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Multiplicative Methodology for Assessing Investment Attractiveness and Risk for Industries

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Abstract: Creating favorable conditions for the development of industry is one of the key tasks with an increased level of complexity, the solution of which is associated with attracting investments and forming an investment policy that takes into account various specific characteristics of its implementation. However, modern science requires a deeper development of tools related to the study of the investment attractiveness of industries and the level of risk of investing in them, including taking into account market value factors. The purpose of this study is the development and practical approbation of a multiplicative methodology for assessing investment attractiveness and risk for individual industries. The methodological basis of the study was the scientific works of domestic and foreign scientists in the field of industrial and investment policy, its goals, tools for implementation and features of formation in individual industry complexes. The work also used the methods of structural-functional, economic-statistical, and comparative analysis, as well as tabular and graphical interpretation of empirical-factual information. The proposed methods for assessing investment attractiveness make it possible to take into account not only quantitatively measured indicators, but also more obscure indicators, which is especially important for obtaining a more complete result and can be used in conditions of limited access to information. As a result of this study, the most investment-attractive enterprises and a separate industry were identified, which at the initial stage should become the priorities of the industrial policy of the regions, since they are a kind of growth pole that can create a propulsive effect for the development of other enterprises and the territory as a whole.

Keywords: investment attractiveness; risks; industries; multiplicative methodology

1. Introduction

Features of the formation of investment policy in certain industries, including its methodological and instrumental components, remain a debatable scientific problem that has not been fully resolved in the practice of managing production systems at all levels: national, regional, sectoral and micro-level of enterprises.

In particular, there are currently no generally accepted methods for diagnosing investment attractiveness and risk for industries. Therefore, the development of additional tools for the development of investment policy in certain industries is a urgent scientific and practical task. Applied research was carried out on the example of the fuel and energy complex (FEC) in the macro-region of the country.

Methodological aspects of investment attractiveness and features of risk research are presented in the works of such scientists as (Groh 2007; Raszkowski 2013; Demirhan and Masca 2008; Vertakova and Plotnikov 2016; Reshetnikova et al. 2019; Al-Abdulla 1989; Pershin 2020; Petryk et al. 2020; Ilyash et al. 2020; Chebotareva 2018; Dang and Samaniego 2022; Zhao and Levary 2002; Ilchenko and Glushko 2017; Blank 2019; Vertakova et al. 2015 and others). However, these papers do not show the features of using the multiplicative methodology in assessing investment attractiveness and risk for individual industries.

2. Materials and Methods

The methodological basis of this study was the scientific works of domestic and foreign scientists in the field of industrial and investment policy, including the goals, tools for implementation and features of formation in individual industry complexes.

In conducting this study, the following methods of investment attractiveness of industrial enterprises and the level of investment risk were used:

(1) assessment of individual indicators of enterprises (WACC and EVA) when measuring the investment attractiveness of enterprises in the industrial complex;

(2) measurement of multipliers oriented to market value and excluding market value (EVA/EBITDA, ROIC, ROE, etc.) to determine the level of investment attractiveness and risk level of industrial complex enterprises;

(3) rating methods and methods of comparative analysis in determining the zone of investment-attractive enterprises.

The information and empirical base of the study was the data of the Federal State Statistics Service, legislative and other regulatory legal acts of the Russian Federation, publications in scientific journals, analytical reviews in periodicals on the problem under study, current operational information on the functioning of the industrial sector in the Russian Federation and regions of the country as a whole and the fuel and energy complex in particular, as well as the works of various authors devoted to the development of investment policy in industries and measuring their investment attractiveness and analytical reviews and materials from scientific conferences.

3. Results

To develop an effective investment policy, we conducted a study of the investment attractiveness and riskiness of sub-sectors of the fuel and energy complex based on a system of multipliers.

The multiplier approach was chosen because: (1) it is the multipliers that make it possible to assess the investment attractiveness of a business (industrial enterprises) regardless of its scale, and (2) multipliers are the basis of the cost approach to investing.

The indicators we chose, including the multipliers proposed for assessing the investment attractiveness of industrial enterprises, can be divided into two groups (Figure 1).

As one of the priority indicators of the study of the investment attractiveness of an economic entity, we have chosen the indicator of economic value added (EVA), calculated using a combined methodology, including taking into account regional and industry specifics.

Note that EVA is a numerical indicator that allows investors to understand the permanence of the gap between profit and expenses, since a positive value (EVA > 0) implies the ability of the firm to create value. EVA provides a more realistic view of a corporation's results by including both operating and capital costs.

The definition of EVA reveals three main elements of the initial data necessary for its calculation, namely the return on capital earned on investments, the cost of raising capital for these investments, and the capital invested in these investments. The advantage of EVA is that it takes explicit account of the fact that a firm does not actually create value for shareholders until it has covered all of its capital costs.

The relevant data for EVA calculations and indicators are taken from the financial statements of enterprises in the fuel and energy sector of the Ural Federal District. In our opinion, the use of the described indicators and methods for measuring value in the aggregate determines the investment attractiveness of the companies under study and provides a better justification for the conclusions and recommendations for developing investment policy, taking into account regional and industry specifics.

Thus, on the basis of the study, we assessed the weighted average cost of capital (WACC) and economic value added (EVA) of the enterprises under study (Table 1).
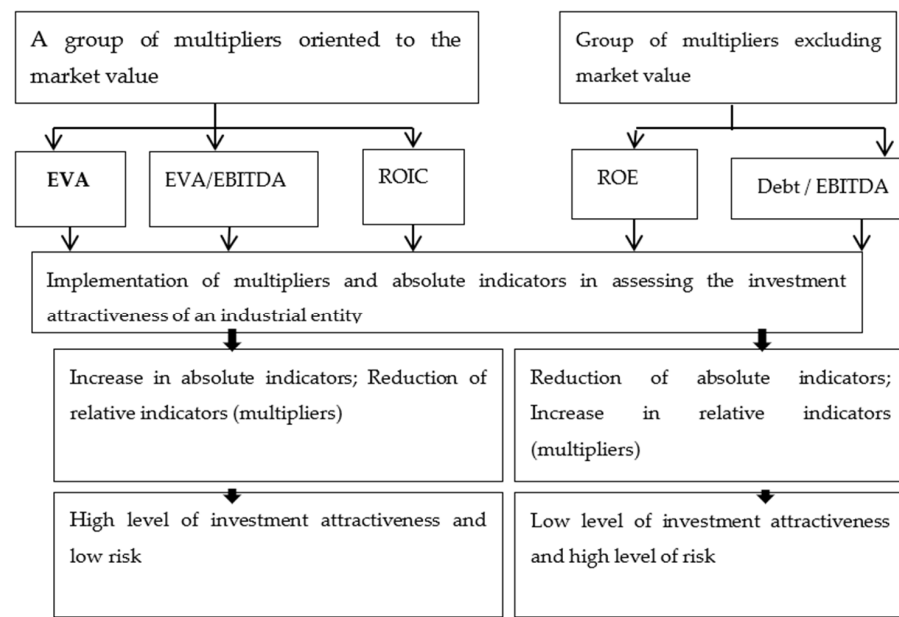
Figure 1. Multipliers: a study of the investment attractiveness of industrial enterprises and the level of investment risk. EVA—absolute indicator, plays a supporting role. Source: developed by Zadimidchenko A. EVA—Economic value added. EBITDA—Earnings Before Interest, Taxes, Depreciation, and Amortization. ROIC—Return on capital, or return on invested capital. ROE—Return on equity. Debt—Debt is a deferred payment, or series of payments, which differentiates it from an immediate purchase.

Table 1. Measurement of the investment attractiveness of enterprises in the industrial complex of the fuel and energy complex of the Ural Federal District based on the assessment of WACC and EVA indicators (table fragment).

Enterprises of the Fuel and Energy Complex of the Ural Federal District	WACC			EVA		
	2020	**2019**	**2018**	**2020**	**2019**	**2018**
"Varioganneft" PJSC	9.31	9.93	11.49	−488,328.8	534,547	978,781.6
"OIL COMPANY "KONDANEFT"" JSC	10.56	9.23	12.12	710,065.12	4,699,694	4,164,068
"Gazpromneft-Khantos" LLC	9.40	8.89	11.31	−1,532,165	11,924,687	26,185,083
"SURGUTNEFTEGAZ" PJSC	8.89	8.72	11.13	-3.89×10^8	-3.1×10^8	-3.8×10^8
Gazprom Pererabotka LLC (branch of Khanty-Mansi Autonomous Okrug, (SURGUT ZSK))	8.79	8.12	10.58	−51,805,477	-4.7×10^7	-6.2×10^7
"SIBUR Holding" PJSC	9.48	8.12	10.98	−29,499,848	60,827,498	48,599,446
"Rn-Nyaganneftegaz" JSC	9.29	10.7	11.29	334,294.32	17,858,609	5,617,511
"NIZHNEVARTOVSKOE NEFTEPERERABATYVAYUSHCHEE OB"EDINENIE" LLC	8.95	8.77	11.20	695,173.18	1,744,678	178,838.7
"NIZHNEVARTOVSKOE NEFTEGAZODOBYVAYUSHCHEE PREDPRIYATIE" JSC	9.52	9.13	11.69	1,926,875.6	5,130,220	3,587,565
"SAMOTLORNEFTEGAZ" JSC	9.10	8.81	11.29	−19,201,793	21,960,410	22,495,952
"UNIPRO" PJSC	6.87	7.46	9.87	5,384,278.8	8,367,583	5,405,213
"YUGORSKAYA TERRITORIAL'NAYA ENERGETICHESKAYA KOMPANIYA-REGIONAL'NYE SETI" JSC	7.02	7.31	9.99	716,113.01	853,308	338,095
"Nizhnevartovskaya GRES" JSC	6.86	7.37	9.90	1,531,387.6	1,317,685	338,843.4

Source: developed by Zadimidchenko A.

The next indicator of the group of investment attractiveness criteria focused on the market value is the multiplicative (relative) indicator EVA/EBITDA, which reflects a comparative assessment of the value of the enterprise and is an investment criterion of significant importance.

Note that with EVA/EBITDA < 3, the company is undervalued and investment-attractive; 3–5 is the norm, while at more than 5 an overvalued company is unattractive for investment. The value of EVA/EBITDA also depends on the industry, so, for rapidly developing industries, its higher value is typical, while for mature companies, a lower value is typical. If the EVA/EBITDA of the company in question is below the industry average, then its shares can be considered as undervalued. The average EVA/EBITDA for the oil and gas industry is 6.

Thus, most of the studied enterprises are undervalued (Table 2).

Table 2. Measurement of the investment attractiveness of enterprises in the industrial complex of the fuel and energy complex of the Ural Federal District based on the assessment of the EVA/EBITDA multiplier (table fragment).

Enterprises of the Fuel and Energy Complex of the Ural Federal District	The Zone of Investment Attractive Undervalued Enterprises		
	2020	2019	2018
"Variogannneft" PJSC			
"OIL COMPANY "KONDANEFT"" JSC			
"Gazpromneft-Khantos" LLC			
"SURGUTNEFTEGAZ" PJSC			
Gazprom Pererabotka LLC (branch of Khanty-Mansi Autonomous Okrug, (SURGUT ZSK))			
"SIBUR Holding" PJSC			
"Rn-Nyagannneftegaz" JSC			
"NIZHNEVARTOVSKOE NEFTEPERERABATYVAYUSHCHEE OB'EDINENIE" LLC			
"NIZHNEVARTOVSKOE NEFTEGAZODOBYVAYUSHCHEE PREDPRIYATIE" JSC			
"SAMOTLORNEFTEGAZ" JSC			
"UNIPRO" PJSC			
"CHERNOGORENERGO" JSC			
"YUGORSKAYA TERRITORIAL'NAYA ENERGETICHESKAYA KOMPANIYA-REGIONAL'NYE SETI" JSC			
"Nizhnevartovskaya GRES" JSC			

Source: Calculated by Zadimidchenko A. based on financial statements.

A negative value of EVA indicates that the profit of the enterprise is insufficient to pay back the capital invested in it, and its conditional market value is reduced. However, in some cases, there is so much cash on the company's accounts that EVA goes into the negative zone.

We carried out a comparative analysis of the investment attractiveness of individual sub-sectors of the fuel and energy complex of the Ural Federal District. The higher the level of investment attractiveness, the lower, respectively, the level of risk of investing in the industry.

At the next stage of the study, according to the proposed algorithm, we considered the second group of multipliers that do not take into account the market value, such as return on equity (ROE) (the larger the value, the better) and debt/EBITDA (the lower the value, the better). ROE does not take into account the market value (the higher the ROE, the higher the return on equity).

Thus, we have assessed the investment attractiveness of the sub-sectors of the fuel and energy complex of the Ural Federal District on the basis of two groups of indicators, including both multipliers that take into account the market value of the enterprise and enterprises that do not take this factor into account. Table 3 presents the final result of the conducted systematic study.

Table 3. Assessment of the investment attractiveness of extractive industry enterprises in the fuel and energy complex of the Ural Federal District (table fragment).

Enterprise	Indicators and Multipliers of Investment Attractiveness				
	Including Market Value			Excluding Market Value	
	EVA	EVA/EBITDA	ROIC	ROE	Debt/EBITDA
	>0—Investment Attractive	<3—Undervalued 3–5—Standard >5—Overvalued	ROIC > WACC	the ↑, the Better (Rating)	<2—Comfortable Level of Debt 2–4—Acceptable level >4—High Level
"Varioganneft" PJSC	<0	<0	ROIC < WACC	5	2–4
"Oil Company "Kondaneft"" JSC	**>0**	**<3**	**ROIC > WACC**	1	>4
"Gazpromneft-Khantos" LLC	<0	<0	ROIC < WACC	4	2–4
"SURGUTNEFTEGAZ" PJSC	<0	0	ROIC < WACC	3	2–4
"NIZHNEVARTOVSKOE NEFTEGAZODOBY-VAYUSHCHEE PREDPRIYATIE" JSC	**>0**	**<3**	**ROIC > WACC**	3	2–4
"SAMOTLORNEFTEGAZ" JSC	<0	<0	ROIC < WACC	5	2–4

Source: developed by Zadimidchenko A.

As priority enterprises to which attention should be paid, we chose: in the mining industry, "Nizhnevartovskoe Neftegazodobyvayushchee Predpriyatie" JSC, which is underestimated and has an acceptable level of debt; and in the manufacturing industry, "Nizhnevartovskoe Neftepererabatyvayushchee Ob"Edinenie" LLC. Similarly, calculations were performed for the manufacturing and energy sub-sectors. As an investment-attractive enterprise, which should be paid attention to, in the energy sub-sector, we chose JSC "Ugra Territorial Energy Company—Regional Grids".

Investors most often look at the EVA/EBITDA and Debt/EBITDA multipliers first. Often, they are combined into one bubble chart, on which the X-axis is EV/EBITDA, the Y-axis is Debt/EBITDA, and the size of the circle is determined by the company's capitalization (the cost of capital of the company WACC). The results of such a study are presented on positioning charts, on which all companies in the same industry are placed (Table 4, Figure 2).

Table 4. Indicators for modeling the positioning diagram of extractive industry enterprises.

| Enterprise	EVA/EBITDA	Debt/EBITDA	WACC
"LUKOJL-Zapadnaya Sibir" LLC	−2.59	9.87	9.25
"Varioganneft" PJSC	−0.45	4.89	9.31
"OIL COMPANY "KONDANEFT"" JSC	0.08	13.36	10.56
"OIL JOINT STOCK COMPANY "AKI-OTYR" JSC	−1.61	21.10	10.36
"Gazpromneft-Khantos" LLC	−0.07	3.71	9.40
"SURGUTNEFTEGAZ" PJSC	0.1	4.02	8.89
"NEGUSNEFT JSC"	−3.55	50.99	9.97
«Slavneft-Nizhnevartovsk» LLC	35.35	−547.28	10.49
"Nizhnevartovskoe Neftegazodobyvayushchee Predpriyatie" JSC	0.26	2.96	9.52
"SAMOTLORNEFTEGAZ" JSC	−0.51	2.39	9.10
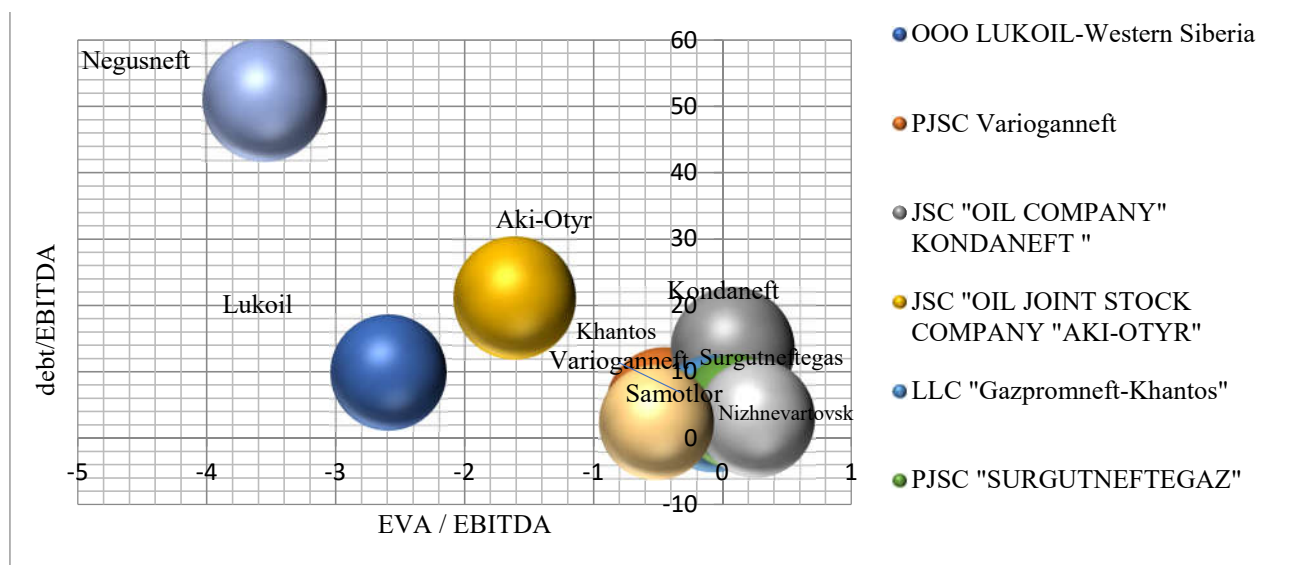
Figure 2. Investment attractiveness: positioning of an extractive industry enterprise. The most attractive companies are in the bottom right. Source: developed by Zadimidchenko A.

The most undervalued companies according to the presented visualization will be in the bottom left, near the origin. A rational investor is left to choose a company from the bottom left, study it and invest in it, since these are the enterprises that are the least risky. Similar calculations were made for the manufacturing and energy sub-sectors of the fuel and energy complex of the Ural Federal District.

Based on the systematization of the developed methods for constructing a matrix of investment attractiveness and multiplicative indicators, we identified the most priority areas, industries, and industrial enterprises for investment (Table 5).

Table 5. Comprehensive study: priority industrial enterprises for investment.

Sub-Sectors of Fuel and Energy Complex	Investment Attractiveness Matrix		Multiplicative Methodology	Positioning
	Level 1 Priority	Level 2 Priority		
Extractive industry	"Samotlorneftegaz" JSC	"Varioganneft" PJSC, "Gazpromneft-Khantos" LLC "Oil Company "Kondaneft" JSC, "Rn-Nyaganneftegaz" JSC, "Surgutneftegas" PJSC	"Nizhnevartovskoe Neftegazodoby-vayushchee Predpriyatie" JSC "Oil Company "Kondaneft" JSC	"Samotlorneftegaz" JSC "Nizhnevartovskoe Neftegazodoby-vayushchee Predpriyatie" JSC "Oil Company "Kondaneft" JSC
Manufacturing industry	"Gazprom Pererabotka" LLC	"Nizhnevartovskoe Nefte-pererabatyvayushchee Ob'edinenie" LLC, "SIBUR Holding" PJSC	"Nizhnevartovskoe Neftepererabaty-vayushchee Ob'edinenie" LLC	"Nizhnevartovskoe Neftepererabaty-vayushchee Ob'edinenie" LLC
Power industry	"Nizhnevartovskaya GRES" JSC	"UNIPRO" PJSC, "Yugorskaya Territorial'naya Energeticheskaya Kompaniya-Regional'nye Seti" JSC, Chernogorenergo JSC	"Yugorskaya Territorial'naya Energeticheskaya Kompaniya-Regional'nye Seti" JSC, "Nizhnevartovskaya GRES" JSC	"Nizhnevartovskaya GRES" JSC ПАО "Юнипро"

Source: developed by Zadimidchenko A.

Thus, the extractive industry and electric power industry can be singled out as the highest-priority areas for investment, but in general, in all sub-sectors, the most investment-attractive enterprises can be singled out. In the manufacturing industry and the electric power industry, the leading enterprises were identified more clearly, namely "Nizhnevartovskoe Neftepererabatyvayushchee Ob'edinenie" LLC and "Nizhnevartovskaya GRES" (State District Power Plant) JSC, respectively. At the same time, it should be noted that in the extractive industry, various enterprises are identified according to various methods; therefore, when making decisions, it is necessary to focus on the goals and main tasks of the decision to be made on investment regulation.

4. Discussion

Thus, on the basis of the study, we proposed a scheme that will visualize the scientific and methodological apparatus developed by us (Figure 3).

Accordingly, the next logical stage of the study is the development of a recommendation on the formation of an investment policy in the fuel and energy complex, taking into account specific factors.
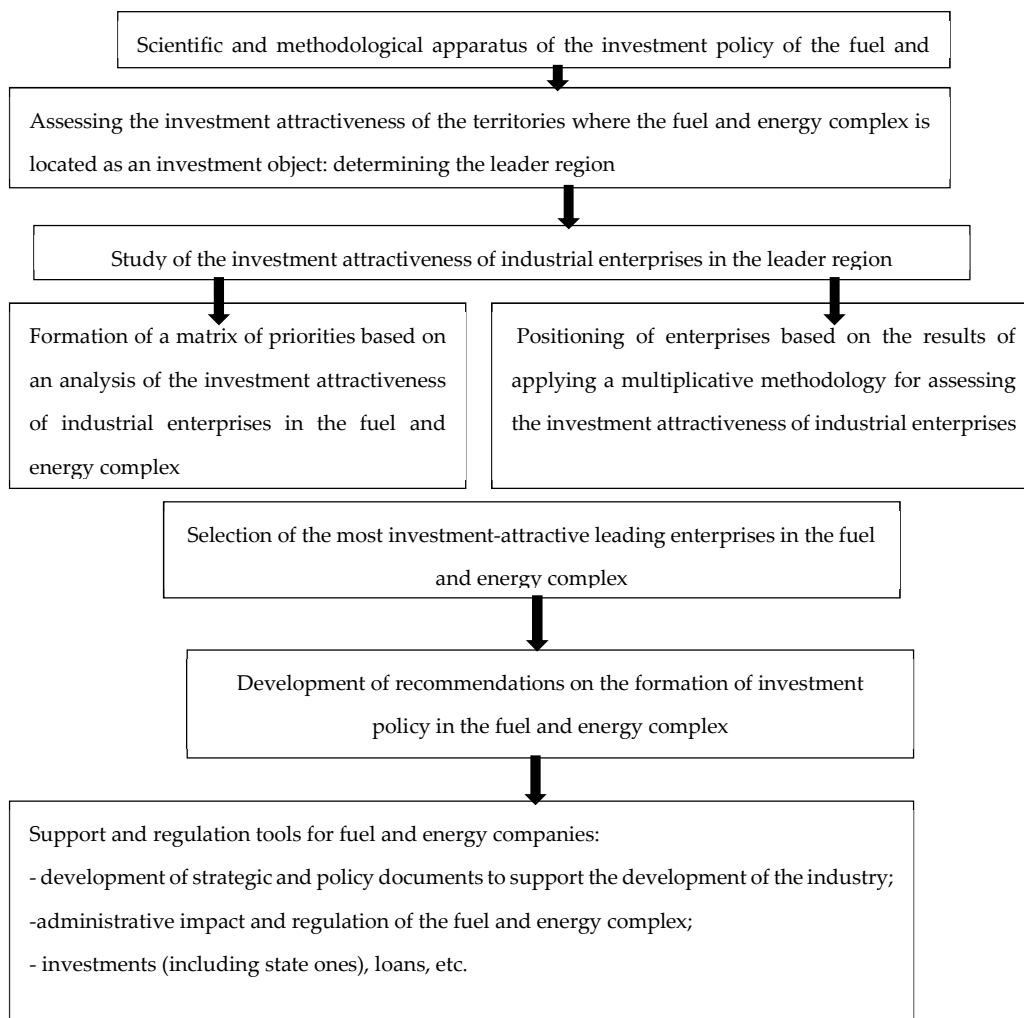

Figure 3. Scheme of visualization of the scientific and methodological apparatus of the investment policy of the fuel and energy complex. Source: developed by Zadimidchenko A.

5. Conclusions

It should be noted that at the moment there are a significant number of large-scale investment projects for the development of the fuel and energy complex—in particular, the production of gas chemical products (25,000 million rubles) in the Nefteyugansk,

Khanty-Mansiysk, Surgut, Nizhnevartovsk regions of the Khanty-Mansiysk Autonomous Okrug-Yugra, projects by JSC "Gazprom" for the geological study of underlying horizons and flanks in the Khanty-Mansiysk and Yama-lo-Nenetsky Autonomous Okrugs, and projects by LUKOIL together with Gazprom Neft to develop a large cluster in Yamal, etc.

The proposed methods for assessing investment attractiveness make it possible to take into account not only quantitatively measured indicators, but also qualitative indicators, which is especially important for obtaining a more complete result and can be used in conditions of limited access to information; a multiplicative methodology, which includes the use of a group of indicators oriented toward market value and involves the positioning of enterprises in terms of investment attractiveness according to a set of criteria, making it possible to comprehensively take into account multidirectional trends in industrial development and make effective management decisions when developing investment policy in fuel and energy complex. It is the multipliers that make it possible to assess the investment attractiveness of an industrial enterprise, regardless of its scale, and are the basis of the cost approach to investment. The proposed approaches take into account the regional specifics of various economic systems and sectoral structures, which makes it possible to more accurately assess and develop specific measures in the implementation of investment policy. These methods for assessing investment attractiveness can be used both by state and municipal authorities in the development of investment policy, and by potential investors and other counterparties.

Thus, the identified most investment-attractive enterprises, at the initial stage, should become the priorities of the industrial policy of the regions, since they are a kind of growth pole that can create a propulsive effect for the development of other enterprises and the territory as a whole.

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