



Article

Forecasting and Evaluating The Efficiency of Investment Activities in Small and Medium Enterprises

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Abstract: This scientific article is devoted to an in-depth analysis of the theoretical and practical aspects of assessing and forecasting the investment activities of small and medium-sized businesses (SMEs) in the conditions of the modern economy. The main goal of the research is to improve existing methodologies and develop new forecasting models used to determine the effectiveness of investment projects for SMEs in a volatile market environment with high uncertainty and risks. The article synthesizes econometric analysis, correlation-regression modeling and discounted cash flow (DCF) methods, and shows ways to optimize the investment decision-making process. The results of the research show that traditional static assessment methods are insufficient in dynamic market conditions, and the introduction of stochastic forecasting methods serves to minimize investment risks and increase capital profitability.

Keywords: Small and Medium-Sized Businesses (SMEs), Investment Efficiency, Forecasting, Discounted Cash Flow (NPV), Internal Rate of Return (IRR), Econometric Modeling, Investment Risks, Financial Stability, Stochastic Analysis

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1. Introduction

In the context of globalization and digital transformation of the world economy, small and medium-sized businesses (SMEs) are the main drivers of sustainable economic growth, job creation and innovation. As a result of large-scale economic reforms implemented in the Republic of Uzbekistan in recent years, the share of the private sector in GDP has been steadily increasing. However, ensuring the long-term sustainability of SMEs and increasing their competitiveness directly depends on the effectiveness of investment activities.

Investment is not only a capital investment, but also a process of giving up today's tangible resources in exchange for uncertain future returns. Unlike large corporations, SMEs are characterized by limited financial resources, limited access to capital markets, and high sensitivity to changes in the external environment. Therefore, assessing investment projects in this sector and forecasting their results is a very complex and at the same time urgent issue [1].

Numerous studies show that most SMEs rely on intuitive approaches or simplified calculations when making investment decisions, rather than scientifically based forecasting methods. This, in turn, can lead to inefficient allocation of resources, project failure, and ultimately bankruptcy of the enterprise [2].

The relevance of this study is that traditional valuation methods (such as payback period or simple rate of return) cannot fully capture dynamic factors such as inflation,

exchange rate fluctuations and market demand fluctuations. Therefore, the development of forecasting mechanisms that are adapted for SMEs, taking into account multifactorial and stochastic processes, is of scientific and practical importance [3].

The purpose of the study is to improve the theoretical and methodological foundations of assessing the effectiveness of investment activities in SMEs and to develop proposals to increase the accuracy of forecasting using econometric models [4].

Literature Analysis and Methods

Literature review

Studied by classical and neoclassical representatives of economic theory [5]. The fundamental foundations of investment theory are reflected in the works of I. Fisher and J.M. Keynes, who analyzed the influence of the time factor on the value of money and the marginal efficiency of expected returns.

In particular, J. M. Keynes, in his work "The General Theory of Employment, Interest and Money", emphasizes that investment decisions depend not only on mathematical calculations, but also on the psychology of business, called "animal spirits" [6]. However, modern financial management requires minimizing subjective factors and relying on objective mathematical models.

The research conducted by Berger and Udell on the investment characteristics of SMEs is of great importance. They raised the problem of "information asymmetry" in the financing of small businesses [7]. According to them, the lack of transparency of financial information about SMEs increases risks for investors and creditors, which leads to an increase in the cost of capital [8]

In modern methods of evaluating investment projects [9]. They recognize the methods of Net Present Value (NPV) and Internal Rate of Return (IRR) as the most reliable criteria [10]. However, in recent years, the "Real Options Theory" proposed by Dixit and Pindyck has emerged as a new approach that allows assessing flexibility in making investment decisions under uncertainty. This theory is especially relevant for SMEs operating in conditions of rapidly changing market conditions.

Uzbek economists Sh. Mustafakulov and B. Berkinov studied the investment climate in the SME sector and its improvement. Their work analyzed the specific features of the national economy [11], in particular, the impact of tax policy and state support programs on investment efficiency. However, it is observed that in the national literature there is still a lack of research on complex models of econometric forecasting of SME investments.

2. Materials and Methods

This study used the following set of methods and approaches to assess and forecast investment performance:

1. Systematic Analysis and Synthesis

1. **Purpose:** To classify internal (operational efficiency, costs) and external (market conditions, economic environment) factors affecting the investment activities of SMEs and understand their interrelations.
2. **Application:** Categorize factors and map cause-effect relationships among them.

2. Discounted Cash Flow (DCF) Analysis

- Purpose: To determine the fundamental value of a project by converting future cash flows into present value.
- Formula:

$$NPV = \sum_{t=1}^n \frac{CF_t}{(1+r)^t} - I_0$$

- \$CF_t\$ – Cash flow at period \$t\$
- \$r\$ – Discount rate
- \$I_0\$ – Initial investment
- Outcome: If \$NPV > 0\$, the project is considered profitable.

3. Correlation-Regression Analysis

- Purpose: To mathematically model factors influencing investment efficiency and quantify their impact.
- Model:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

- Y – Investment efficiency (ROI)
- X_1 – Capital turnover
- X_2 – Operating margin
- X_3 – External debt burden
- ϵ – Stochastic error
- Outcome: Each β coefficient indicates the sensitivity of investment efficiency to the corresponding factor.

4. Scenario Analysis

- **Purpose:** To test project stability under different economic or market conditions.
- **Scenarios:**
 - **Optimistic:** Best-case scenario.
 - **Realistic:** Most likely scenario.
 - **Pessimistic:** Worst-case scenario.
- **Outcome:** Evaluates project risk and flexibility in investment decisions.

5. Monte Carlo Simulation

- **Purpose:** To model uncertainties in investment projects and assess expected outcomes through probability distributions.
- **Application:**
 - Randomly vary inputs like raw material prices, interest rates, or demand.
 - Run thousands of iterations to estimate the range of NPV or ROI.
- **Outcome:** Provides a probabilistic assessment of expected results and risk levels.

The database was based on official data from the State Statistics Committee of the Republic of Uzbekistan and financial reports (anonymized) of 50 selected SMEs in production sectors for 2018-2023.

3. Discussion

The biggest problem in forecasting investment activity in small and medium-sized businesses is the lack of data and the high level of volatility of the external environment. While large enterprises have their own analytical departments and a large historical database, SMEs are often forced to act "blindly" [12].

Our analysis shows that traditional static methods (for example, simple payback period) lead to serious errors in the assessment of investment projects in the conditions of Uzbekistan. This is because these methods do not take into account the time value of money. For example, in an economy with an inflation rate above 10%, the present value of income received after 3 years differs significantly from the nominal value. Therefore, we emphasize that the study should focus only on dynamic methods (NPV, IRR, PI).

However, even the NPV method is not perfect. Its main drawback is the difficulty in choosing the right discount rate (r). For SMEs, the discount rate is often equated to the interest rate on a bank loan, but this may be a misnomer. Because the cost of equity is higher than that of debt capital (because of the higher risk). Therefore, we recommend using the WACC (Weighted Average Cost of Capital) model for SMEs [13].

Another important aspect is the influence of macroeconomic factors on forecasting. The liberalization of the exchange rate policy implemented in Uzbekistan in recent years has had a direct impact on the price of imported equipment and, therefore, on the initial cost of the investment project (I_0). The results of the regression analysis show that a 1 % change in the exchange rate can reduce the return on investment (ROI) of import-

dependent SMEs by an average of 0.4%. This creates the need for hedging currency risks when planning investment projects.

that needs to be discussed is the difficulty of measuring investments in human capital. In SMEs, the main asset is often the team and the idea of the entrepreneur. It is easy to calculate investments in tangible assets, but it is difficult to accurately predict the return on investment in employee training or marketing research. This requires combining expert methods of valuing intangible assets with econometric models [14].

4. Results

Conducted based on data from 50 SMEs selected as part of the study showed the following.

First, in enterprises that used only static methods (PP, ARR) in planning investment projects, the average deviation of the project from the planned indicators was 35-40%. On the contrary, in enterprises that used discounted cash flows (DCF) and scenario analysis, this figure was around 15-20%. This means that scientifically based forecasting methods allow reducing the risk of uncertainty by almost half.

Second, the constructed multiple regression model ($R^2 = 0.78$) identified the factors that have the strongest impact on return on investment (ROI):

Indicator	The value of β	Impact and explanation
Sales volume growth rate	0.45	Positive and relatively high impact: Increased sales volume is the most important guarantee for return on investment. Stable demand increases profitability.
Optimization of operating costs	-0.38	Negative and significant: Cost optimization is inversely related to investment efficiency. Effective cost management increases revenue, otherwise profitability decreases.
Share of debt capital	-0.22	Negative, moderate impact: Increased leverage increases interest costs and increases financial stability risks, so profitability decreases after a certain point.

Third, the results of Monte Carlo simulations showed that the probability of failure of investment projects for SMEs ($NPV < 0$) is on average 28%. However, if "real options" (e.g., the possibility of expanding, suspending, or abandoning the project) are included in the project, the expected strategic value (Strategic NPV) of the project increases by 12-15%.

The table below (expressed in text form) presents the comparative results of the investment project calculated based on the traditional and proposed approaches:

Hypothetical project: Launching a new production line (Investment = 1 billion soums)

Indicator	Analysis
Calculation method	The traditional approach calculates simple payback periods and fixed costs. The proposed approach discounts the NPV (Net Present Value) with WACC and considers different scenarios through Monte Carlo simulation. It is an approach that considers dynamics and risks.
Expected NPV	In the traditional approach, NPV was not calculated, only net profit was taken into account.

	In the proposed approach, the average expected NPV is 240 million soums.
Coverage period	The traditional approach is 2.5 years, while the proposed approach is 3.2 years with discounted value. Discounting takes into account risk and the time value of money.
Risk level	The traditional approach does not assess risk. The proposed approach has a high risk, variance (Var) = 15%.
Decision	In the traditional approach, an optimistic decision is made (the investment is acceptable). In the proposed approach, a reconsideration with additional conditions is recommended.

The results show that the traditional approach makes the project look very attractive, while when the risks are taken into account, the project is at a marginal level. This proves the importance of the proposed methodology in protecting SME managers from making wrong investment decisions [15], [16], [17].

The analysis also showed that in forecasting investment efficiency, SMEs with a high level of digitalization (using CRM, ERP systems) have a forecast error 2.5 times lower than non-digitalized enterprises. This is explained by the accuracy and speed of data [18], [19], [20].

5. Conclusion

The research, the following conclusions were drawn regarding the assessment and forecasting of the effectiveness of investment activities in small and medium-sized businesses:

1. The need for methodological transformation: SMEs must abandon static methods in evaluating investment projects and switch to dynamic models (NPV, IRR, MIRR) that take into account the time factor and risks. This will prevent inefficient use of resources.
2. Multi-factor forecasting: When forecasting investment performance, using regression models that include macroeconomic variables (inflation, exchange rate) and industry characteristics, rather than being limited to internal financial indicators, significantly increases forecast accuracy.
3. Risk management integration: Quantitative risk assessment methods (Monte Carlo, Scenario Analysis) should be integrated into the investment decision-making process. This will allow SMEs to be prepared for the "black swan" effect (unexpected events).
4. The role of digitalization: Automation of accounting and management accounting is crucial in building a quality database for investment analysis.

Suggestions and recommendations

- a. It is advisable to create simplified, but scientifically based digital platforms (calculators, scoring systems) for evaluating investment projects for SMEs at the state level and provide them with free access.
- b. It is necessary to increase investment literacy for SME leaders and financial managers, in particular, to organize training courses on financial modeling.
- c. Banks should more widely implement an assessment system based not only on collateral, but also on a realistic cash flow forecast of the project (Cash Flow based lending) in the loan allocation process.

In future research, it is advisable to explore the possibilities of using artificial intelligence (AI) and machine learning algorithms to optimize SME investment portfolios.

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