MODIFYING CORPORATE PERFORMANCE ASSESSMENT TO IMPROVE INCENTIVE WITH THE OPTIMAL OPTION PRICING APPROACH IN CHINA

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Abstract: In order to explore the effective incentive design relying on qualified performance assessment for human resource development in corporations, the study conducted innovative exploration by employing Option Pricing Model to derive optimal incentive considering the uncertainties. Panel Least Regression is executed for Pooled, fixed effect, and random effect, through processing the 16 largest listing firm in Shanghai Stock Exchange Index 50, from the year 2008 to 2016. It results that performance assessment of operational efficiency is the key to determine the level of compensation and it can effectively motivate employed executive to perform optimally, incorporating the uncertainty faced by both firm and executives. It is suggested to fetch operating efficiency as key benchmark for incentive design. It is strongly against the usage of overall performance measurement Return on Equity as the key benchmark as currently what the market is doing.

Keywords: Performance Assessment, Option Pricing Model, Effective incentive, Human Resource Development

Introduction

Designing an effective incentive and rewarding system has been one of crucial components of corporate governance, which inevitably challenges decision making of both shareholders and employees.   It is unarguably supported by Murphy (1985), that executive compensation is strongly positively related with corporate performance.

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In addition, Haubrich (1994) further expresses the non-expensive incentives for enhancing a firm's performance to a CEO. Sigler (2011) explored the significant positive relationship between CEO compensation and corporate performance, recognizing the material impacts from firms' size. The similar findings have been presented by Mitchell, Lewin, and Lawer III (1989), from which profit sharing results higher productivity and improved firm performance. In addition, Swanson and Holton (2001) illustrated the comprehensive model for diagnosing organizational system in which performance measurement systems have definite impacts on organization effectiveness.

Nevertheless, information asymmetry and agency problem do impede the perfective contribution of incentive system to corporate performance and complicate the resulting firms' value. For instance, Wulf (2007) strongly demonstrates the negative tradeoff between risk and incentives and illustrates incentive design conditioned with authority over project selection, for maximizing firm performance. Meanwhile, Jasen (2001) contributes the important concept of "Kinked" relationship between pay and performance, in which poor-performing employees are more willing to take risky projects resulting reduced corporate value, and good-performing employees are more willing to take less risky projects causing opportunities forgone.

Recognizing the important role of performance incentive system, in the circumstance of fast developing economy of China, the reform of listing firms' rewarding system is under the urgent agenda. Improving the efficiency and effectiveness of operational activities are the crucial hinge for Chinese listing firms' competitiveness, which is fully understood by executives and regulators. How to implement optimal rewarding system including the compensation range, is one of critical issues that Chinese firms are seeking. Unfortunately, Firth and Rui (2005) demonstrate non-apparent relationship between performance and pay due to the state agency as the major shareholders. It raises the question about the effectiveness of Chinese listing firms' incentive systems.

It is worth to mention the constructive findings for confronting the problems. Joskow and Rose (1994) suggest Boards may discount extreme performance outcomes both high and low relative to performance that lies within some "normal" band in setting compensation. Further improved by Copeland, Weston, and Shastri (2005), and Baker (2000), both the difference between actual and expected economic profit, and characteristics of performance measures, have been proposed as key considerations into incentive design. In short, all the studies mainly confront the similar issues such as, linkage between corporate profitability and employees' performance, information asymmetric between employer and employee, agency problem existing in the organizational structure, and so on. It is unobservable for

firm to conclude performances of the year at the beginning of the each period even thought the incentive arrangement has to be announced to employees in advance. Therefore, firm is facing uncertainty of employees' performance when is committing the payment of incentives.

The study grounds on the aforementioned practical issues to explore the optimal bonus range recognizing the ambiguous performance types of employee. By assuming the incentive payment to poor-performing employees as long call option in finance and assuming the incentive payment to good-performing employees as short call option with different exercise price (which is minimum and maximum compensation). Through Option Pricing Model, it results the optimal bonus range, which is the difference between maximum bonus (ceiling) and minimum bonus (flooring). Following the calculation of optimal bonus range, a multivariable regression analysis will be executed to detect the relationship between optimal bonus range and other control variables that representing firms' characteristics including firm size, profitability, capital structure, and industrial classification. These observable controlling variables will be the factors of guideline that leads firm to design the incentive range in practice.

Literature Review

It is systematically demonstrated by Swanson and Holton (2001) that there are three-legged stool, with the three legs providing stability for Human Resource development for effective functioning in uncertainty. It is proposed that Human Resource Development should be the integration of psychological, economic, and system theories within an ethical frame. In addition, there are three specific economic theory perspectives to the discipline of Human Resource Development, which includes, scarce resource theory, sustainable resource theory, and human capital theory.

There are three specific psychological theory perspective proposed to the discipline of human resource development, which includes, Gestalt psychology, Behavioral Psychology, and Cognitive (purposive-behaviorism) psychology. It is worth to address that HRD should to include direct analysis, action, and measurement of economic outcomes, without which there is no motivation paid off from firm to employees. The purpose of any business organization is to maximize the wealth and gain profitability and any requirements for human resource/capital development aims for these goals. Unfortunately, in past decades, there were lack of literatures address the issues of one of there Human Resource Development's "leg" – Economic. Instead most of literatures were emphasizing on the "leg"-Psychology.

Nevertheless, the theory of HRD should be the "integration" rather than "isolation" of three aforementioned "legs", especially when we are studying business

organizations. Therefore, this study aims to explore the economic perspective of HRD theory without ignoring the System and Psychological perspectives, which will be elaborated and discussed in detail in the later chapters. It is prevailed rewarding system that compensation partially in alignment with performance achievement, which subject to the conditional ceiling due to the profitability protection and floors considering labor legislative requirement. The employee with high potential to contribute relative enormous profitability is more willing to take risky projects. Nevertheless, the one with low risk-taking propensity is the employee has less capability to be success in project implementation, for which basic salary and wage will be offered as the result.

The poor-performing employees are more willing to take risky projects under the protection of floor of basic salary. However, the good-performing employees are more willing to conduct conservatively although with the relative high capability to success, due to the demotivation effects of bonus ceiling. It is explicitly expressed in "Figure 1.1: The Kinked Relationship between Pay and Performance", from which vertical axis is pay consisting of basic salary and bonus, and horizontal axis is the level of performance from poor to good. The linear relationship does exist in between the point A and B. It is resulted that the risky projects with relative high possibility to success if undertaken by good-performing employees will be forgone due to the mechanism of demotivation from bonus ceiling placed toward them. On the other hand, the projects with relative high possibility to fail if undertaken by poor-performing employees will be implemented in expectation of receiving extra bonus if success by chance. Comprehensively, the firm will be taking less profitability projects, which in turn definitely will deteriorates the wealth maximization goal of firm.

Although the firm's willingness to pay for the bonus is determined by firm's size and industrial classification etc., it is theoretical irresistible to state that market mechanism does play the role of choosing the firm as the demanding side of labor. The firm's bonus setting or say pay alignment with performance have to incorporate the market response of employees based on own cost-benefit analysis for utility maximization. Consequently, it is acceptable to consider the equilibrium point between the pay to and input from employees. Employees are going to be demotivated in the scenario of bonus constraints and therefore the firms are willing to expand the bonus range.

Alternatively, employees are more willing to take the risky project with less possibility to win. It results that firm will decrease the basic salary level and expand the bonus range, as long as in accordance to the legislative requirement. As the result, there is the market mechanism of bonus dynamics accordance to the performance of

employees, to which employees interactively adjust the input according to the bonus floors and ceilings adjustment. Although employee compensation reform in Chinese industrial sector has been discussed in the literature, the real changes in compensation system and pay practices have received insufficient attention and warrant further examination. Cieri, Zhu, and Dowling (1998) briefly reviewed the pre- and post-reform compensation system, and reports the results of a survey of pay practices in the four major types of industrial enterprises in China.

The research findings indicated that the type of enterprise ownership has little influence on general compensation practices, adoption of profit-sharing plans, and subsidy and allowance packages. In general, pay is linked more to individual performance and has become an important incentive to Chinese employees. However, differences are found across the enterprise types with regard to performance-related pay. Current pay practices are positively correlated to overall effectiveness of the enterprise.

One of the major implications is the interdependence of other reforms. When the PRC was founded in 1949, the government adopted a 'three into one' system that mixed employment, wages and welfare (Huang & Yang, 1987). This policy forced enterprises, especially those in the public sector, to evenly distribute subsidies and allowances to their employees. Therefore, while a new compensation system is needed to help improve productivity, it depends on reforms in other fields, such as releasing SOEs' (State Owned Enterprises) heavy burden of social welfare (Liu, 1996), and establishing an acceptable objective performance appraisal system to strengthen the link between work and pay (Zhu & Dowling, 1997).

Overall, the results of many researches have supported the prediction of Adler, Campbell and Laurent (1989) that reforms in China would bring a trend towards performance-based compensation systems. Shenkar has argued that continuing reforms "may change the situation, particularly in collective, private, and foreign-invested enterprises" (1994). The research findings suggest that there is likely to be greater diversity in China in the future, with POEs and FIEs, in particular, placing increasing emphasis on performance-based compensation.

Application of Option Pricing Model to HRD Theory
The power of application of Option Pricing Model essentially captures the nature of decisions based on the dynamic payoff in future. The selection of future payoff is explicitly the decision on the portfolio construction in current period. With uncertainty incorporated into the model, the option-pricing model can be employed to decide the current portfolio's value. The benefit of option pricing model is not only the portfolio construction of decision making but also market mechanism of pricing

dynamics. It is demonstrated that for European call option there is a fixed relationship between the price of put and call options with the same maturity date that are written on the single assets, which derived by Stoll (1969) is called put-call parity relationship. The application of Optimal Pricing Model can capture the psychological responses from human capital facing business uncertainty and incorporates the economic outcome into systematic measurement and motivation to employees' performance. More specifically, when people face uncertainty of firm performance in future, they will perform in different ways due to his/her different capacity. This situation will definitely result different compensation cost for firms. Qualitative analysis possesses limited scope to handle it effectively. Fortunately, one of quantitative approach called optimal option pricing model can integrate the "uncertainty", "response with different capacity", "resulted different compensation costs for firm", all together in statistical model.

In the case of pay with performance, the compensation can be considered as the portfolio payoff of decisions. The good-performing employees are choosing the portfolio of shorting the call option, with exercise price equivalent to the summation of fixed payment (salary in the kinked linear relationship) and bonus range. If good performance is achieving the projects return that results higher bonus than ceiling, the good-performing employee only receives the ceiling that is the exercise price, in which the bonus payment is linearly proportional to project return. In the case that good-performing employees failed in operating the projects, the bonus will declined, which is the call option longed. The one with poor performance actually is selecting the portfolio of long the call option with exercise price equals to fixed payment (salary in the kinked linear relationship).

The case illustrated is exactly the duplication of bull spread of options, which can be created by buying a call on an asset with a certain strike price and selling a call on the same asset with a higher strike price. Definitely, the asset derived by option is the actual performance of employee, which is proportional to profitability of firm. The performance results from both the employees' conducts and market circumstance. Therefore with equal possibility of success, the expected future payoff, to both good-performing and poor-performing employees, are the summation of payoffs of states two and three, both weighed by the possibility. More specifically, when both good and poor performance employees achieve bad results that deserves less than minimum pay, they are given basic salary with zero extra bonus. When the preferred performance achieved by relative poor-performing employees, the extra bonus is offered. In contrary, there is no extra bonus that more than ceiling offered to good-performing employees if the performance results in-between the bonus range. Worth to remind, the good-performing employees are going to loss the deserved extra

bonus for the part that more than the ceiling of bonus range, if they perform excellently high.

Consequently, current rewarding system is creating hypothetical bull spread options to the decisions of good-performing employees and poor-performing employees. The resulting extra bonus pay is exactly in the range of bonus that defined and expected by the firm. The question is that, what's the theoretical bonus range that leads the equilibrium to the firm and employees, recognizing the market mechanism.

Conceptual Framework

In the theory of human resources development, as one of components of "Psychology" perspective, cognitive psychology states that purposive-behaviorism attempts to explain goal-directed behavior and the idea that human beings organize their lives around purposes. Low-capability employee takes risky-but-easy-to-fail action due to the factor that the minimum wag still can be paid out even the purpose can not be achieved. High-capability employees take less-risky-but-highly possible-to-success projects due to the factor that the compensation cannot be more than ceiling even the risky-but-high-return project successes. Aforementioned arguments can exactly fit the so-called "purposive behaviorism" in the theory of Human Resource Development.

If one of most crucial component of firm's compensation system is to define efficient bonus range which means the ceiling of pay, it is the aim of study to derive the theoretical optimal difference between the two exercise prices of good-performing and poor-performing employees based on option pricing model. For solving the purpose, it is incorporated that firm's profitability (therefore the pay as the proportion of it) follows binomial process in short run and continues-time dynamics in long run. Since the pay is linearly related to the profitability of firm, which usually is calculated based on the certain percentage of earnings of firm, the change of earning actually leads the change of compensation.

However, the complicated theoretical bonus range derived from the Option Pricing Model does lead the ambiguous implications for firms' executives. It is desirable to offer explicit and efficient proxies with statistically significant correlation with optimal bonus range. Referring to the literatures, numerous factors have been addressed in terms of importance in relevance to firms' rewarding system. Among these factors, firms' size, industrial classification, capital structure, and earning volatility, are receiving prevailing attentions.

The study aims to derive the optimal theoretical incentive for facilitating the guidelines of rewarding system design, and thereafter, discover the empirical correlations between the inventive and list of factors for articulating the efficient

proxies. As the result, the proxies with degrees of significance can be listed as recommendations to firm executive for compensation design. Nevertheless the efficiency of methodology is not fully guaranteed thought the practice, the innovative path and theoretical implications can be strongly recommended to the academy and industries. The theoretical framework has been demonstrated in the following.
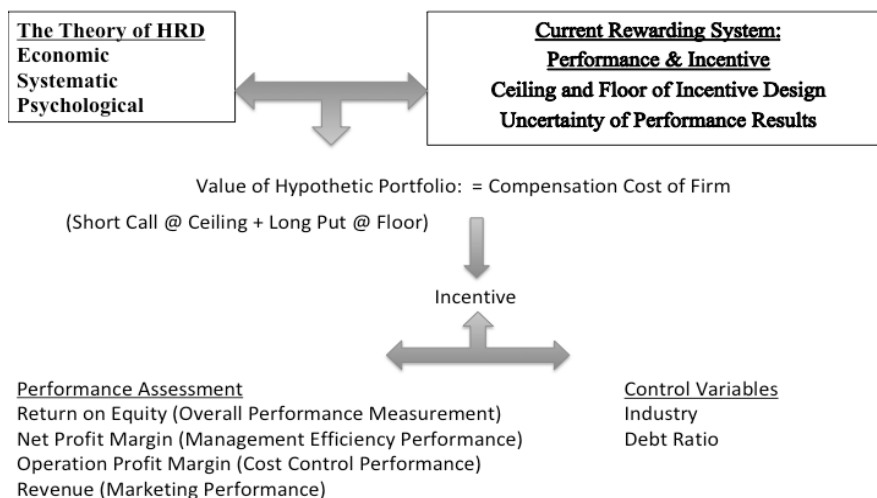
In order to explore the suitable model for designing Chinese listing firms' rational model of incentive regarding to performance assessed by financial terms, the study employed four levels of performance measured by, Return on Equity, Net Profit Margin, Operating Profit Margin, and Revenue, respectively. For specification, Return on Equity (ROE) assesses the overall performance of firm in specified period, dividing net income available for common shareholders by the total equity capital invested by common shareholders. The other three performance assessments measure different aspects of business activities. Net Profit Margin measures firms overall efficiency in terms of overall cost controls including both operational and non-operational cost controls.

Operating Profit Margining assesses the operational performances of firm, including production, marketing, and administrative activities of firm. By incorporating all levels of performance, the study seeks to establish rational strategies to design the incentives for executives through concentrating on the most effective linkage between incentive and specified resulting level of performance assessment. Acknowledging the dynamic characteristics of firms classified into different industry and poised at different financial burden, there are two control variables were

introduced into the model, which are industrial classifications (simply reclassified into financial and non-financial industries) and capital structure (measured by debt ratio of firm). It is acceptable to simply classify the industries into finance and non-financial industries due to the attributes of Shanghai Stock Exchange Index 50.

Model for Corporate Performance Assessment and Incentive
Following the theoretical measurement of optimal compensation range, a multivariate regression analysis will be conducted for exploration of proxies relevant to efficient ceiling of rewarding system, in which certain pertaining controlling variables will be incorporated. Those variables are, industrial classifications, firm size, capital structure, and earning volatility, suggested by research references. Among all regression variables, industrial classification will be the dummy variable in the model. Firm size is measured by log variable of firm market capitalization, capital structure is represented by the debt to equity ratio of firm, and earning volatility is measured by standard deviation of profit margin of firm.

All the financial data will be collected from financial statements of listing firms in Shanghai Stock Exchange. The time series data of variables, compensation payments, volatility of compensation, firms' total assets, firms' debt to asset ratio, earnings, and dummy variables representing industrial classifications, are gathered from the quarterly financial statements of a sample of top 16 firms in Shanghai Stock Exchange over past 9 years, for processing the multivariable regression tests. These top 16 firms in Shanghai are from Stock Exchange of Shanghai 50 Index (SSE 50 Index) consisting of 50 most representative stocks from Shanghai security market by scientific and objective method. The objective is to reflect the complete picture of those good quality large enterprises, which are most influential in Shanghai security market. It will be resulted that the considerable optimal compensation model can be suggested with executable framework.

Worth to remind, the industrial classification is not only contributing regular industrial nature of Chinese listing firm but also special structure of Chinese stock market. According to Li, Lon, Wang, and Yuan (2013), government-controlled companies give more compensation to executives comparing to non-government-controlled companies. And government-controlled companies scattered into similar industries.

First of all, the theoretical compensation will be generated by "Optimal Option Pricing Model Calculator", through inputs of relevant variables, including interest rates, compensation ceiling and floor (representing the exercise price of calls shorted and the exercise price of put longed), earning volatility, and so on. As long as the incentive costs (transferred from compensation paid by firm to executives) result, it

is one of variables in the panel regression model.

The multicollinearity regression model of panel least square will be executed for exploring the practical relationship between, return on equity, compensation cost, net profit margin, operating profit margin, revenue, capital structure, and industrial classifications.

The quantitative multicollinearity regression is presented as follows.

$$\ln LCOM_{it} = a_0 + a_1(\ln LROE_{it}) + a_2(\ln LNM_{it}) + a_3(\ln LOPM_{it}) + a_4(\ln LREV_{it}) + a_5(\ln LDE_{it}) + a_6 IND_i + \varepsilon_{it}$$

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Where, i represents the listing firm i. And LCOM is the log of theoretical optimal incentive cost of firm, which can be calculated based on actual minimum compensation and profitability that reported in the quarterly financial statements of listing firms and optimal compensation is the theoretical amount of optimal compensation generated from Option Price Model based on the compensation and performance of firms.

There are two directions of regression. One holds the hypothesis that optimal change of compensation is statistically relevant one or more than one independent variables including four different level of performance assessment, industrial classification, and financial burden of firm. In this first regression, the optimal change of compensation is dependent variable.

Another directional regression holds the hypothesis that optimal change of compensation is one of many independent variables that affect the overall performance of firm, which is measured by Return on Equity (ROE). In addition, due to the compensation variation among industrial classifications, 1 dummy variable of industrial belongings have been incorporated into the model.

There are 2 major industrial classifications in the selected 16 firms from Chinese top 50 listing firm, including financial industry, and non-financial industry, such as wholesale and retail industry, manufacturing industry, and utility industry. The value of "1" represents financial industry and the value of "0" represents non-financial industry.

Discussion

Although the independent variables Operating Profit Margin and Revenue show significant determination on incentive, the low R square and later Hauseman Test reject the pooled test for relevance. Interestingly, when time period fixed, or in other

words, on the assumption of incentive consistency over time period variation, Operating Profit Margin really demonstrated strong relationship with incentive offerings to executive. Even though, after loosing the assumption of time consistency, operating profit margin still demonstrates strong determination power over incentive plan for executives.

Worth to remind, when we assume both time period and cross section of firms are random, revenue comes to attention and shows the power of determination on incentives.

Changing the direction of testing, it results the insignificant power of incentive in the explanation of overall firms' return ROE. It turns out that ROE is not statistically relevant to the incentive plan. Instead of being impacted by incentive offering, firms overall performance assessment is relevant to other factors such as profit margin and financial structure. The accuracy of the Hausman test is an important issue in panel data analysis. A procedure for estimating the properties of the test, when dealing with specific data, is suggested and implemented. Based on simulation that mimics the original data, the size and power of Hausman test is obtained.

The procedure is applied for different methods of estimating the panel data model with random effects: Swamy and Arora (1972), Amemiya (1971) and Nerlove (1971). Also, three types of critical values of the Hausman statistics distribution are used, where possible: asymptotical and Bootstrap (based on simulation and bootstrapping) critical values as well as Monte Carlo (based on pure simulation) critical values for estimating the small sample properties of Hausman test. The simulation mimics the original data as close as possible in order to make inferences specifically for the data at hand, but controls the correlation between one of the variables and the individual-specific component in the panel data model. The results indicate that Hausman test over-rejects the null hypothesis if performed based on its asymptotical critical values, when Swamy and Arora and Amemiya methods are used for estimating the random effects model. The Nerlove method of estimation leads to extreme under-rejection of the null-hypothesis.

Testing for stationarity in panel data models is also per se a matter of interest and it can be more directly motivated. It seems fairly intuitive that, within the general class of models where heterogeneity is restricted to an individual fixed effect, the times series behavior of an individual variable should often be well approximated either as an autoregressive process with a small positive coefficient and large fixed effects or as an autoregressive process with a near-unit root and negligible individual fixed effects. Both alternatives can be nested in a single model, in which the test of the former against the latter is a panel data unit root test. One expects, however, that

such test might not perform well in a short panel, owing in particular to the problem of unobserved initial conditions and incidental parameter estimation. Trying to assess the properties of the available tests in a realistic setting is therefore of practical importance.

Conclusions

It results that incentive plan the firm should carry out is statistically significant to the operation and/or non-operational efficiency, recognizing differentiations between finance and non-finance industrial firms. No matter from what perspectives, descriptive or regression both are not supporting the importance of Return on Equity's role playing in determining incentive plan. With or without considering firm's consistency of incentive plan in responding to circumstance change over time variation, Profit Margin always demonstration strong supportive role in determining the inventive plan or compensation package. The strong linkage between optimal inventive and efficiency performance assessment is not getting weak even after Hauseman test. The control variable, industrial identity and firms' capital structure do show some level of impacts on incentive. Nevertheless, it does not demonstrate statistically significant role for incentive that firm is designing.

Conclusively, when we consider the uncertainty confronted by both firm's employed executive and firm, optimal incentive costs for the firm is relevant to how efficiency the firm manages operational activities, rather than final overall performance assessment. It implies that traditional overall performance assessment of listing firms' performance Return on Equity should not be considered or at least should not be emphasized in the designing of rewarding incentive in Chinese listing market. It probably due to the non-operation factors inefficient involving in the firm's Return on Equity assessment. And those factors are irrelevant to the efficiency of performance by executives. It can be called "noisy impact".

Therefore, performance assessments including Return on Equity and Revenues/Sales, are not well defined to effective facilitate firms to design optimal incentive package for executives. More specifically, final overall performance measurement and marketing performance assessment are not qualified to be the proxy for designing compensation package. Performance assessment of operational efficiency is the key to determine the level of compensation and it can effectively motivate employed executive to perform optimally, incorporating the uncertainty faced by both firm and executives. It is suggested to fetch operating efficiency as key benchmark for incentive design. It is strongly against the usage of overall performance measurement Return on Equity as the key benchmark as currently what the market is doing.

It is worth to address that HRD should to include direct analysis, action, and measurement of economic outcomes, without which there is no motivation paid off from firm to employees. The purpose of any business organization is to maximize the wealth and gain profitability and any requirements for human resource/capital development aims for these goals. Unfortunately, in past decades, there were lack of literatures address the issues of one of there Human Resource Development's "leg" – Economic. Instead most of literatures were emphasizing on the "leg"-Psychology. Nevertheless, the theory of HRD should be the "integration" rather than "isolation" of three aforementioned "legs", especially when we are studying business organizations. Therefore, this study aims to explore the economic perspective of HRD theory without ignoring the System and Psychological perspectives, which will be elaborated and discussed in details.

The theory of Human Resource Development requires the integration of psychological, economic, and system theories within an ethical frame. In addition, there are three specific economic theory perspectives to the discipline of Human Resource Development, which includes, scarce resource theory, sustainable resource theory, and human capital theory. There are three specific psychological theory perspective proposed to the discipline of human resource development, which includes, Gestalt psychology, Behavioral Psychology, and Cognitive (purposive-behaviorism) psychology.

The Optimal Pricing model innovatively integrates the economic (monetary compensation), systematic (standardized adopting and consistent benchmark), and psychological (clarification of objective to individuals) perspectives. The study is not only adopting the economic measurement to motivate the human capital's performance but also consider the psychological response of individuals. The adoption of merely qualitative analysis method to the development theory of human resource development has the critical limitation due to the nature and goal of business organizations. As the goal of profit-oriented business organization is to maximizing wealth, the compensation costs must be dispensed based on the effectiveness and efficiency, assessed by performance of firm.

In addition, employees response to the result and take action for the purpose of maximizing personal utility according to the theory of HRD and labor economy. Optimal Option Pricing model incorporates, the uncertainties, individual responses to uncertainties, and compensation payment by firm, to come up with theoretical incentive cost for the firm. Thereafter, after obtaining the theoretical incentive cost of firm, the regression had executed to explore the standardized and simplified proxy for effective performance incentive. As the results, profit margin can be the proxy for maximizing the linkage between performance and incentive. Profit margin is

standardized "economic" measurement to "systematically" establish "Psychological" objective for executives of firm. In summary, it results that one of financial measurements, "Profit Margin" is an effective integration of three components of theory of Human Resource Development, at least for the Chinese stock market the research studied.

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