general due to the risk born by investors and the tax shield benefit of debt finance. Therefore, with a decrease of equity finance and an increase of debt finance, the cost of capital does not show change of the same significance.

In the second period of operation and finance, costs of debt and equity finance have been clearly incorporated into the system. It is analogous to the understanding of the cost of capital that with more or less weight on debt or equity decided by the firm in the current period, the overall cost of capital or discount rate used for the future period is endogenously determined, recognizing that the market also exogenously impacts the cost of specific-type finances. Therefore, the cost of capital is determined by endogenous factors, i.e., debt and equity raised by the firm in the current period, and exogenous factors, i.e., the cost of debt and the required rate of return in the market.

1. Two-Period Consumption and Investment Decisions

Principles are both shareholders and consumers to firms. They decide to choose the consumption level over current and future periods. Also, they decide to choose the investment portfolio in order to improve their wealth. The principle i has state-contingent initial endowment, which is $\omega^i := (\omega_0^i, \omega_1^i, ..., \omega_s^i)$, and utility function of state-contingent consumption bundle, which is $Q^i(y^i) := Q^i(y_0^i, y_1^i, ..., y_s^i)$. For extra shares issued or repurchased, each principle i has initial shareholdings that are $\tilde{k}^i := (\tilde{k}_1^i, ..., \tilde{k}_j^i, ...\tilde{k}_J^i)$, and new shareholding $k^i := (k_1^i, ..., k_j^i, ...k_J^i)$ after transactions of repurchases or re-sales. These shareholdings are not an amount of shares but the proportion of ownership they have. Therefore, consumers or shareholders can choose optimal consumption and portfolios plans $(y^i, B^i, \tilde{e}^i)$ to maximize the utility implied by consumption bundle Q, which is clearly explained by Eichberger and Harper (1997).

$$\arg Max\left\{\begin{array}{l} Q(y_0^i, y_1^i, ..., y_s^i) \mid p_0 y_0^i + B^i + \sum_{j\in J} k_j^i \tilde{e}^j \le p_0\omega_0^i + \sum_{j=J}\left[\tilde{k}_j^i(\tilde{e}^j + D_0(1-\tau_p)\right] \\ p_s y_s^i \le p_s\omega_s^i + (1+r_s)B^i + \sum_{j\in J} k_j^i\left[(X_0^j + \frac{1}{1+r}X_s^j) + D_0(1+g)(1+\tilde{e}^j)(1-\tau_p)\right] \end{array}\right\} \quad (8)$$

In which, τ_p is the marginal rate of personal income tax levied on incomes from dividend distribution, which causes the actual amount of dividend received to be less than the announced amount. One should note that, in practice, dividend tax is generally higher than the tax for capital gains. We assume a tax rate of zero for capital gains when the proportion of shareholding k has been changed by transactions. When large amounts of dividends are distributed by firms, high personal tax should be paid by shareholders. The change of proportional ownership from the original to a new one does impact the budget constraints for both periods but does not lead to extra tax payments for personal income under the assumption.

For the first constraint in equation (8), the amount of goods a principal can consume – implied by the production of price and units (output for firm), and the financial assets the principal decides to hold – are limited to the original wealth he or she possesses and the original financial assets the principal owned with the dividends received from original financial investments. The activities in future terms are expressed by the second constraints in equation (8), where the principal gets all the investments back with additional returns such as interest and dividends. A certain proportion in each firm that is owned by principals consists of cash flows generated and dividends distributed by the firm in two periods. It is obvious that current and future periods have different consumption constraints due to allowing transfers between the current period and future terms. The wealth between the two periods can be identified as follows:

$$\begin{aligned} W_0^i &= \sum_{j\in J}\tilde{k}_j^i(\tilde{e}^j + D_0^j(1-\tau_p)) - \sum_{j\in J} k_j^i\tilde{e}^j - B^i \\ W_s^i &= \sum_{j\in J} k_j^i\left[(1+r)X_0^j + X_s^j + D_0^j(1+g)(1+\tilde{e}^j)(1-\tau_p)\right] + (1+r_s)B^i \end{aligned} \quad (9)$$

Recognizing that financial assets held by shareholders are certainly part of the wealth they own, the wealth expressed is the "wealth available" for utility objectives. It is the reason that the functions net the amount for new portfolios from the sum of the original financial assets and dividend returns. More funds contributed to firms by shareholders/consumers in the current period equals less wealth for the realization of utilities in that period. Furthermore, according to market clearing conditions, the following should be satisfied:

$$\sum_{i\in I} y^i = \sum_{j\in J} y^j + \sum_{i\in I}\omega^i, \sum_{j\in J} B^j = \sum_{i\in I} B^i \quad (10)$$

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It is obvious that the willingness to transfer is definitely determined by the marginal rate of substitution between two periods in accordance with the utility maximization. This transfer is implied in the choice of consumptions as well as the change of investment strategies. By increased proportional ownership holding from the original to a new one, principals confront changed (decreased) budget constraint or wealth possessed in the corresponding period or vice versa. With increased new proportional holding of ownership in firm j, principal i has less wealth to consume in the current period by greater sharing of the firm's termination in future terms calling for an increasing value of financial assets. It is brought to our interest about changing investment strategies by dealing with average proportional ownership rather than a specific percentage of shares in firm j in a later part of the analysis, assuming the investment occurs in the context of portfolio instead of as a stand-alone risk.

Although wealth consideration is consistent under the principal and the firm itself, the introduction of utilities into the problem probably requires more complicated dividend policy solutions. In addition to the performance for wealth maximization, the allowance of inter-temporal transferring and change of budgeting constraints need dividend policies to be further scrutinized by the marginal substitution effect over two periods. Financially, distributions of dividends give more or less different cash flows generated from operations through available needs for production. Concentrating on real free cash flow growth or dividend payment is the way to maximize their salary for the realization of their utilities. However, these two directions are not in the same orientations. Real free cash maximization is inconsistent with the wealth maximization of shareholders, but not dividend payment. Suspecting severe agent problems forces shareholders to prefer monitoring tools of dividends, and manager's compensation and salaries are highly impacted by the dividend payment in any term, including current and future terms.

Certainly, besides recruitment contracts, managers and executives are able to observe the governance of firms to assess the severity of agent problems. According to the results of hiding observations, managers and executives perform the service accordingly. We clearly understand that a high degree of information asymmetry and a high level of agent problems lead to different concentrations over discounted cash flows and dividends. The simple P can be set as the weight on real free cash flows that shareholders define for salaries of executives. Accordingly the study indicates (1-P) as the weight on dividends that can impact salaries of executives. If the firm is bearing a high level of information asymmetry, the principal has limited reliable information to monitor and evaluate the performance of the agent. The persuadable approach to compensate the agent under this situation is to rely on salaries for agents mainly on the dividends they distribute. In contrast, under less severe agent problems, the principal definitely prefers actual total maximization of discounted cash flows from current and future periods, instead of dividend maximization. It is understandable that executives have observation abilities to discover the weight for performing the corresponding job. Externals, or stakeholders, as well as internal managers, identify the type of corporate governance to conclude pro-principal or pro-agent responses for suitable weights on cash flows and dividends. Those corporate governances are reflected in primary mechanisms such as provisions in the charter that affect takeovers, the composition of the board of directors, and compensation plans considering degrees of entrenched management. Straightforwardly at high degrees of entrenched management, there is a low value of P.

The salary function can be defined as follows:

$$W^I = \left[P(X_0 + \frac{1}{1+r}\frac{1}{1+\tilde{e}^j} X_1) \right] + \left\{ (1-P)\left[D_0(1-\tau_P) + \frac{1}{1+r} D_0(1+g)(1+\tilde{e})(1-\tau_P) \right] \right\} \quad (11)$$

The salary is determined by generated cash flow and/maybe by the distribution of dividends. Let P range from 0 to 1. When P is exactly equivalent to 0, there is extremely serious distrust between principals and agents. This situation is understandably very rare in practice. At the time that P is equal to 1, we see the disappearing of agent problems because the principal evaluates the present termination value as the index of salaries for agents and ignores how much dividends are scheduled or distributed by executives. If this is the case, there is no need to separate the systems between firms and executives and the irrelevance hypothesis seems acceptable, which again is not practicably recognized. Then, the suitable value of P should be greater than 0 and less than 1, and it is probably reasonable to narrow this value to the middle value form 0 to 1, such as around 0.5 for regular firms by assumption.

Efforts contributed by executives are also the major personal costs for their utility goals. We can define the efforts function used by Bhattacharyya (2003) as follows:

$$\frac{1}{2} ME^2 \quad (12)$$

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M is a parameter of the cost of the effort function and E is the effort made by executives. It is obvious that the more efforts made by agents, the more costs they face. Linking all previous considerations, executives have the following maximization goal:

$$Max\left[P(X_0+\frac{1}{1+r}\frac{1}{1+\tilde{e}^j}X_1)\right]+\left\{(1-P)\left[D_0(1-\tau_P)+\frac{1}{1+r}D_0(1+g)(1+\tilde{e})(1-\tau_P)\right]\right\}-\frac{1}{2}ME^2 \quad (13)$$

In this problem, executives decide the policy of dividends, debt, issuing extra equity, and effort. The executives have a plan of (D, B, $\tilde{e}$, E) to maximize their own wealth, more or less under the name of wealth for principals. Meanwhile, there are certain salary reservations (i.e. minimum wage required by executives) which are considered as participation constraints. And there are certain incentive constraints that need to be incorporated into the analysis in the latter part of this study. The utility of the agent is the results of the remaining salary after the deduction of effort costs. A high salary is caused by the combination of dividend distribution and cash flows, generating less effort needed to pay in order to reach maximum utility. Recalling the cash flow function of equation (5), the effort from the agent also impacts the salary through the channels of output to cash flows.

2. Optimal Dividend Theory

The agent's problem of utility maximization realized from salaries leads our interest to how salaries are determined as a result from weights over cash flows and dividends. If information indicates a high level of asymmetry, or agent problems show a high degree of severity by corporate governance and mechanisms, the salaries by contract or negotiation will be high depending on how many dividends that firm schedules to distribute. That means salaries depend less on the discounted cash flows from a two-period operation in that scenario. If the information asymmetry and agent problems express less severity by corporate governance and mechanisms, the wages from contract or negotiation will be high depending on how much cash flows from the two-period operation. This concept is implied in the following equation:

$$MAX\left\{\begin{array}{l} W=\left\{P\left[p_0y_0+(1-T_B)B+(1-T_e)\tilde{e}-D_0+\frac{1}{1+r}\frac{1}{1+\tilde{e}}\left[\begin{array}{l}p_sy_s-[1+r_s(1-\tau_B)]B\\-D_0(1+g)(1+\tilde{e})\end{array}\right]\right]\right\} \\ +\left\{(1-P)\left[D_0(1-\tau_p)+\frac{1}{1+r}\frac{1}{1+\tilde{e}}D_0(1+g)(1-\tau_p)\right]\right\}-\frac{1}{2}ME^2 \end{array}\right. \quad (14)$$

Therefore, how the firm or principal decide the determination of salaries is the first consideration for the agent to maximize their utility. From the viewpoint of the agent, what really matters to their utility is not the contractual amount of salaries but actual net "income". Instead of using a salary that represents the amount of a contractual agreement, the study indicates that the net amount after the deduction of effort costs for managers is the "salary". The salary jointly has the effect with financial strategy including debt and equity on the dividend policy of the firm. Salary also is determined by two trade-off channels including cash flows and dividends. It is probable that different firms have different levels of agent problems and each firm's severity of asymmetry implies diversification.

Proposition 1: $\Delta\tilde{e}>0,\Delta P<0,$ more diversified ownership, high degree of agent problems; $\Delta\tau_B>0,\Delta\tilde{e}<0,$ with increased tax shield from debt issuing, agent is willing to issue less equity. It is interesting to see the disappearance of the tax shield of debt from the observation of agents in the degree of agent problems under optimal dividends and debt policies. The managers observe all the factors except tax shielding from the context. Tax shields do not, more or less, change the optimal level of dividends or debt decisions for managers and do not affect current decisions made by managers due to the post-occurrence of the saving. However, they do affect the optimal equity that the agent is willing to issue. Consistently with the general cash flow hypothesis again, more tax shields from debt issuing cause a less optimal level of equity issuing:

$$\tilde{e}^*=\frac{[1+r_s(1-\tau_B)]-p_sy'_B}{(1-T_B)(1+r)}-1 \quad (18)$$

In equity (18), the tax shield represented to managers expresses similar results as for the firm itself, which we will explore later. Up to this point, it is possible that a high tax shield contributes to resource of personal benefit in terms of cash availability or to the firm's maximization of discounted "true" cash flows in terms of better funding for output. Temporarily embedding the doubt to later proof, the equation (18) gives definite expression that a tax shield does matter to a manager's utility maximization. There are internal factors, such as transaction costs and tax shields from debt, and marginal outputs of debt, that are vital to a manager's decision about equity issuing, together with external factors that are the cost of capital and vector of prices over states.

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Proposition 2: With a constant market rate of return and price of output, the effort curve of the agent is concave in the explanation of the degree of asymmetry information and level of additional equity issuing, although those will not "discourage" effort to be "negative".

$$E^* = \frac{Pp_s y'_E}{M(1+r)(1+\tilde{e})} \tag{19}$$

The probable answer for the effect of marginal output of effort is that the agent is willing to pay more efforts when managers observe the result of high output contributing availability resources for discounted cash flows or dividend distributions. Marginal output increases or degrees of asymmetry decrease; both have the same effect because it leads to increased cash flow availability or high levels of self discipline. It is understandable that more weight is assigned on "true" discounted cash flow results and less on agent problems or information a

$$E = \sqrt{\frac{Pp_s \ln X}{M(1+r)(1+\tilde{e})}} \tag{20}$$

Where X represents the cash flow availa

ble for operations in state s of future period, the positive sign means the agent will more or less pay efforts but not negative as long as he or she has committed to principals according to a contract, although there is a reservation salary required by them. It is reasonable to assume that the agent will quit the system if the salary is less than the reservation wage $\tilde{w}_R$. The agent will remain in the firm by contributing positive efforts, and zero efforts will be unacceptable due to unsustainable cash flows and dividend payments. If equity issuing and degrees of agent problems show relative relationships as in proposition 1 ($\Delta\tilde{e} > 0, \Delta P < 0$), the impacts on the efforts will be a little complicated in the explanation of equation (20) because it is unclear whether it is positive or negative of the net effect from nominator (P) and denominator ($\tilde{e}$). For a call of better understanding about the efforts of agents, we assume the consistency of the price of output (p=1), market rate of return (r=0.8), and parameter of effort (M=2). Original cash flow available for production is assumed to be constant at one unity as well. According to $\Delta\tilde{e} > 0, \Delta P < 0$ in proposition 1, P and $\tilde{e}$ move oppositely and the effort of the agent expresses a diminishing increase and reaches its optimal point at point of a concave shape. In the simulated scenario, the point, where the value is at 0.2001, is the optimal choice of effort that the agent is willing to contribute. At this selection point, the value of P (0.6) is different from the proportion of additional equity (0.4) that the agent schedules to issue. This indicates that the agent does have a choice about effort under the combination of the observed movement of asymmetry information and equity issuing, in which additional equity issuing is controllable for the agent.

Proposition 3: Marginal rate of substitution $(\frac{Q'_{y_0}}{Q'_{y_s}} = \frac{(1+r)p_0}{p_s} = MRS)$, investment strategy (original average invested proportion of ownership $\tilde{\tilde{k}}$ and new average invested proportion of ownership $\bar{k}$), and personal income tax are major factors for the principal to evaluate the optimal dividend policy. When it turns to the problem of the principal (shareholder), consumption budgets play the key role in the determination of utility maximization. As shown in "Appendix B: Proof of Propositions", Lagrangian equations for the principal express two budget constraints consisting of current and future periods.

$$\begin{aligned} &L(y_0, y_s, B, \tilde{e}, \lambda_1, \lambda_2) = Q(y_0, y_s) - \\ &\left\{ \begin{aligned} &\lambda_1 \left[p_0 y_0 + B + \sum k_j^i \tilde{e}^j - p_0 w_0 - \sum \tilde{k}_j^i (\tilde{e}^j + D_0(1-\tau_p)) \right] \\ &+ \lambda_2 \left[p_s y_s - p_s w_s - (1+r_s)B - \sum k_j^i \left[\begin{aligned} &(x_0^j + \frac{1}{1+r} x_s^j) \\ &+ D_0(1+g)(1+\tilde{e})(1-\tau_p) \end{aligned} \right] \right] \end{aligned} \right\} \end{aligned} \tag{21}$$

The willingness of the principal to transfer the consumption as well as investment between current and future terms is determined by the observations of the principal about market prices in current and future terms and market rates of return. This one can be called intertemporal consumption preferences under the assumption of a two-period model.

It results in optimal dividend policy for principals in the explanation of investment strategy changes, marginal rates of substitution between two periods, and so on. In order to explore overall changes in the investment strategy of principals, we are not concerned with stand-alone investment in the specific firm j. The change of investment decision is reflected in the average proportion overall invested in firms by defining the original

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average proportion in each firm j as $\bar{\tilde{k}}$ and the new average proportion in each firm as $\bar{k}$. It turns out that the optimal dividend for principals is definitely linked with their investment schedule.

$$D_0^* = \frac{(1+r)(\bar{k}-\bar{\tilde{k}})}{\bar{k}(1+g)(1-\tau_p)} \text{ or } D_0^* = (\frac{p_0}{p_s} MRS)(1-\frac{\bar{\tilde{k}}}{\bar{k}})\frac{1}{(1+g)(1-\tau_p)} \quad (22)$$

In equations (22), the marginal rate of substitution (first term on right side of the second equation) and the investment decision change (second term on right side of the second equation) have bonding power on the optimal dividend policy for the principal. With increased average-invested proportion of ownership, the level of optimal dividend seems to increase as well. It is understandable that increased equity investment is hoped will achieve incremental changes in dividend returns. At the same time, with high scheduled growth rates of dividend g, the principal is willing to accept a relatively low optimal dividend in the current term. However, the movement of marginal personal income tax does not seem to follow what we expected. A relatively high level of marginal rate of personal income tax indicates a high level of optimal dividend for the principal in the third term of equation (22). Theoretically speaking, the principal prefers a low level of dividend payment for avoiding high rates of marginal tax. The answer for this dilemma is probably embedded in the introduction of a two-period transferring of consumption and investment. Because a high level of marginal rate of tax is not only for the current term's dividend but also for the future term's receiving of dividend, a high level of dividend in the current term with positive growth rate leads to an even higher level of dividend in the future term. As a result, tax for dividends will be high for both periods. This loss for the principal seems acceptable under the considerations of consumption, substitution and investment strategy.

Finally, before incorporating the problems of the principal and agent to the firm's decisions in equation (6) or (7) about debt, equity and dividend, the study primarily explores isolative understanding about the firm itself. By taking the first order derivative on equation (6) with respect to B and $\tilde{e}$, we see the optimal level of debt and equity for the firm in order to maximize the overall value over the two periods.

$$\tilde{e}^* = \frac{[1+r_s(1-\tau_B)]-p_s y'_B}{(1+r)(1-T_B)} - 1 \quad (23)$$

$$B^* = \frac{(1+r)(1+\tilde{e})^2(1-T_e)+(1+\tilde{e})p_s y'_{\tilde{e}} - p_s y_s}{1+r_s(1-\tau_B)} \quad (24)$$

Pertaining to the optimal level of equity for the firm, the market rate of return, and the price of output impact the decisions about equity. For the firm's self conditions, three factors relative to debt are major influences that determine the optimal level of equity. These are marginal output of debt, transaction cost of debt and tax shield from debt. It is tenable that a high tax shield and preferred level of marginal output are associated with relative lower optimal equity. It is also acceptable that a high transaction cost T_B of debt forces the firm to lean on more equity issuing. Most importantly, the equation of optimal equity in (23) is exactly the same as the one for the agent in equation (18), which means **there is no disagreement between firm and agent in terms of the policy for equity issuing**. However, it is not a definite conclusion about equity policy due to further impact under the problem of the agent, by recalling that a high level of equity issuing leads to a high degree of asymmetry information and, therefore, agent problems. Following this change of the degree of asymmetry effort shows a concave movement in proposition 2. The dynamic character of effects transferring is probably the most difficult part that requires us to further explore the rules about dividend policy.

In equation (24), optimal debt for the firm shows more complicated associations among factors including marginal output of equity $y'_{\tilde{e}}$, transaction cost of equity issuing T_e , amount of additional equity issuing $\tilde{e}$, and tax shield of debt τ_B , and so on. It is interesting to see that the amount of equity that is scheduled to be issued becomes one of the factors that determines the optimal amount of debt for the firm.

Proposition 4: Without agent problem, $V'_D < 0$ and $D^* = 0$, the marginal value of the firm with respect to the dividend is negative and the optimal level of the dividend distribution for the firm equals zero. Under the assumption of perfect mechanisms, due to negative signs of marginal output in the following equation (25), the marginal value of the firm shows a negative sign also.

$$y'_D = \frac{-\delta}{\theta + p_0\delta\ln(\theta) + (1-T_B)B + (1-T_e)\tilde{e} - D} \quad (25)$$

In which the denominator is the cash flows available for the second term and it is definitely positive, the positive cash flows in the denominator and negative in the numerator make the marginal output of the firm with respect

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to dividend change negative. The sign of marginal value of the firm with respect to dividend is actually determined by the sign of marginal output of the firm with respect to dividend change, as shown in equation (26).

$$V'_D = \frac{1}{1+r}\frac{1}{1+\tilde{e}}(p_s y'_D) \tag{26}$$

Consequently, the more dividends distributed, the less the firm's value would be when no agent problem is present. All cash flows retained from reduced or zero dividend distribution are reinvested in profitable operations, of course with the impact from the output price.

Finally, the study sets up the system for maximizing the value of the firm as our overall goal for better utility maximization and efficient economic resources allocation.

$$Max\left\{\begin{array}{l} V_j = \left[p_0 y_0^j(p_0,\delta^j) + (1-T_B)B^j + (1-T_e)\tilde{e}^j\right] + \\ \left(\frac{1}{1+r}\right)\left(\frac{1}{1+\tilde{e}}\right)\left\{p_s y_s^j(p_s,\delta^j) - \left[1+r_s(1-\tau_B)\right]B^j\right\} \end{array}\right\} \tag{27}$$

Incentive constraint 1:

$$\begin{array}{l} D_0(1+g)\left[p_s y'_D - (1+r)(1+\tilde{e}) - (1+g)(1+\tilde{e})\right] = \left[p_s y_s - (1+r)(1+\tilde{e})^2(1-T_e)\right] \\ \left[(1+g)+(1+r)(1+\tilde{e})\right] - p_s y'_{\tilde{e}}\left[(1+\tilde{e})(1+g)+(1+r)(1+\tilde{e})^2\right] \end{array} \tag{17}$$

Incentive constraint 2:

$$D_0^* = \left(\frac{p_0}{p_s}MRS\right)\left(1-\frac{\bar{\bar{k}}}{\bar{k}}\right)\frac{1}{(1+g)(1-\tau_p)} \tag{22}$$

With the values of marginal output:

$$y'_B = \delta(1-T_B)\frac{1}{\theta + p_0\delta\ln(\theta) + (1-T_B)B + (1-T_e)\tilde{e} - D} \tag{28}$$

$$y'_{\tilde{e}} = \delta(1-T_e)\frac{1}{\theta + p_0\delta\ln(\theta) + (1-T_B)B + (1-T_e)\tilde{e} - D} \tag{29}$$

Derived from the agent and principal's problems, there are two incentive constraints. One is the constraint (equation (17)) from agent problems under the considerations of utility maximization of salary. For the agent to participate in the decision about the optimal dividend policy of the firm, the utility for them must be satisfied with the observations about the firm's asymmetry information. The debt policy has disappeared from the incentive constraint of the agent. That can be explained previously that a compromise over debt issuing has been reached between the firm and agent. What really matters for the agent is the impact from the issuing of equity and the distribution of dividends by the firm. The changes of equity levels help us to decide the level of debt suitable to issue, and also the agent adjusts his or her efforts accordingly to the degree of asymmetry information that is observed in equity issuing. There is no doubt that debt enhances the monitoring power over the performance of managers because of financial stresses and stringent scrutiny. The bearing of this burden might be tolerated by executives if the equity issuing and the resulting utility are located at the preferred range of the agent. That also means how much debt to issue already is in hiding schedule of the agent that is observing or deciding amount of equity and making effort correspondingly. Another constraint is from the utility maximization of the principal that receives a salary from the firm measured by the amount of cash flows and dividends. As we mentioned previously, the most important factors for the principal to decide are the marginal rate of substitution, investment strategy and personal income tax.

Those two constraints are heard formally in the firm's board of directors by routine or non-routine influences, or informally through the threat of being taken over. The firm's decisions actually are the results of interactions between those two constraints. If the firm's goal is to maximize the value of the firm over a two-period model, this value should be considered as the "value" of utility for principals as well. Also, due to the firm's value being under the control and contribution of the agent, in the process of maximization agent's utility is second one (first one in fact) to be considered involving degree of asymmetry information and level of equity issuing.

By the simple process of equation (17) and equation (22), the study discovers a new marginal output of equity in equation (30) which is different from equation (29) in form. The proof has been provided in the Appendix.

$$y'_{\tilde{e}} = \frac{\left(\frac{1-T_e}{1-T_B}\right)\left[1+r_s(1-\tau_B)\right] - (1+r)(1+\tilde{e})(1-T_e)}{p_s} \tag{30}$$

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In equation (30), on the left side of the equation, first term $(\frac{1-T_e}{1-T_B})[1+r_s(1-\tau_B)]$ in numerator shows the product of comparison between transaction costs T of equity and bond or debt, and the net effect of the tax shield. When the tax shield from debt is low or the transaction cost from debt is high, the marginal output of equity is probably high. Nevertheless, the high level of equity is not always preferred by firms. As in the second term of the numerator on the right side of equation (30), the actual high cash flow received from equity issuing after the deduction of transaction costs reduces the marginal output of the equity. If the factors of transaction costs and tax shields prefer equity issuing by increasing the marginal output, that equity issuing is not always favored at a high level because increasing the level of equity also means decreasing the rate of marginal output. Consequently, from the maximization of the value of the firm and all constraints derived from agent and principal problems, by defining $K = \frac{\bar{k} - \tilde{\bar{k}}}{\bar{k}}$ as the change of equity holdings by principal at the end of the current period where $\bar{k}$ is new average proportion of equity that the principal holds in each firm and $\tilde{\bar{k}}$ is the original average proportion of equity that the principal holds in each firm, an optimal level of dividend has been explored in the form of pertaining factors including, K, B, $\tilde{e}$, r, rs, g, τ_B , τ_p .

$$D_0^* = \frac{KB[1+r_s(1-\tau_B)]}{(1+\tilde{e})\{K[(1+r)+(1+g)]-(1-\tau_p)B[1+r_s(1-\tau_B)]\}} \quad (31)$$

3. CONCLUSIONS

It results that the dividend policy has been explicitly explained in the interaction between the debt and equity of the firm recognizing influences from the agent. The study firstly introduces the investment strategy of principals or shareholders into the system of optimal dividend policy. K in this equation is the rate of change of the average equity holding in each firm by shareholders and this change is probably caused by shifting wealth into consumption or debt investments. When the investors or principals change the structure of investment, we say they change the investment and consumption strategy. Tax effects of personal income tax and tax saving for firms do matter in determining the optimal dividend policy. One channel of tax effects is tax shielding τ_B thanks to debt issuing. Another side of the tax effect is marginal personal income tax that influences the actual amount a principal receives. It is evident that marginal personal income tax τ_p does have a negative impact on the optimal dividend policy. With a high level of marginal rates of personal income tax, firms' and also principals' preferred level of optimal dividend distribution should be less. This theoretical output is in line with the contributions from Elton and Gruber (1970), Litzenberger and Ramaswamy (1980), Miller and Scholes (1982), Bernheim (1991), Chetty and Saez (2007) and Desai and Dharmapala (2007).

Meanwhile, a high scheduled constant rate of dividend growth should be accompanied by a low level of original or current level of the dividend. It is reasonable to say that the firm is willing to maintain a constant increased rate of dividend change by which to please principals, rather than setting up a high current dividend distribution with a decreased rate of growth. The firm's actual capacity does limit dividends scheduled in abnormity. Even though we recognize certain weights of dividends measured on salaries of agents, that weight should be in the constraint of the firm's rationale and is not fully conducted merely according to the preferences of agents.

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