Choosing the Investment Business Model for The Energy Industry

Инвестиционные модели ведения бизнеса в энергетическом секторе экономики

Modelos de inversión para hacer negocios en el sector energético de la economía

Written by:
Michael Evgenievich Kosov[166,167]
ORCID ID: 0000-0002-1067-0935
https://elibrary.ru/author_profile.asp?id=710940
Ravil Gabdullaevich Akhmadeev[168]
ORCID ID: 0000-0002-7526-0144
https://elibrary.ru/author_profile.asp?id=264522
Vladimir Mikhailovich Smirnov[169]
ORCID ID: 0000-0003-3347-5347
https://elibrary.ru/author_profile.asp?id=638489
Sergey Yuryevich Popkov[170]
ORCID ID: 0000-0002-2617-5226
https://elibrary.ru/author_profile.asp?id=750081
Nataliya Sergeevna Shmigol[171]
ORCID ID: 0000-0001-7093-3947
https://elibrary.ru/author_profile.asp?id=483098
Alexander Yurievich Chernov[172]
ORCID ID: 0000-0002-6126-7724
https://elibrary.ru/author_profile.asp?id=691582

Abstract

Investment by companies, which target growth of key labor productivity factors, labor attraction, modernization, and development, as well as reduction of production risks and higher investment attractiveness, is the main growth factor for emerging economies. However, the key drawbacks of the existing models of investment attractiveness assessment of state-sponsored projects are the absence of alternative financing from adjacent sources and the lack of the scenario approach when analyzing cash flows of a project. The authors' scientific and practical research offers the choice of the best investment project model, ensuring a lower default risk, lesser expected losses for the state (in case of redeeming the loss, occurring in the case of breach of warranty), and a lower possibility of tax receipt shortfalls under the project. The measures imply the use of the scenario and probabilistic approach,

Аннотация

Основным фактором роста экономики стран развивающего типа является реализация инвестиционных проектов хозяйствующими субъектами, ориентированными на рост основных факторов производительности, привлечении трудовых ресурсов, модернизации и развития, снижении производственных рисков и увеличении инвестиционной привлекательности. Вместе с тем основными недостатками используемых моделей оценки инвестиционных проектов, реализуемых за счет государственной поддержки, является отсутствие рассмотрение альтернатив финансирования из смежных источников, неиспользование сценарного подхода при анализе денежных потоков проекта. В рамках проведенного научного исследования предложен выбор наиболее оптимальной

[166] Financial University under the Government of the Russian Federation, Russian Federation
[167] Plekhanov Russian University of Economics, Russian Federation. mtrushin@mail.ru
[168] Plekhanov Russian University of Economics, Russian Federation. mtrushin@mail.ru
[169] Financial University under the Government of the Russian Federation, Russian Federation
[170] Moscow city Government University of management Moscow, Russian Federation
[171] Financial University under the Government of the Russian Federation, Russian Federation
[172] Financial University under the Government of the Russian Federation, Russian Federation

ensuring consideration of all possible alternatives for an investment project of companies, engaged in the energy business, and, consequently, higher efficiency of budget spending.

Keywords: investment, taxes, budget, coal production, steel production, budget financing, economy, capital, profit.

модели инвестиционного проекта, позволяющей снизить риск вероятности дефолта, уменьшить ожидаемые потери для государства (в случае возмещения ущерба, образовавшегося при наступлении гарантийного случая), снизить вероятность недополучения ожидаемых в рамках проекта налоговых поступлений в бюджет соответствующего уровня. Реализация данных мер подразумевает использование сценарного и вероятностного подхода, что позволяет рассматривать все возможные альтернативы для инвестиционного проекта для компаний, занимающихся ведением бизнеса в энергетических секторах экономики и как следствие реализация данной меры позволяет увеличить эффективность использования бюджетных средств.

Ключевые слова: инвестиции, налоги, бюджет, добыча и производство угля, производство стали, бюджетное финансирование, экономика

Resumen

El factor principal en el crecimiento de las economías de tipo en desarrollo es la implementación de proyectos de inversión por parte de entidades comerciales centradas en el crecimiento de los principales factores de productividad, atracción de recursos laborales, modernización y desarrollo, reducción de los riesgos de producción y aumento del atractivo de la inversión. Al mismo tiempo, los principales inconvenientes de los modelos utilizados para evaluar los proyectos de inversión implementados con apoyo estatal son la falta de consideración de alternativas para el financiamiento de fuentes relacionadas, la no utilización del enfoque de escenario para analizar los flujos de efectivo del proyecto. Como parte de la investigación, se hizo una selección del modelo de proyecto de inversión más óptimo, que reduce el riesgo de una probabilidad de incumplimiento, reduce las pérdidas esperadas para el estado (en caso de compensación por daños incurridos en el caso de un evento de garantía), y reduce la probabilidad de ingresos fiscales por debajo de lo esperado para el presupuesto. . La implementación de estas medidas implica el uso del escenario y el enfoque probabilístico, que permite considerar todas las alternativas posibles para el proyecto de inversión para las empresas que realizan negocios en los sectores energéticos de la economía y, como consecuencia, la implementación de esta medida permite aumentar la eficiencia del uso de los fondos presupuestarios.

Palabras clave: inversiones, impuestos, presupuesto, extracción y producción de carbón, producción de acero, financiamiento del presupuesto, economía.

Introduction

Investment projects are usually financed by three sources – own funds of the initiator of the project (capital, accumulated undistributed profit, ordinary shares, venture capital, mezzanine financing, etc), borrowed money (credits, promissory notes, bonds, leasing), and hybrid funding (preferred shares and convertible bonds). As investment structure in emerging markets, including the Russian Federation, changes in the aftermath of the crisis, which started in 2015,

there is a great number of investment projects with a low or negative margin. Valuation of such projects with state participation in 2017 can be even lower. At that, the low effectiveness of the projects and the lack of cost control pushed the overall producer price index up, worsening economic prospects of a country (Skidmore, 1999). This means that the investment risk of any project exceeds the average risk of peer projects in developed states by many times, pushing the

required margin higher and cutting the investment horizon and the repayment period. This translates into falling private investment in such an economy and heavier state participation.

More efficient use of investment resources and better quality of investment projects will boost capitalization and, consequently, the quality of credit. This, in turn, will provide a wider range of financing sources for investment projects, reduce the need in large government participation, and ensure the effectiveness. According to the State Statistics Service, debt (from 54.23% to 59.02%) acted as the core source of investment in fixed capital from 2005 to 2014. The federal budget and budgets of subjects of the Russian Federation (32% on average) account for the largest share.

However, in the European Union states, borrowed capital prevails, being not only the financing source for operations but also for investment projects (according to Eurostat Statics, the debt to revenue ratio amounted to over 94% in 2015).

However, there are certain types of investment projects with high R&D, which cannot be financed with the help of debt, borrowed from banks. Other types of support replace traditional banking credit. At that, the overall need of business for state support largely depends on its scale and development. For instance, we can single out the following needs of the producing economy (Figure 1).
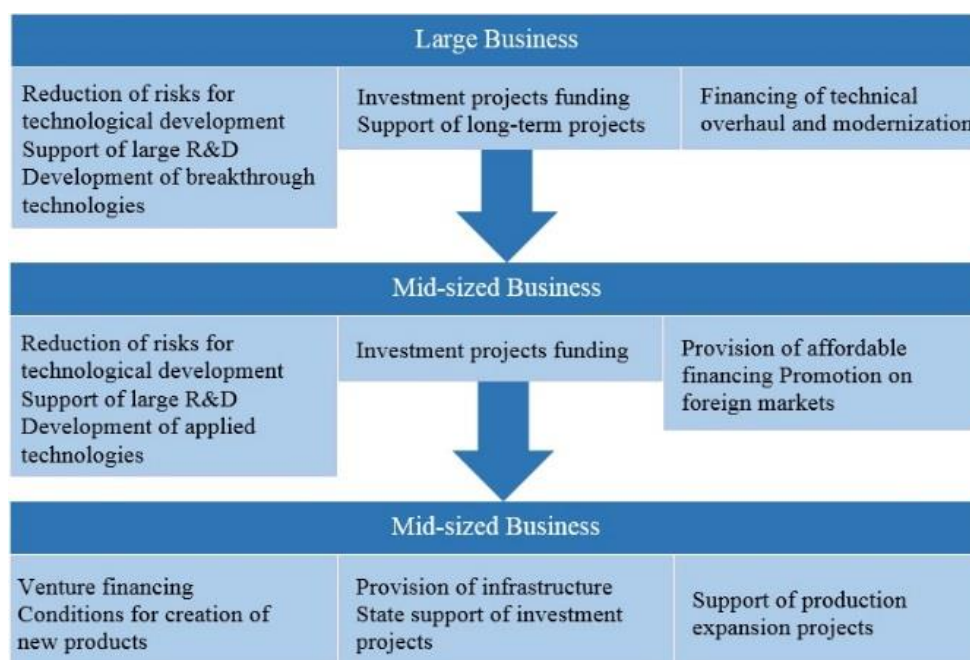

Figure 1. Need for state support depending on the development stage

We should note that most governments undertake comprehensive measures to stimulate innovations at subjects of the economy, including the most important taxation measures, and to ensure sustainable innovation development. Systematic use of tax advantages, which stimulate R&D and production of hi-tech products, started in the 1960s. In that period, developed countries massively introduced advantages, aimed at support of innovative activities into their taxation legislation. The most widespread tax incentives include the following: discounts on profit equaling to investment in new equipment; reduction of the profit tax by the sum of spending on R&D; allocation of spending on some types of equipment often used in scientific research to current costs; tax holidays; creation

of special tax-free funds from profit; profit taxation at lower rates (for small and medium-sized businesses).

Each country created its own system of tax incentives for the innovation activities, which combined multiple elements and adjusted to the national R&D, innovation, and production policy. Another fact seems conspicuous here. To curb state spending on tax support of innovation activities, many countries capped the advantages. There is a so-called practice of establishing a ceiling for tax reliefs on R&D and investment. In Japan and South Korea, the tax reliefs must not exceed 10% of the corporate tax. In Canada, Spain, and Taiwan, the ceiling is much higher – 75, 35 and 50% respectively. Britain raised its

ceiling for non-taxable investment by 50% to 150,000 pounds (Kosov, 2016). Russia uses a significant number of tax incentives invented abroad, but these instruments are used in different conditions (different approaches to the taxation base, to the order of tax advantages, and to control over the legality of tax advantages application).

The highest effectiveness of tax exemptions aimed at stimulating the innovative development of the economy can be attained on condition of their differentiation depending on specific features of the taxpayer. The specific feature can be a high share of labor spending, a high share of added value, large volumes of fixed assets, etc. Higher effectiveness of tax reliefs also ensures their differentiated application depending on the stage of innovative activity.

Concept   Headings   and   Statistical Methodology

We should note that not all data can be used when assessing effectiveness because, as a rule, market information is needed, which cannot be assessed with a sufficient degree of probability. In some cases, social indicators are also hard to assess. As a rule, four key criteria for assessment of an investment project's effectiveness are singled out: financial, budget, economic, and social effect indicators. At that, the financial criteria are such indicators as NPV (net present value) of a project and the internal rate of return. In this case, the calculation of NPV is done according to the following formula:

$$NPV = FCF_0 + \sum_{t=1}^{T} \frac{FCF_t}{(1+WACC)^t} + \frac{V_T}{(1+WACC)^T} \ (1)$$

where FCF_o is cash flow produced inside the investment project in the first year (this is, as a rule, initial capital spending);

FCF_t is cash flow coming in annually during t time period;
V_t is the terminal value of a project at time T;
WACC is a discount rate as a weighted average cost of capital (calculated based on three figures of capital: own capital, borrowed or credit capital, and capital offered as budget subsidies). The cost of capital of the fund in the WACC model is defined annually by the Ministry of Economic Development and the Ministry of Finance.

The internal rate of return (IRR) is a rate, which ensures NPV at zero in formula (1), consequently, the key condition is the IRR> ratio

(Brock, 1996). If the IRR is below WACC, it means that NPV is negative. Along with the net present value, the payback period (standard and discounted) is also calculated. These indicators show the number of years (t) after which NPV equals zero. After calculating the net present value, the internal revenue rate and the payback period, we calculate the RFA under the following formula:

$$RFA = \frac{NPV}{\sum_{t=1}^{T}\frac{Inv_t}{(1+WACC)^t}} \ (2)$$

where Inv(t) is the total volume of investment by all participants of an investment project (investors and the state).

The following financial conditions should be met to receive state support for an investment project (and as an indicator of the effectiveness of such a project due to the support):

a) NPV should be above zero;
b) IRR should be above WACC;
c) The payback period should be acceptable for investment;
d) RFA should be above 1.

As budget funds' effectiveness in an investment project is assessed, the volume of all budget appropriations and all discounted tax receipts to all budgets is calculated. Our research assesses budget effectiveness (PI) with the help of the following formula:

$$PI = \frac{\sum_{t=1}^{T}\frac{BCF_t}{(1+\bar{r})^t}}{\sum_{t=1}^{T}\frac{Inv(IF)_t}{(1+\bar{r})^t}} \ (3)$$

where BCF is a sum of direct and indirect taxes coming from an investment project (including the sums calculated based on forecasted assets of the projects, taxation legislation and additional adjustments);
Inv(IF) is a budget investment.

To acknowledge a project effective and fit for support, the PI index should be above 1. The economic criterion is one of the indicators to be assessed. The criterion assesses the added value of a project for a region. An annual index of economic effectiveness (E) calculated to the following formula is used to assess economic effectiveness:

$$E_r^t = \frac{VA^t}{GDP^{t-1}} \ (4)$$

Where VA is added value at t time, calculated as earnings before interest, taxation, depreciation, and amortization (EBITDA), the overall payroll under the project and rentals;

GDP is the gross domestic product of the previous year in current prices in the absence of the investment project.

As the social effect of the investment project is assessed, the following data are taken:

a) Higher employment of working age people;
b) Higher provision with comfortable housing;
c) Better environment;
d) Higher affordability and quality of transportation, health, education, sports, culture, and municipal services.

All indicators should be fixed in the financial model of the investment project. The model, according to Theodossiou (1995), also includes forecasted statements and demonstrates the calculation of the indicators, pointing to the effectiveness of an investment project with state support. However, although the indicators are recommended by legislation and are common for analyzing investment projects, there are other indicators for the assessment of an investment project's effectiveness. Besides, scientific research shows that NPV and discount related indicators sometimes fail to reflect the real condition of a project (Freedman, 2016).

Scientific research in modeling investment projects with state support, as well as additional options (Espinosa, 2014; Limitovsky, 2016), discusses the efficiency of investment projects in terms of modeling (Telekhov, 2013; Maltseva, 2015) and creation of realistic options since NPV can be very low (Ahlin, 2008). Such approaches allow us to factor in additional solutions in the project, which boost its value (Theriou, 2004). At the same time, researchers noted that the traditional approach towards NPV valuation, which exists in legislation, produced a negative figure, while imitational modeling, including modeling with the use of the Monte Carlo methodology (Bykanova, 2017) and valuation of real options, produce a positive NPV. Arkin and Slastnikov (2016) take another, optimization point of view, which allows us to assess an investment project's effectiveness with the use of non-traditional methods. Research by Vladimirov (2016) and Ivashkovskaya (2013) stands out from the point of view of the market and social indicators as the authors discuss the problem in the framework of company

valuations, based on economic profit and indices, characterizing stakeholders' risks. We should note that such approaches towards assessment of investment projects fully meet modern conditions of organization and functioning of investment projects, because market indicators can answer the questions, which are interesting for investors: the efficiency of the company management in managing the investment projects; whether organic growth is sufficient for the company; how to assess and range investment projects by their effectiveness (Kuznetsov, 2017). State support of investment projects allows us to have an additional assessment of an investment project's effectiveness with the help of the indicators considered in the research of economists. The key criteria of an investment project's effectiveness can be demonstrated with the help of factors (drivers) of the project's value and its successful implementation. Apart from the traditional methods of investment projects' effectiveness assessment, assessment of the credit quality and solvency of an organization is used to evaluate a warranty event (in case of state guarantee issuance for an investment project). To evaluate a warranty event (the possibility of bankruptcy) the following is assessed:

a) company bankruptcy signs;
b) net asset value of the appraised company;
c) assessment of indicators, which characterize the ability of a commercial company to meet long-term liabilities;
d) assessment of the commercial company's effectiveness indicators.

Expected payments on state guarantees from the point of view of state debt repayments can be reflected in the following formula:

$$EL = \text{Guarantee volume} * P(\text{project liquidation}) \quad (5)$$

where EL is expected loss;
P (project liquidation) is the probability of bankruptcy or liquidation of an investment project.

Results and Discussion

The appraisal of various methods of financial support of an investment project and their influence on the economy of a state was conducted at the microlevel, taking into consideration different stages of an enterprise life cycle (ELC). ELC is important when considering investment projects because companies implement several investment projects during their life span and they can start at an early stage. The most famous ELC concept, which describes

typical problems and development, was introduced by famous economist Mann, who described in his research the key indicators of the ELC model taking into account methods of state support (Adizes, 2014). Now, we are able to summarize the multiplicative effect in Table.

Table 1. Influence of key methods of state support on investment project's effectiveness indicators.

Support method	Impact on indicator	Result
Interest subsidies	Lower debt cost	Higher NPV of the project because of a lower discount rate
Cost subsidies	Lower capital expenses	Higher NPV of the project due to lower initial and subsequent capital expenditures, higher cash flow of the project
Tax exemptions or tax cuts	Lower tax payments on the project	Higher NPV following cash flows increase with lower tax payments
Investment following a higher share in the capital	Higher/lower average capital cost	Higher/lower NPV due to changes in the discount rate (depends on the current capital structure and capital costs of the project)
State guarantee	Higher/lower average weighted capital cost Higher interest payments	Higher/lower NPV due to changes in the discount rate (depends on the current capital structure and capital costs of the project), higher interest payments. However, these are forced costs as the project could not be implemented without the sources

In this research, we analyzed and built financial models for two investment projects with state financial support. While building the financial model, we took into consideration all necessary preconditions and requirements under the current legislation and recommendations of Vnesheconombank.

Investment Project 1 has been implemented by a large public holding company Mechel PAO since the start of 2014. A separate mining company was created for the project, which fully belongs to Mechel PAO. The resources of the deposit amount to 2.1 bln tons of coal. The project is supposed to help develop the field to sell coal for exports and domestically. In December 2013, Vnesheconombank provided a large $2.5 bln credit for 13.5 years for Project 1. The credit will be disbursed in tranches until 2022. Under the credit agreement, Vnesheconombank has the right for a 49% share in the capital in case of bankruptcy of the company or its failure to meet credit obligations. Interest on the credit amounted to 6% + Libor. At present (as of the end of 2016), Vnesheconombank is considering the sale of the 49% share in capital to Gazprombank (Norko, 2017). The key reason behind the decision is a very shaky situation in the market and high risks of the investment project.

The period from 2014 to 2090 was taken as a forecast period. The wide bracket of the forecast stems from the belief that resources of the deposit will have been practically depleted by 2090 (there will only be resources, which cannot be mined). The planned 18,000,000 tons of coal will be produced by 2021 under the project. The target estimated output of 32,749,000 tons will be reached by 2025. After which, from 2025-2069, the capacity of the investment project will amount to an average level in the Russian Federation (Goodhart, 1988). Lower capacity and consequently, lower output volumes are forecast from 2069 because of the difficulties in the maintenance of fixed assets and production of remaining resources on the deposit. Under the project, coking coal will account for 37% of the sales and steam coal for 30% (Ferreira, 2017). At that, 73% of coking and steam coal are to be supplied to the foreign market (Lim, 2011).

Prices for coking and steam coal differ in the internal and external markets. We forecast prices for futures contracts for Hard Coking Coal (HCC) FOB Australia, for steam coals – for Newcastle 5500 kc FOB.

In turn, in the Russian market, we chose a contract price forecast for fat coal (historical contract prices are provided by Metal Expert). The prices were forecast based on an international price forecast for coking and steam coals.

Based on the investment project's cost factors, we have forecast financial indicators for the company without taking into account historical data because average industry indicators will be reached when the design capacity is attained:

1) Gross margin will amount to 30.70% by 2018;
2) EBIT margin will amount to 18.97% by 2018;
3) Effective tax rate until 2022 will amount to 0% (accrued loss), after which from 2023 to 2028, it will amount to 10% (following tax exemptions in accordance with Article 284.3 item 2 of the Russian Federation Tax Code), and later to an average industry figure of 21.48%;
4) Amortization to revenue ratio averages 6.92%;
5) Capital expenditures in 2014-2019 are mainly represented by credits used to develop the deposit. After 2019, capital expenditures are meant to maintain the funds to revenue ratio at 1.06%;
6) The turnover capital to revenue ratio will amount to the industry average (-1.52%) by 2018;
7) The discount rate is calculated under the WACC model. The change of the rate follows a lower debt burden of the investment project. The CAPM model parameters were forecast taking into account an average beta, adjusted to financial leverage.

The industry averages used while compiling the financial model forecast contain data taken from the Bloomberg information terminal (Table 2).

Table 2. Average industry indicators for the investment project.

Company ticker	D&A/Sales	WC/Sales	EBIT Margin	CAPEX/Sales	Effective Tax rate	Gross margin
UKUZ RM Equity	7.66%	-43.22%	22.67%	60.70%	25.34%	41.70%
KBTK RM Equity	5.97%	-0.08%	9.37%	n/a	22.06%	19.38%
BLNG RM Equity	12.02%	6.68%	5.50%	-22.35%	14.38%	17.33%
PRUG RU Equity	7.42%	37.56%	13.26%	-18.98%	17.72%	25.30%
UPIR RU Equity	5.25%	-28.48%	n/a	21.11%	n/a	n/a
RTUL RU Equity	6.42%	n/a	n/a	n/a	n/a	n/a
MZDR RU Equity	3.83%	n/a	42.26%	n/a	20.90%	42.68%
KZRU RU Equity	8.60%	-2.96%	20.77%	n/a	26.81%	36.10%
Average	7.14%	-5.09%	18.97%	10.12%	21.20%	30.41%
Median	6.92%	-1.52%	17.02%	1.06%	21.48%	30.70%

Accrued cash flow of Project 1 is presented in a graphic form in Figure 2.
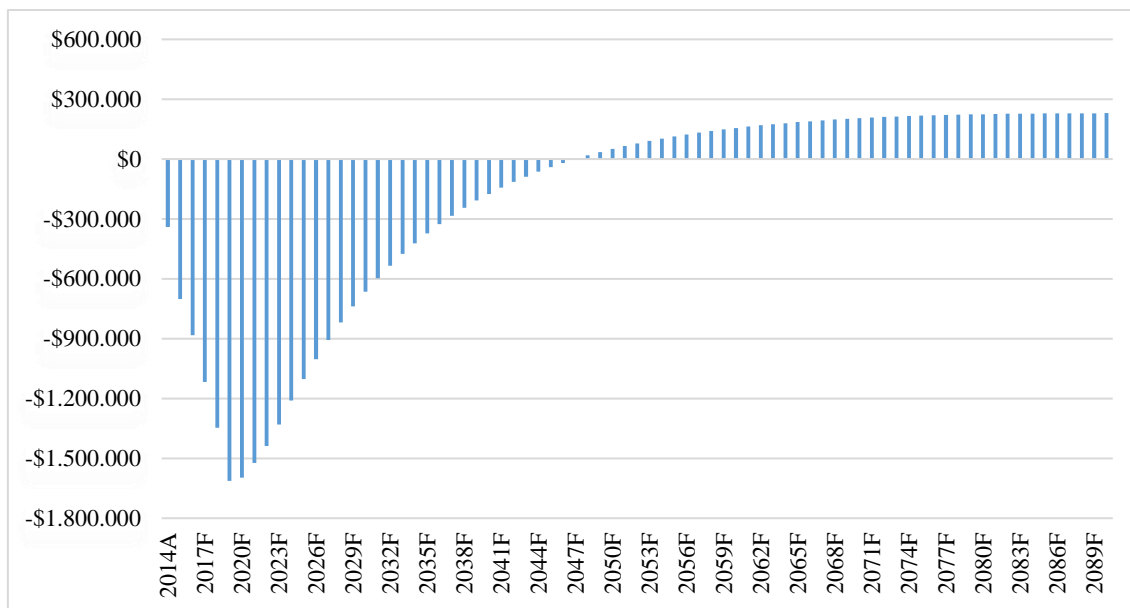
Figure 2. Cumulative discounted FCFF for Project 1.

Thus, NPV of Project 1 amounts to 229,935,000 USD, the discounted payback period – to 3.5 years (a full payback period to 2046-2047). Since we suppose that Vnesheconombank can sell its share in the project company, we valued the 49% share of the company in Table 3.

Table 3. Valuation of VEB's 49% share as of the beginning of 2017.

Indicator	Value
Enterprise Value, thousand USD	927,406
Adjustment to net debt, thousand USD	(620,101)
Capital cost, thousand USD	307,304
Capital cost, mln rubles	20,601
Cost of VEB's 49% share, mln rubles	10,094

Investment Project 2 is implemented by one of Russia's large public metallurgical companies. At that, the region (Nizhny Novgorod) acknowledged the project as innovative. Fulfillment of the project is strategically important because it will allow the region to boost steel product output significantly in such industries as the production of aviation engines. The investment project is primarily aimed at import replacement in this segment of the market. The key innovativeness of the project consists in the use of modern technologies, which improve steel quality to the level, outstripping international standards and cuts costs. At the end of 2014, the company raised 3 bln rubles from VTB Bank under an eight-year state guarantee for the project. The key credit tranches were disbursed to the organization in 2015 and 2016. The key interest on the credit was set at specialized refinancing instrument + 2.5%. The credit funds will be used by the company in 2015-2016 to buy new equipment and replenish turnover capital under the investment project.

As we assessed investment Project 2 and built its financial model, we forecast the indicators similar to those of Project 1. As steel products are produced and sold under investment Project 2, it is supposed that the organization will reach a production capacity of 22,000 tons a year by 2019, which will be maintained for the next 4-5 years. At that, steel output outside the project maintains steel output at an average Russian rate. Since the company is an exporter (exports account for the smallest share of 10% of total sales as of 2015), the prices were forecast for Russian and foreign markets. At that, basic prices are fixed at the London Metal Exchange (LME)

but differ because of industry specifics. Consequently, the calculations take into account historical data given average international prices for similar types of steel. The company plans to attain a 35% share of exports in the overall sales by 2021.

The key factors of the financial indicators growth were forecast based on the target figures of the investment project, average industry figures, and historical data of the company:

1) The gross margin at the project's planned capacity will amount to 35% (since the investment project cuts the need in materials and raw materials by 20%);
2) The EBIT margin will amount to 19% when the planned capacity is reached (following cost cuts under the project);
3) The effective tax rate amounts to 13% for the whole forecast period (the rate is taken as a median from the company's historical data, according to the researches;
4) The amortization to revenue ratio amounts to 8% (the company has been maintaining this level since the launch of the investment project). The rate is very close to an average industry rate by peer companies;

5) Capital spending is mainly done in 2015-2016 for equipment upgrade and purchases under the investment project. From 2017 to 2025, the company is supposed to maintain fixed assets at 3% of revenue (an industry average);
6) Turnover capital is forecast separately by the size of reserves (10% of revenue for the whole period), accounts receivable (9% of turnover for the whole period), and accounts payable (9% of revenue, excluding 2018-2021, when the rate will amount to 20% as revenue growth exceeds a stable growth rate, (SGR));
7) The discount rate for the whole period amounted to 12.82% (since the risks of the project coincide with the company's activities). We assessed the discount rate in the same way as in project X – on the basis of industry average beta, the WACC, and CAPM-Built-Up models;
8) The terminal growth rate amounted to 1.37% given the future steel output growth and its sales at forecast prices.

The series of average industry values used to calculate a forecast financial model using data of Bloomberg information terminal is presented in Table 4.

Table 4. Average industry investment project indicators.

Company ticker	D&A/Sales	WC/Sales	EBIT Margin	CAPEX/Sales	Effective tax rate
CHMF RM Equity	22.49%	28.98%	-1.26%	22.16%	31.05%
NLMK RM Equity	22.31%	26.44%	4.43%	26.71%	31.37%
MAGN RM Equity	19.48%	11.75%	-0.68%	2.26%	22.46%
VSMO RM Equity	31.87%	52.08%	19.63%	24.48%	41.72%
TRMK RM Equity	14.93%	10.74%	2.35%	29.30%	21.42%
MTLR RM Equity	15.07%	-8.83%	11.10%	8.82%	36.90%
Average	20.90%	19.10%	3.39%	23.32%	31.21%
Median	21.03%	20.20%	5.93%	18.96%	30.82%

The financial model of investment project Y is presented in Table 4. Accrued cash flow of the project is presented in Figure 3.
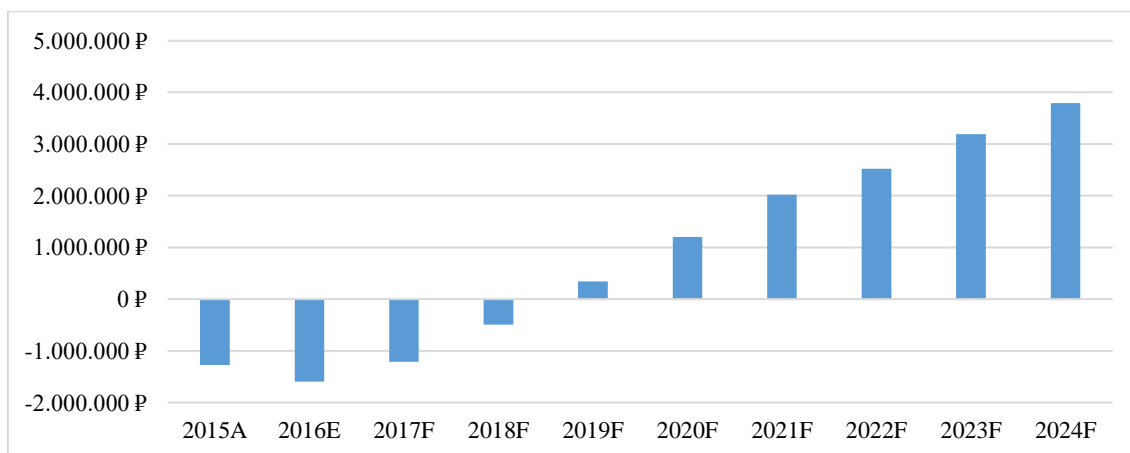
Figure 3. Cumulative value of discounted FCFF 2.

The generalized final indicators of the project are presented in Table 5.

Table 5. Final indicators of Project 2, thousand rubles.

Indicator	Value	Share
Discounted cash flow (FCFF)	3,792,062	42%
Discounted terminal value	5,339,808	58%
NPV of the project	9,131,870	100%

Thus, the net present value of the project amounts to 9,131,870,000 rubles. At that, the share of terminal value in NPV amounts to 58%, which is a reasonable value and meets calculations of the financial model. The discounted payback period of the project (DPBP) amounts to 4.32 years.

Conclusion

The calculations of effectiveness allow us to make the following conclusions:

a) Project 1 has a high investment payback from the point of view of the budget and economic effectiveness, however, we believe that the project is not fit for implementation by the RFA criterion as it is below 1;

b) Project 2 also has a high payback confirming its implementation worthiness, although its payback is much lower than that of Project 1.

Thus, state financial support of the projects is reasonable from the financial and economic points of view because the projects have quite a large payback on the funds invested by the government. In particular, the total tax revenue of Project 1, which received a credit to develop a

deposit, exceeds the net present value by 850%. At that, the company brings 6.19% of added value to the region on average. In its turn, Project 2 has a high return on discounted tranches backed with state guarantees. The investment project brings 0.55% of added value on average to the gross regional product.

At that, when analyzing the investment projects in practice, the use of additional models, which will forecast situations stemming from normal approximation, is possible. In particular, one of the most popular and used models for the assessment of investment projects is the Monte Carlo method (Ailawadi, 2003). The research by Janekova (2015) and Sazanov (2016) analyzes the practical use of the method and shows that it demonstrates the results allowing us to test and analyze the financial model of a project.

Here we have analyzed investment Projects 1 and 2 with the use of the Monte Carlo method (Visual Basic for Applications in Excel was used) to evaluate the distribution of indicators, which are modelled in the financial model of the project and assessment of a project default probability (negative net present value). At that, the method ensures the results demonstrating qualitative characteristics of the project's risks

from the point of view of state financial support. Distribution of production rates and the net present value of Project 1, based on 1,000 iterations are shown in Figures 4 and 5.
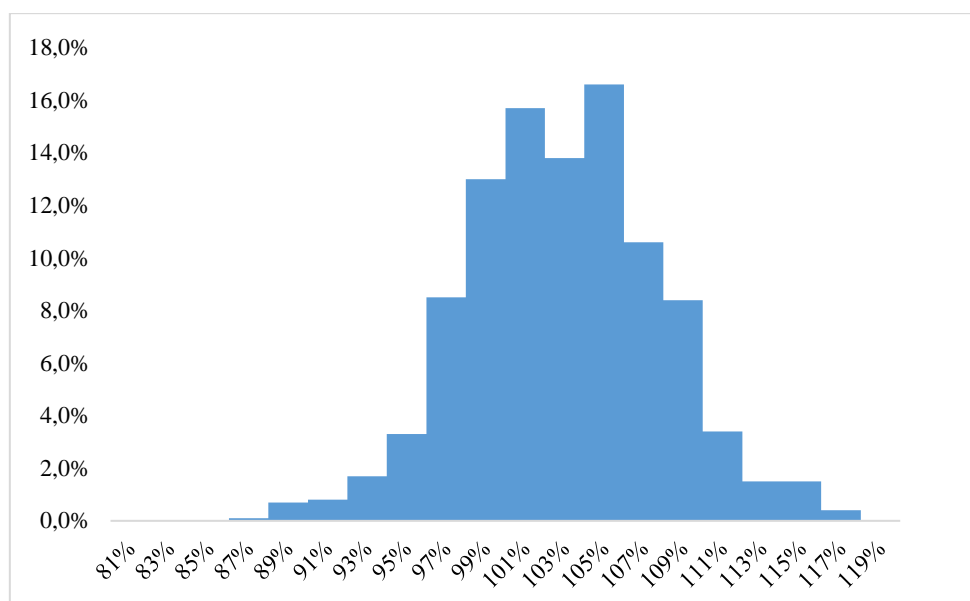

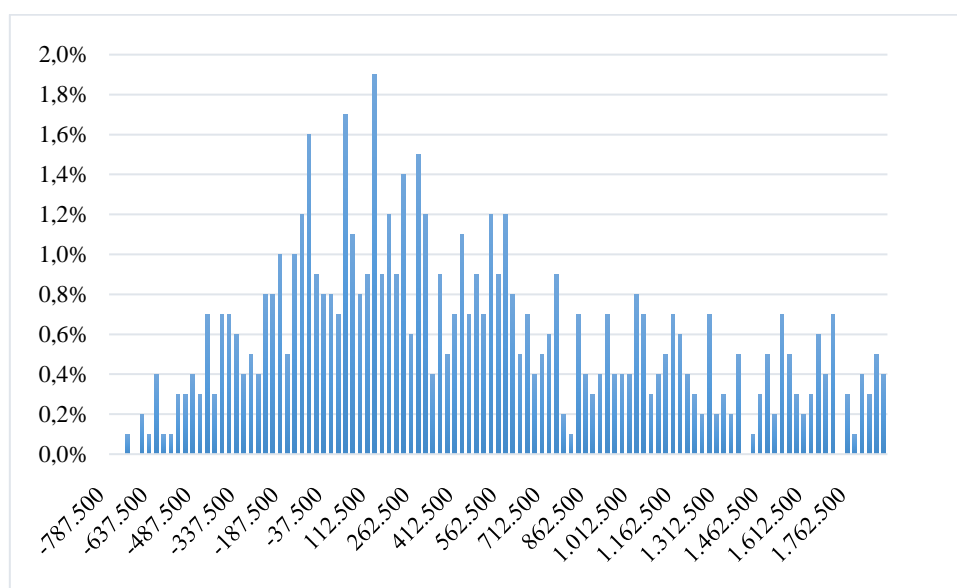Figure 4. Distribution of coal production in Project 1.

Figure 5. NPV distribution in Project 1.

The default probability assessment of the investment project and credit repayment based on the Monte Carlo method is presented in Table 6.

Table 6. Default probability assessment of investment Project 1.

Indicator	Value	
NPV of project	from	(800,000)
	to	0
Number (n)	167	
Total number of iterations	1,000	

Defaults probability	16.70%

Thus, the probability of the project company liquidation and investment company bankruptcy amounts to 16.70%. By calculating the risk probability with the help of formula (5) we may adjust the value of the 49% share of company capital belonging to Vnesheconombank:

Adjusted value $= 10,094,000$ USD x $(1 - 16.70\%) = 8,408,000\ USD$.

Steel price growth distribution and the net present value of investment Project 2 following 5,000 iterations are presented in Figures 6 and 7.
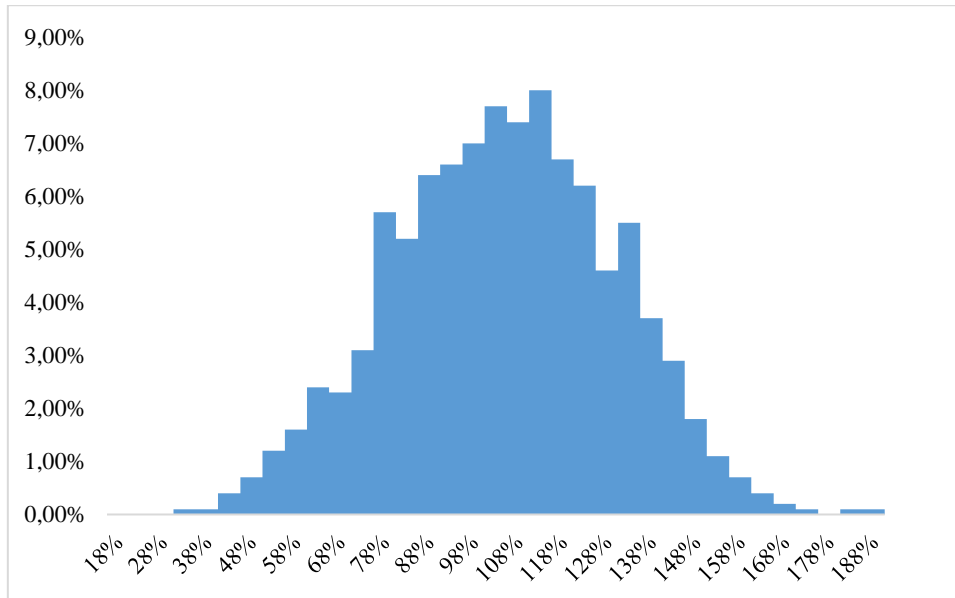

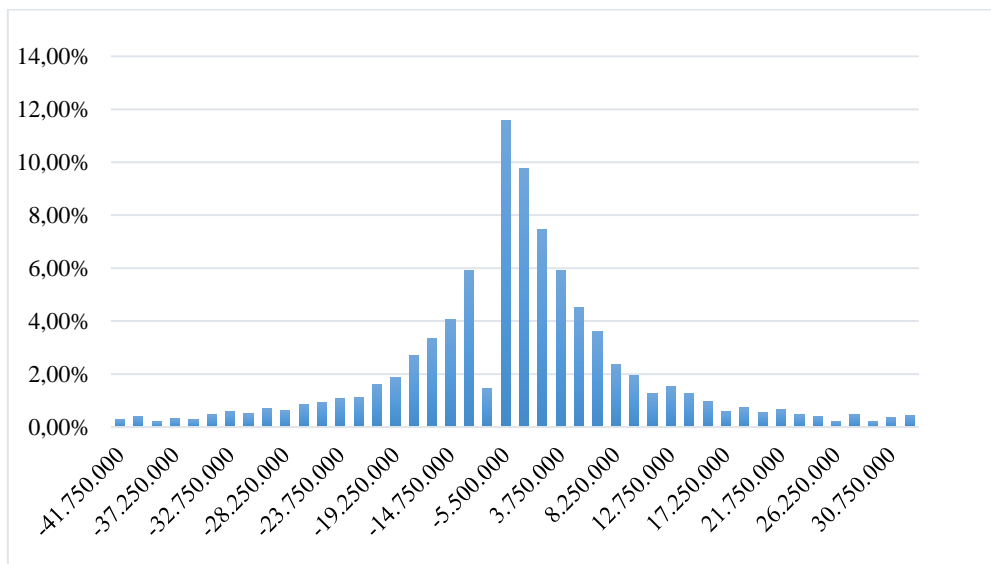Figure 6. Steel price growth distribution under Project 2.

Figure 7. NPV distribution of Project 2.

In its turn, the default probability assessment of an investment project and the possibility of failure on a credit, as well as the occurrence of the guarantee case (funds repayment based on state guarantee), calculated with the help of the Monte Carlo model are presented in Table 7.

Table 7. Default probability assessment of investment Project 2.

Indicator	Value	
Project NPV	From	(21,141,750,245)
	To	0
Number (n)	2,387	
Total number of iterations	5,000	
Default probability	47.74%	

Formula (4) allows us to evaluate the expected loss (spending) for the government in case of a guarantee case occurrence: $EL = 3$ bln rubles x $47.74\% = 1.43$ bln rubles.

Thus, with a default probability of 47.74% as of the start of 2017, expected payments on state debt for the investment project amount to 1.43 bln rubles. Financial modeling for the project points to significant risks as compared with Project 1.

Generalized comparative characteristics of Projects 1 and 2 based on the aforementioned indicators are presented in Table 8.

Table 8. Comparison of characteristics of Projects 1 and 2.

Indicator	Project 1	Project 2
Project NPV, thousand rubles	15,414,078	9,131,870
Project IRR	14.10%	45.42%
DPBP, years	33.5	4.32
PI	9.57	1.44
RFA	0.27	2.67
Economic criterion	6.19%	0.67%
Default probability	16.70%	47.74%

Analysis of each of the indicators enables us to formulate the following:

a) Project 1 brings more added value and taxes to the budget as compared with Project 2 due to industry specifics and the long term of the project;
b) although there is a great industry difference, investment Project 1 has no significant net present value unlike investment Project 2, which is implemented inside the company. This is because the key cash flow under the investment project is negative in the first few years;
c) from the point of view of project risks, Project 2 carries higher risks because it is an innovative project.

The government should revise additional support for Project 2 ensuring the best loss and spending to the effectiveness ratio because of high risks and with the aim of cutting the expected loss and risks. The choice of the financing source is a priority when implementing investment projects. An economic subject chooses the financing source based on its needs, industry and target capital structure (Engle, 1982). One of such sources is state support, which is also of significant impact for economic development on the whole. A company can raise funds (or reduce their cost and increase their affordability) with the help of state credit despite the risks, which can be unacceptable for a banking credit.

State guarantees in no less than 90 countries of the world, mainly in the OECD, are also an important support instrument. As a rule, state guarantees are viewed as an instrument for

stimulation of social and economic development. This type of incentive is carried out by the government or entities created with its participation. International practice demonstrates that state guarantees are used for debt obligations of a principal, as well as for losses connected with risks (as a rule used in state and private partnerships).

The key goal of a state guarantee is additional financing, i.e. raising of funds, which cannot be raised without the guarantee, or would be raised at higher rates (research by the international consulting company KPMG states that a state guarantee without additional support measures helps to receive a loan only in 20% of cases). Additional incentives for getting financing can be represented by risk diversification, overruling of collateral restrictions. At the same time, state support of investment projects at the macrolevel helps increase the GDP of a country by boosting competitiveness and contribution of each organization to the national economy. The success of investment projects helps industries develop, attract new foreign investment, support high demand for labor, and boost the income of state coffers.

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