Section 6. Economic theory

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Shamshin Viktor Nikolaevich,
eng.-programmer, Donetsk

CALCULATION OF MANAGER'S BONUSES AND SHAREHOLDER'S DIVIDENDS

Abstract. A method is proposed to encourage managers working for the overall result of the firm, using which the firm will achieve the greatest profits and a "size", proportional to income. A method for calculating dividends on shares is also proposed for discussion. Calculation formulas are given. The method was developed on the basis of reasonable recommendations of Nobel laureates [3].

Keywords: Profit, income, costs, manager, shareholder.

Problem statement. The problem generally trivial. It is necessary, knowing the current salary of the manager, to evaluate his efforts in money, according to the given target function and the results of the company's activities. If we take a one-time payment based on the result of the activity as an estimate, then how to calculate the amount of the "bonus" that would further stimulate the employee? Is it possible to apply the results obtained to the shareholders of the joint-stock company, who (to their money) perform the functions of "exogenous" managers?

Analysis of publications. Of the Nobel laureates, Jean Tirole [1] dealt with this problem most "tightly", Richard Thaler [2] dealt with it somewhat less, but there is no solution to the problem. Here are their statements on the topic, which are almost all trivial, but taken out of context cause confusion. Jean Tirole:

– "chief managers remain responsible for all activities… so that incentive mechanisms for managers can be more closely approximated to actual execution" [1, 30]. What is the incentive mechanism; and why only it can come close to execution; and what is the peculiarity of actual execution; and besides the actual, what and how many types of executions are found in the mechanisms, is not clear.

– "farms with insufficient managerial talents are considered" [1, 28], but how to find out or how to measure the level of managerial talent and its sufficiency or insufficiency – Jean criterion does not lead.

– "The firm is led by a manager who chooses between two levels of effort: high ("work") and low ("shirking")" [1, 57]. A manager who shirks work. Where is this possible? Why such assumptions? Why won't he be fired?

– "The manager's salary should grow with the growth of the profit received" [1, 60]. To the question: "and in what proportion to profit?", we read: "a reasonable prediction… of a $1 increase in profit leads to an increase in the manager's salary in the range from $0… to $1" [1, 86]. "Predictions" are such that do not need to go to a fortune teller. Weather forecasters' forecasts are even more accurate;

– "profits are a very distorted criterion of a manager's activity… For example, profitable investments reduce current profits, without at the same time testifying to the laziness or stupidity of managers"? [1, 64]. So, it is necessary to welcome unprofitable

investments, which, according to the "logic" of constructing the phrase, can only increase profits. Or did I misunderstand something?

"In general, the remuneration of managers can be built on the basis of the average industry rate of return" [1, 67]. And where are the formulas for calculation? There are no formulas. Let the average rate of return be 6.9%. And to what extent will Jean reward managers? There was no such "equalization" even in the USSR;

"Competition in the market … can create incentives for managers who already have an advantage from their monopoly position" [1, 645]. So, managers have a monopoly advantage. Competition creates incentives (a synonym for the whip), and that's fine, but it also deprives managers of their monopoly advantage, which Jean did not mention here, because both monopoly and competition cannot be on the market at the same time, just as morning and evening cannot be at the same time. (Note that economists have a concept of "monopolistic competition", which differs in that: "1. Every firm faces a decrease in demand. 2. None of the firms makes a profit" [1, 452]. And it does not occur to anyone that when demand decreases, it is necessary to indicate the lower limit of this decrease, which is not zero. Otherwise, there is no point in studying "monopolistic competition". The lack of profit is also a complete absurdity). But return to "monopolist managers".

– "managers of monopolies can be lazy (lead a "quiet life"), they may not gain anything from it" [1, 114]. I am wondering in which area of economic activity can idlers win and in what exactly? Lazy people always lose to hardworking people.

– "the manager's activity depends on the assets they inherited" [1, 67]. The bigger the inheritance, the more active the manager, or what? But here is Jean's clarification: "the threat of rent loss can make managers be less lazy" [1, 68]. How can become less lazy, for example, for a manager who: "… at the beginning of his career, he may work even harder than is socially optimal" [1, 70]? And where would find out what this "social optimality" is in diligence, and what will happen if, before retirement or leaving for another company, the manager reduces diligence below this level? Suddenly, I have worked harder all my life than it is socially optimal, and received a salary below its socially optimal level? After all, Jean does not exclude: "the possibility that the manager will leave the company" [1, 70], but at the same time states that if there is: "The possibility of obtaining good prospects outside the company where he is currently employed, just as receiving remuneration inside the company, of course, gives an incentive to the manager to work satisfactorily" [1, 70]. And since when have satisfactory employees been rewarded? But not only material incentives, Jean noted. Managers are also pressured by shareholders who: "can choose … the level of effort they want and impose it on the manager (with the threat of a large punishment if he disobeys)" [1, 58], because only: "direct monetary incentives … can reduce … the caution of managers" [1, 55], and this is undesirable, and therefore, the above-mentioned power is necessary: "control of managers … of the company by shareholders" [1, 23]. And the fact that such "forceful pressure" can cause the "diligence" of the manager to be much higher than the socially optimal level for some reason Jean stopped worrying. Interestingly, there are a lot of shareholders, there are also a lot of levels of effort that they can impose on the manager, the shareholders do not know each other in person, nevertheless, they have no disagreements regarding the choice of the level of effort, as there are no disagreements on a level of bigt punishment.

"Managers of management firms, if they do not react very strongly to monetary incentives, use every opportunity to stretch the work" [1, 74]. All this is true if by "management firms" we mean state institutions that respond to "monetary incentives" not in the form of salaries, but in the form of bribes;

"The potential disadvantage is that the manager can bear all the risk. This, however, does not matter, because the manager is risk-neutral" [1, 83]. If

someone carries a risk, it is not a disadvantage, but a virtue. How can you carry something and be neutral to the "load"? But if it doesn't matter, then why mention it at all?

Can almost agree with this: "the salary of each manager depends on the activities of another manager as well as on his own" [1, 65], if we exclude the option of mutual responsibility, when everyone is responsible for the blunder of one. But where the formula of this "depends" is not clear. And with this: "If higher profits really reflect higher efforts, then compensation to managers increases with the growth of observed profits" [1, 85]. There is no formulas for calculating this increase either. And it is doubtful that: "the remuneration of managers of one company can be made dependent on the activities of managers of competing companies" [1, 67], since you will not find these formulas of dependence in Jean's. But this dependence can be "direct" and "reverse". Can be more specific? In the sense of how to choose the reference company on which competitors depend? Jean did not understand the question, because he gave a particular example, according to which: "… it seems natural to base the remuneration of "Ford" managers on the achievements of "General Motors" managers" [1, 114]. We do not focus on the problem of "direct" and "reverse" rewards for competitors' achievements. But here is the thought of his colleague Richard Thaler [2]: "I cannot recall that experts considered "General Motors" to be a company with reasonable management" [2, 64]. Two opinions of the laureates, and who is right – think for yourself, because it is unnatural to reward someone for the "achievements" of competitors;

– "the effectiveness of management (whatever you stimulate it with – ***V. Sh.***) does not change much over time" [2, 251]. And with this phrase, Richard multiplies by zero all attempts to stimulate the work of managers, although he received the "Nobel" precisely for methods of correcting the behavior individuals in the right (it is unclear to whom) direction, and for developing methods of stimulation;

"One of the … tasks that company managers had to solve was to convince their managers of the need to take on risky projects if a sufficiently high profit was expected" [2, 35]. Or, Richard has managers who do not comply with the decisions of the "bosses", and thay should convince managers … to take up work. In normal companies, all the risk falls on the "bosses", not on the staff. And here his recommendations: "In order for managers to be willing to take risks, it is necessary to create conditions in which encouragement would be intended for the decision itself aimed at maximizing profits" [2, 200]. And colleague Jean Tirol thinks differently (I repeat): "direct monetary incentives … can reduce … the caution of managers" [1, 55], they will take risks and, therefore, additional administrative control by shareholders is needed over them. How many laureates – they have so many opinions on the topic. But in general, Jean does not associate the risks of managers with the level of their remuneration, but attributes everything to their characters. He has: "the risk averse side" [1, 57], it happens: "that the manager becomes infinitely risk averse" [1, 62], it happens: "The manager is somewhat risk averse" [1, 66], there is also: "risk-neutral side" [1, 57], but there is also: "situations of high risk disposition" [1, 296]. And the final "conclusion" of Jean: "Managers, however, may have different attitudes to risk" [1, 624]. How to determine the "psychotype" of a manager in relation to risk, how the risk–neutral side differs from the risk-averse side – the laureate does not specify how the risk-averse one differs from the infinitely risk-averse one, too. But the risk can lead to failure and even to the collapse of the company, and according to his observations: "When the future of a company is at stake, managers tend to trust their intuition" [2, 301], and everything developed by the laureates of their incentive theory and "scientific formulas", that do not exist in reality are ignored.

Speaking of risk. There is no precise and unambiguous definition in the economic and other kind of literature. There are no "formulas" for its calculations

in specific situations. Nevertheless, the phrases: "reduce the risk" [1, 30], or: "the risk is insignificant" [1, 44], or: "the least risk" [1, 55], or: "all risk" [1,83], "high risk" [1, 162], it is unclear what: "part of the risk" [1, 299], "high and low risk" [1, 230] (without specifying the threshold of "separation" of the degree of risk) and even: "moral risks" [1, 174], and many others – are found everywhere.

The purpose of the article. To derive unambiguous formulas for monetary bonuses for managers, if it is known that they alone are responsible for profits and losses, and the company has a certain "target function" for the implementation of its activities, but the economic interests of shareholders and managers may differ. ·To consider the possibility of applying this general methodology of awarding and for calculating payments of "bonuses" on shares in joint stock companies (**JSC**). At the same time, the derivation of formulas should be based on the thoughts and ideas of Nobel laureates.

Presentation of the main material. Consider a company under the management of its owner-the head, who is subordinate to a group of managers. Let the economic results of the company's work be calculated periodically, once a month (or quarter), and for each period, by comparing its results with the previous period, the remuneration of managers is recalculated, as a result of which bonuses or fines are accrued. Taking into account the fact that: "the salary of each manager depends on the activities of another manager as well as on his own" [1, 65], and considering the erroneous opinion when: "the remuneration of managers of one company can be made dependent on the activities of managers of competing companies" [1, 67], consider a firm consisting of which managers work for the overall result. We introduce notation for the key economic parameters of the company (all dimensions are [$/month])

X_J – the required salary of the J-th manager according to the results of the current period;

X^0_J – salary of the J-th manager for the previous period;

$Y \equiv \sum X_J$ – the desired "fund" of the salary of managers of the company;

$Y^0 \equiv \sum X^0_J$ – "fund" salaries of managers of the company for the last period;

$P = (D - S - Y)$ – the company's known profit for the current period, where:

S – expenses of the company excluding managers' salaries;

D – the company's known income at the end of the current period;

D^0 – the company's income based on the results of the previous period;

P^0 – the company's profit based on the results of the previous period.

Since there is no reason not to trust the opinions of Nobel laureates, who have: "chief managers remain responsible for all activities" [1, 30], then consider the form of remuneration for managers with the target function that reflects the direction of the firm's "movement". Jean writes that although: "firms maximize expected profits… in practice, managers have other goals (for example, maximizing the size… of the firm" [1, 54], and the "size" of the firm determines its income D. And in confirmation of this, we read Jean's correct thought that: "the growth of a company can be desirable for managers not only for their own comfort, but also because it allows them… to get great opportunities for promotion" [1, 55]. And most importantly: "The remuneration of managers… must be considered in a broad sense. Such rewards may be monetary… but may… consist in promotion through the ranks" [1, 56]. But, according to Jean: "The salary of the manager should grow with the growth of the profit received" [1, 60], therefore we will accept identical: both the target function of the movement-the development of the company, and the "aspirations" of the J-th manager in the form of his salary

$$X_J = \lambda_J \times (D \times P)^{0.5}, \qquad (1)$$

where: λ_J is a scale factor. The dimensions of the left and right sides of the equation are the same (which provides the square root of the right part); the left

part the salary X_J and is the evaluation of the manager's work; the right part in the form of the product of the company's profit P by income D (reflecting the "size" of the company) as a whole is the mathematical record of thoughts of the laureates. In principle, instead of the square root in (1), you can take any exponent, because at the position of the maximum of the product D × P (if there is one) it won't affect. But there will be "problems" with the dimension and interpretation of the parameter λ_J... Since equation (1) is also true for the previous period, then

$$X^0_J = \lambda_J \times (D^0 \times P^0)^{0.5}. \quad (1')$$

Excluding the unknown parameter λ_J from (1) and (1'), and recording the company's profit in an expanded form, we obtain a system of equations for calculating salaries of each manager

$$X_J = X^0_J \times [(D/D^0) \times (D - S - Y)/P^0]^{0.5}. \quad (2)$$

Summing up all the equations (2), after the transformations we will get

$$(Y/Y^0)^2 = (D/D^0) \times (D - S - Y)/P^0, \quad (3)$$

from where the "fund" of managers' salaries will be based on the results of the current period

$$Y(D, S) = ½ \times Y^0 \times (D/D^0) \times B_Y \times \times \{[1 + 4 \times (1 - S/D) \times A_Y]^{0.5} - 1\}, \quad (4)$$

where dimensionless parameters are entered:

$$A_Y = P^0 \times D^0/(Y^0)^2 \text{ and } B_Y = Y^0/P^0.$$

Substituting Y(D, S) from (4) to (2), we find the salary of each J-th manager.

As you can see, the new salary X_J is proportional to the previous salary X^0_J, and the proportionality coefficient $[(D/D^0) \times (D - S - Y)/P^0]^{0.5}$ is determined by the previous (D^0, P^0) and the present (D, P) results of results of company's activities.

Note that, although the salary was optimized to the maximum of profit and income\size of the company, only its income D and costs S were included in the formula, and the initial salary X^0 is chosen from "endogenous" considerations: education, qualifications, work experience, initiatives, etc.. The very cost reduction of S, as a necessary factor for profit growth of P, was noted by the laureate Paul Samuelson when he said: "Producers can... maximize their profits only by minimizing their costs (in this case, it's S – V. Sh.)" [4, 35].

It is proposed to discuss the possible calculation of optimal total dividend payments to shareholders using a formula similar to (4) and their "division" between them according to a formula similar to (2), if the variable X^0_J is understood as income from the shares of the J-th shareholder, and the cost level S is not understood as the "net" costs of the company, but costs firms plus payments to managers. This is all the more justified, since all the "employees" of the company create profits. Suppose there are many shareholders, and each has shares worth N_K [$] with the "expectation" of a share p of earnings per share. Formulas for calculations will take the form

$$(p \times N_K) = (p^0 \times N^0_K) \times [(D/D^0) \times \times (D - Z - W)/(P^0 - Y^0)]^{0.5}, \quad (5)$$

$$p(D, Z) = ½ \times p^0 \times (D/D^0) \times B_W \times \times \{[1 + 4 \times (1 - Z/D) \times A_W]^{0.5} - 1\}, \quad (6)$$

where: p^0 is the "share percentage" of payments on shares in the previous period;

p(D, Z) – is the percentage of payments on shares in the current period;

$W = p(D, Z) \times \Sigma N_K$ – the contribution of virtual "labor" to the income of shareholders of JSC in the form of dividends paid by them on shares,– as a complete analogue of the real contribution of labor managers, estimated the total salary of Y;

W^0 – the same as W, but for the previous period;

Z = S + Y – costs of the company, taking into account payments (4); and coefficients are introduced: $A_W = (P^0 - Y^0) \times D^0/(W^0)^2$ and $B_W = W^0/(P^0 - Y^0)$. At the same time, we assume the number of issued shares to be unchanged $\Sigma N_K = \Sigma N^0_K$.

Since the salary of managers "goes" first (4), at relatively low costs S, and share payments are second, when the costs of the joint–stock company equal to Z = S + Y (and grow by the managers' salary fund Y), the dollar contribution from the managers' salary will be higher than the dollar contribution of shareholders in $k = \{[1 + 4 \times (1 - S/D) \times A_Y]^{0.5} - 1\}/ /\{[1 + 4 \times (1 - Z/D) \times A_W]^{0.5} - 1\}$ times.

Let us turn to the formula (1) of the relationship of the manager's salary with the "target aspirations" of the firm $X_J = \lambda_J \times (D \times P)^{0.5}$, which can be written in a generalized form, but with an extra degree of freedom (parameter $0 < T < 1$).

$$X_J = \lambda_J \times D^T \times P^{1-T}, \qquad (1'')$$

the right part of which resembles the "famous" Cobb-Douglas function, which was aptly expressed by V. V. Leontief: "Cobb-Douglas functions. Theorists questioned the arbitrary form of the function, and statisticians questioned the methods of fitting it to the data, but despite all the criticism expressed, the familiar… equation appeared again and again" [5, 348]. If the Cobb-Douglas formula establishes an alleged connection between labor and capital costs, then in this case we have some (like Cobb-Douglas, but) functions expressing the dependence of the "purpose of the company's agents' activities" on its micro-indicators: income and profit, functions that mathematically combine "into one", often contradictory the interests of the participants.Here, the appearance of the function is justified. At $T \Rightarrow 1$ we have $X_J \sim D$ and managers are rewarded for the growth of the "size"-profitability of the company, otherwise at $T \Rightarrow 0$ – for the growth of profits. The same value of T is chosen by the owners of JSC, based on "their" considerations. In this case, equations (4, 6) will be written (for iterations) easier

$$Y_{n+1} = Y^0 \times (D/D^0)^T \times [(D - S - Y_n)/P^0]^{1-T}, (4')$$

$$p_{n+1} = p^0 \times (D/D^0)^T \times [D - Z - W_n)/(P^0 - Y^0)]^{1-T}, (6')$$

the latter is taking into account the connection $W = p \times \Sigma N_K$, and their solution is iterative. To do this $Y_0 = Y^0$, is assumed in the zero approximation, which is substituted into the right part (4'), getting the 1st approximation Y_1, which is again substituted into the right part (4'), getting the 2nd approximation Y_2, etc., until the desired accuracy is achieved. Equation (6') is solved similarly with recalculation of $W_n = p_n \times \Sigma N_K$.

Remark. The parameters T in formulas (4') and (6') should not be equal at all. On the contrary, it is reasonable to accept them as "opposite". Since managers can have more influence on profits, and shareholders (by buying shares) – on the "size" of the company, then T from (6') should always be greater than T from (4'), which can be provided for a given T from (4'), such a record of equation (6')

$$p_{n+1} = p^0 \times (D/D^0)^{1-T} \times [D - Z - W_n)/(P^0 - Y^0)]^T, (6'')$$

but the method itself still needs further verification and comprehension, because, as it was shown above, the opinions of the laureates expressed by them only in words in their "works without formulas", in the form of private "ideas on the problem" – are ambiguous.

If the company assumes the growth and expansion of markets, then it is reasonable to take the results and data of the last period as parameters p^0, D^0, P^0 and Y^0, otherwise the results for any fixed period will be suitable, the one that the firm considers the most "ideal" for working at that market.

Example. Let the sum of the shares of JSC $\Sigma N_K = 50$, and the results of last month $S^0 = 20$; $D^0 = 50$; $Y^0 = 5$; $P^0 = 25$; $p^0 = 0.1$. Let the current month be successful in the main indicators $S = 18 < S^0$ and $D = 55 > D^0$. Then from (4', 6'')

at $T = 0.10$ we have $Y = 6.107 \approx 1.22 \times Y^0$, and $p = 0.1107 \approx 1.11 \times p^0$;

at $T = 0.30$ we have $Y = 5.983 \approx 1.20 \times Y^0$, and $p = 0.1121 \approx 1.12 \times p^0$;

at $T = 0.50$ we have $Y = 5.853 \approx 1.17 \times Y^0$, and $p = 0.1136 \approx 1.14 \times p^0$;

at $T = 0.70$ we have $Y = 5.717 \approx 1.14 \times Y^0$, and $p = 0.1153 \approx 1.15 \times p^0$;

at $T = 0.90$ we have $Y = 5.574 \approx 1.12 \times Y^0$, and $p = 0.1171 \approx 1.17 \times p^0$.

As you can see, with the growth of the parameter T, the relative additions of managers to the salary fall, and in the shareholders grow.

If the current month is "unsuccessful", e.g. $S = 22 > S^0$ и $D = 45 < D^0$, then

at $T = 0.10$ we have $Y = 3.886 \approx 0.78 \times Y^0$, and $p = 0.0893 \approx 0.89 \times p^0$;

at $T = 0.30$ we have $Y = 3.998 \approx 0.80 \times Y^0$, and $p = 0.0879 \approx 0.88 \times p^0$;

at $T = 0.50$ we have $Y = 4.122 \approx 0.82 \times Y^0$, and $p = 0.0863 \approx 0.86 \times p^0$;

at T = 0.70 we have $Y = 4.260 \approx 0.85 \times Y^0$, and $p = 0.0847 \approx 0.85 \times p^0$;

at T = 0.90 we have $Y = 4.415 \approx 0.88 \times Y^0$, and $p = 0.0829 \approx 0.83 \times p^0$.

And here, too, with the growth of the parameter T, the relative losses of managers in wages are falling, and the shareholder's are growing. It turns out that an increase in the parameter T increases the interest of shareholders in the work of the JSC, because the volatility of dividends increases, as well as a decrease in T, on the contrary, increases the interest of managers in the work of the JSC, because the volatility of their salaries increases, at the same time (it is like "sensitivity" to the results of the work of the JSC).

Thus, the parameter T can be used to "regulate" the relative interests of managers and shareholders in the results of the JSC's work. We have, as it were, a certain "uncertainty ratio" not in quantum mechanics, but in economics: the more active managers are, the calmer shareholders are and vice versa, for objectively, the growth of the activity of some is compensated by the growth of the indifference of others… One can only welcome the foresight of Jean Tirol, who formulated half of this provision without any mathematical calculations, studying the activities only of management firms: "If managers react significantly to monetary incentives, a large proportion of entrepreneurs (read, shareholders – V. Sh.) increases laxity in management firms" [1, 75] (текст в оригинале: "Если менеджеры существенно реагируют на денежные стимулы, большая доля предпринимателей увеличивает расхлябанность в управленческих фирмах" [1, 75] – В.Ш.), this phrase in its finished version should have the following text: "If managers in joint-stock companies actively respond to monetary incentives, then shareholders, on the contrary, equally increase laxity and vice versa".

Consequently, the formulas for calculating bonuses to managers (4') and dividends to shareholders (6") correspond, at least, to the qualitative observations of Jean Tirol on employee relationships in firms of some kind.

Conclusions. Based on the analysis of the recommendations of Nobel laureates in economics J. Tyrol and R. Thaler [3] in the field of economic stimulation of the activities of managers of firms, a model for calculating the remuneration of managers and dividends of shareholders of JSC is proposed for discussion according to the principle common to all participants in production: taking into account the labor costs of managers of firms and shareholders, – according to the principle that does not contradict the condition of maximizing both profit and income at the same time in the company (or JSC).

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