Review of economic efficiency indices for enterprises innovative activities

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Abstract: Research on ways to effectively manage business growth of its market value in terms of investment, it seems urgent problems of the economy critical to economic growth in national and overall market scale. There has been a gap between economic theory and practice.
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Introduction

Maximization of shareholder value (the goal is to have the biggest market value of a common share) has advantages: it accentuates long-term run; calculates risks and uncertainty; accounts for time lag in profit getting; considers profits of shareholders. It is worth mentioning one of the disadvantages of this criterion: interrelation between financial decisions and stock share rate is not considered, which can result in complications and frustration of managerial plans. In practice, in order to assess efficiency, the following indices are applied: net profit, economic profit, profit margin, return on invested capital, return on equity, earnings per share and proportion of cost recovery. For strategic development goals of the company such indices as net present value, economic value added, internal rate of return, profitability investment index are used [1]. Lately, these strategic indices of managerial efficiency have included market value of the enterprise (MVE). Enterprises Innovative Activities (EIA) has to be managed with a structured system of indices, which allows managing goals and approving them at different levels of management and centers of responsibility plus according to stages of the company's life cycle. Such an approach justifies the necessity to build up a consistent structure of goals and develop procedures for decision-making to help provide well-directed management of economic efficiency of EIA from the positions of the general strategy that has been worked out (focus has to be on controlled parameters of EIA). This comes into agreement with the principles of purpose approach to the company's efficiency management.

At this, use of the aforementioned methods can be complicated due to the reasons presented in the Table 1:

Table 1. Assessment parameter, assessment parameter and effect according to value methods. Possible problems when determining value of the company

Assessment parameter	Complication factors	Effect
Profit	Multi-industry business One time income and expenditure Income from uncertain sources Change of index constituencies	It complicates understanding interrelation between profit and income sources It complicates forecasting future income
Taxes	Income from different regions Use of tax offshores	Different regional tax rates It complicates correct accounting and planning
Investments	Volatility of investment level Often and big takeovers Payment of acquisitions and takeovers with the company's own shares	It complicates forecasting They require normalization of indices for several years It is difficult to evaluate the cost of acquisition
Working capital	Contents of current assets and liabilities are not clearly defined	Contents of current assets and liabilities can include heterogeneous assets
Expected growth	Off-balance assets and liabilities Share repurchase	They complicate assessment of invested capital Reduces book value of capital and, thus, overvalues return on capital
Capital value	Multi-industry business Instable markets Debt obligations are unlisted Company's securities do not have market ranking Financing with off-balance resources	When proportions between different industry assets changes, risk degree changes too (β-coefficient) Different risk premiums at different markets It is necessary to asses market value of liabilities It is difficult to evaluate WACC It is difficult to assess proportion of used capital sources
Prepared according to "Information Transparency and Valuation: Can you value what you cannot see?" Aswath Damodaran, Stern School of Business, January 2002. [2]		

Analysis of contemporary approaches, techniques and indices of industrial enterprises' performance makes it possible to conclude there is no single criterion, being universal from the management standpoint, so a complex approach should be used when analyzing economic efficiency. Some indices can be used as local criteria either at separate stages of industrial innovation introduction, or when tackling different individual tasks.

Procedure to do calculations and evaluate economic efficiency

1. Calculate market value of the enterprise (MVE, V) at least for two periods in the following way [4, 5, 3, 6]:

DCF series (direct capitalization, discounted cash flows);

$$V^{DCF} = \frac{NOI}{R} \quad or \quad V^{DCF} = \sum_{t=0}^{\infty} \frac{FCF_t}{(1+i)^t}, \quad i = WACC \tag{1}$$

Series of economic value added (EVA) of the company Stern, Stewart&Co or economic profits (model of the consulting company McKinsey) [2]:

$$V^{EVA} = IC_{t-1} + PV(EVA) = IC_{t-1} + \sum_{t=1}^{\infty} \frac{EVA_t}{(1+WACC)^t} \tag{2}$$

According to the theory, the economic profit EVA is net operational profit of an enterprise after deduction of interest on all used capital at the rate, defined by weighted-average cost of capital (WACC):

$$EVA = NOPAT - WACC \times IC \tag{3},$$

where IC – is invested capital; WACC – weighted-average cost of capital; NOPAT – net operational profit after corporate tax (profit tax), but before financial expenses on bank credit/loan: $NOPAT = EBIT^{adj}(1-T^{эфф})NOPAT = EBIT(1-T)$, where $EBIT$ or $EBIT^{adj}$ – earnings before interest and tax or the same including adjustments and corrections on capitalized costs for R&D, leasing, writing-off methods, T, T' – normal or fact corporate tax rate.

2. Value added of an enterprise is created when there is increment or when EVA>0 index is positive. The same as the book-keeping index, EVA index gives an idea about economic efficiency for a certain time period and, contrary to the traditional profit, EVA does not only cover explicit costs on investment attracted, but cover alternative costs on capital. Evaluate the major financial indices of the company's efficiency [7]:

- ΔEVA>0, ΔV>0;
- efficiency spread as (ROIC – WACC)>0;
- ROI/WACC, where ROIC – return on invested capital;

Show the change in the amount of the company's WACC and value of the company when changing the capital structure – increase in borrowings by 10%, 20%, 30%. What do the assessments received show? How do values of ROIC, ROA, ROE and WACC change from year to year? Evaluate the change of the enterprise's market value and value of the shareholder's equity. Evaluate the required return on equity of the chosen company in terms of weighted average capital cost (WACC) (assessment of return on borrowed capital; assessment of return on shareholder's equity (CAPM model); defend discount rate);

3. What are the highest economic efficiency values (chosen key indices of efficiency) that the companies, leading in their industries, demonstrate (qualitative, quantitative ones, NOPAT, EBIT)?

4. Calculate ROE index (return on equity). What does this index diagnose? What does the comparison of ROE to ROIC show? Determine indices of economic efficiency: profit (NOPAT, EBIT, net profit); free cash flow (FCF); free cash flow to the firm (FCFF); return on invested capital (ROIC); return on equity (ROE); return on assets (ROA) in terms of profit factor analysis method (DuPont method) and factor analysis of profit; analysis of correlations which form ROE coefficient.

5. Calculate operational and financial risk on the basis of operating leverage (DOL) and financial leverage (DFL). Analyze profitability change in terms of operating and financial leverage [2].

6. Evaluate market value of intangible assets by Edwards-Bell-Ohlson model (EBO) and compare it with the balance sheet amount of assets. Use cash flow return on investment (CFROI) of the company Holt, cash value added (CVA), and shareholder value added of the company LEK/Alcar, market value of net assets, multipliers of the stock market, or by the real option technique (OPT);

7. Justify the choice of alternatives to conduct evaluation with the method of fund multipliers.

Agree the results by all methods of evaluation. Make conclusions on value change for two periods analyzed. Justify the choice of the best evaluations methods (including the one for projections). Define how efficient the company performance is? Make projections on market value of the company for next period. On the basis of financial analysis, develop value mapping and determine its key indices. Give recommendations on its introduction into the management system of the enterprise.

Sources of initial data are:

General information on the enterprise are: the year of setting up and history, management and lines of business of the company. Management system and

ownership structure, specification of material status, client database, personnel qualification. Trends (plans) of the company's development (plans of production, investment, innovations, capital raising); presence of corporate management and certification of its management system according to ISO 9004 quality standard. Analysis of financial status and economic efficiency of the company: indices of the market position and competitiveness of the enterprise's products. indices of managerial, engineering and personnel levels of the enterprise; indices, characterizing dividend policy of the enterprise; indices, characterizing the structure of owners (shareholders) of the enterprise; indices of financial position; analysis of the balance sheet structure; analysis of the company's financial stability: liquidity analysis. indices of resource used at the enterprise; analysis of the enterprise's profitability and structure of production costs; analysis of labor productivity; factor analysis of profit (according to Dupont model) ; analysis of return on equity; analysis of capital turnover; indices of operational risks and financial risks (analysis of profitability as the function of operating and financial leverages.

Analysis of restructuring of assets of a production company

Analysis of investment decisions and development strategy of the enterprise: assessment of possible business risks and development strategy; assessment of economic efficiency of investment projects in terms of investment analysis; projection of the investment and innovative projects' results on economic position of the enterprise; determination of the actual market value of the enterprise and economic growth in terms of economic model of the enterprise that has been developed. Let us consider restructuring of assets of a production company.

Table 2. Basic parameters comparison options

	Indicators	Option 1 – joint project	Option 2 – investment agreement
1	Form of participation	Joint activities	Investment agreement
2	Plot	Transfer of investor plot with subsequent exclusion 4/5 of the territory and return 1/5 of it after construction	
3	Capital owner	Participating shareholders' equity	Money owners are not involved.
4	Assessment of the company's assets, taking into account losses of business at the time of construction	56 million dollars	56 million dollars
5	FCFE of owners	150 million dollars	96 million dollars
	New assets	34 million dollars	88 million dollars
	Returns of owners	107,7 million dollars	now
6	Economic effect, discount 10%	36 million dollars	9,3 million dollars
7	APV	33 million dollars	15 million dollars
8	MIRR, %	21%	15%
10	Net profit (forecast for 5 years.)	5,4 million dollars	5,4 million dollars

Let us assume, some of its land territory is located in the city center. One plans to construct a modern multipurpose production complex in the place of the old administration building. The project is the construction of buildings with a total area of 200 000 sq. m. After the construction is finished the shareholders of the company are suggested passing into the ownership the building of the business center, part of parking and 1/5 of the land plot. According to the first option of the project joint activities of the investor and the enterprise are foreseen. The second option is to make an investment agreement: in this case the shareholders shall transfer the asset for the construction to the investor, and in exchange to obtain a new asset (equal in surface) on the land plot of a smaller size.

Sources of information for economic efficiency analysis are accounting reports and management accounts (yearly, quarterly); press; management survey; expert information; comparison of economic financial indices in retrospective with previous time periods so as to determine development trends of the enterprise; comparison of indices for the enterprise examined with industry-average values or analogous indices of related businesses and competitors. You will see (table 2) that a base state of the enterprise (m_0) is characterized by negative economic added value. The enterprise considers choosing two innovative projects (m_1 and m_2).

It is important to emphasize that the coefficient of elasticity of 0.393 shows how much profit is brought by additional investment in the company. Please, note that elasticity decreases [6].

From the above analysis we can draw the following conclusions. In case the capital investment is carried at the operating company, return, obviously, must be greater than the average cost to raise capital that should be satisfied $\frac{WACC}{ROI(IC)} \le 1$.

Table 3. Definition of investment efficiency in the assets of two projects

Indicators	m_0	m_1	m_2	Total (m_0+m_1+m_2)
NOPAT, million dollars.	7 433	15 669	13 093	36 195
IC, m.d.	73 541	93 371	92 081	258 993
Gross cash flow (GCF), m.d.	6 486	26 576	30 306	63 368
Salvage value (SV), m.d.	1 856	3 136	3 676	8 668
Gross Invested Capital (incl. inflation)(GIC), m.d.	4 672	86 760	67 116	158 548
Operating cash flow (OCF), m.d.	891	28 751	29 229	58 871
WACC, %.	10,12%	10,12%	10,12%	10,12%
ROI, %	10,11%	16,78%	14,22%	13,98%
EVA= NOPAT-WACC*IC, m.d.	-9,3	6 220,2	3 774,4	9 985,3
EVA= (ROIC-WACC)*IC, m.d.	-9,3	6 220,2	3 774,4	9 985,3
CFROI = (GCF+SV)/GIC, in %	1,786	0,342	0,506	0,454
Economic Margin (EM=(OCF-WACC*GIC)/GIC),%	8,94%	23,02%	33,43%	27,01%
WACC/ROI<=1	1,001	0,603	0,712	0,724
E(IC)=dROI/dIC		0,603	0,544	0,393

Based on the optimality conditions, this provision can only be achieved in case the negative character on the coefficient of elasticity E (IC) in absolute value is less than unity, i.e. in the inelastic range of the marginal return on investment that meets the conditions of a perfect competitive market where the marginal return on investment tends to have a

fixed value [7]. We can write a principled optimization model. For a fixed elasticity and a certain value of invested capital, its ROI and WACC of its involvement are inversely related, so that the increase (decrease) of one of the variables requires an increase (decrease) on the other. With increased investment capital, the cost of capital is committed to the market interest rate. This result is quite understandable, since the representation of profit earned as a function of invested capital, as well as the assumption of diminishing marginal returns on investment, consistent neo-classical concepts, allowing for the analysis of the existence of conditions of a perfect competitive market.

The economic margin [7, 9] is based on the principle of economic profit, expressed-with the position of cash flow. The method combines the advantages of EVA and CFROI (return on investment based on cash flow) and takes into account the cost of capital, inflation, amendments to the life cycle stages, the presence of balance-sheet accounts. EM is an indicator of the value of those businesses whose value is above or below the price of the stock market. EM is based on four factors (economic profit, competition, growth, cost of capital). EM models the effect of competition on the gradual loss of excess profits (in contrast to the principle of residual income). Unlike the EVA, EM takes into account the depreciation, includes the cost of capital invested in the capital expenditure. Unlike CFROI only equity financing is taken into account (the cost of borrowing to calculate economic feasibility is not considered), however, the EM method is based on the total amount of the asset. Condition assessment of economic effectiveness is $\Delta EM > 0$:

$$EM = \frac{OCF - CC}{GIC}$$

$$OCF = NI + Am + ATIntEx + REx + RDEx \pm n\,\mathrm{Re}\,c,$$

$$CC = f(r_e, ROE, CAMP)$$

$$GIC = TA + {}^{Acc}\,Am + Infl + {}^{Cap}\,REx + {}^{Cap}\,RDEx - nDebtCL \quad (4)$$

where EM-economic margin in%; OCF-operational cash flow, CC-impact at capital; GIC-gross invested capital; NI – net income; ${}^{Acc}\,Am$ and Am, – is the accumulated annual amortization and depreciation; $RDEx$ and ${}^{Cap}\,RDEx$ annual and cumulative development expenses and R&D; REx and ${}^{Cap}\,REx$ - annual and cumulative rental payments; $ATIntEx$ $ATIntEx = (1 - T)\,Int$ - costs of interest after tax; $n\,\mathrm{Re}\,c$ - change of the off-balance sheet accounts; $Infl$ - -adjustment for inflation; $nDebtCL$ - payables.

Procedure of financial analysis for evaluating economic efficiency of EIA

This procedure for doing financial calculations is aimed at revealing bottlenecks of the object examined and is used, in future, for value mapping. Formation of key indices of accounting for their analysis and assessment on the basis of their comparison to industry-average data, reference standard and previous periods [10, 11]. Financial analysis technique for investors. Liquidity control includes calculation and assessment of quick and current liquidity coefficient indices, plus relation of operational cash flows to short-term mature liabilities. Control over efficient use of assets, resource turnover and assessment of business activities in terms of the following coefficient: coefficient of inventory turnover; period of accounts receivable turnover in days; coefficient of fixed assets turnover; asset turnover coefficient, etc. Capital structure management (leverage, financial leverage, debt management): financial leverage (lever, capital multiplier); interest coverage coefficient; fixed payment coverage coefficient; management and assessment of target capital structure. Profitability management (return, earning capacity) – is assessment of change trends in return on sales (ROS), return on assets (ROA), return on equity (ROE) and return on invested capital (ROIC) to draw up short term and long term projections.

Conclusions

So, managing economic efficiency of the enterprises innovative activities (EIA) entails the following problems: dynamic character of modernization process and update of funds of the enterprise; infrastructural representation of the control object of EIA; specifics of the complex system for assessment and analysis of economic efficiency of EIA in terms of value maximization principle; insufficiency of economic efficiency criteria used in traditional approach to EIA; asymmetry of information; need for formalization and standardization of criterion guidelines for decision-making about innovations on the basis of value concept; elaboration of mechanism for control of economic efficiency of the enterprise in terms of commercialization of R&D and intangible assets, motivation of personnel and competitiveness of the enterprise. The authors consider it necessary to point out flaws in the concept of value. First, the underestimation of the negative factors contributes to

the destruction of the companies' market value (excessive diversification, poor distribution of resources, underestimation of risk). Secondly, the lack of information on the relationship between the parameters and methods of evaluation of economic efficiency for Russian companies, which delays the development of this approach in Russia. Third, institutional issues (diversity terminology in the reporting (NOPAT or EBIT (1-T), FCF, OCF, FCFE etc.)). So, the authors see as most developed, in terms of theory and methodology, the techniques of economic efficiency evaluation of selected activities (investment project, implementation of innovation, computer control systems, analysis of financial and economic activity, etc.) than the control as a whole. Convergence is possible through the assessment of the market value on the basis of multi-purpose optimization within the economic model of the company with elements of dynamics, taking into account numerous internal and external factors in the creation of value in each chain. For this purpose you need to create a holistic mechanism with feedback, dynamic modification parameters and key factors, as well as the availability of adaptive capacity.

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