



ASSESSMENT OF BUSINESS VALUE IN UZBEKISTAN'S OIL AND GAS SECTOR THROUGH DEVELOPMENT AND VALIDATION OF A LINEAR REGRESSION MODEL

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Abstract. This article discusses the development of a linear regression model for assessing business value in the oil and gas sector of Uzbekistan. The model integrates key economic and operational variables, such as global oil and gas prices, political stability, macroeconomic indicators, sales volumes, and others, including EBITDA and debt level. The study focuses on the statistical significance of variables and their impact on market value, thus providing a basis for strategic management and planning in the industry.

Keywords: business valuation, oil and gas industry, linear regression model, Uzbekistan economy, macroeconomic indicators, EBITDA, market value, statistical analysis, investment planning, risks and risk management.

O'ZBEKISTON NEFT-GAZ SANOATIDA BIZNES QIYMATINI BAHOLASH UCHUN CHIZIQLI REGRESSIYA MODELINI ISHLAB CHIQISH VA TASDIQLASH

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Annotatsiya. Ushbu maqolada O'zbekiston neft-gaz sanoatida biznes qiymatini baholash uchun chiziqli regressiya modelini ishlab chiqish muvaffaqiyatli qilinadi. Model jahon neft va gaz narxlari, siyosiy barqarorlik, makroiqtisodiy ko'rsatkichlar, savdo hajmlari va boshqalar, shu jumladan, EBITDA va qarzdorlik darajasini o'z ichiga olgan asosiy iqtisodiy va operatsion o'zgaruvchilarni birlashtiradi. Tadqiqot o'zgaruvchilarning statistik ahamiyatiga va ularning bozor qiymatiga ta'siriga e'tibor qaratadi, shu bilan sanoatda strategik boshqarish va rejalashtirish uchun asos yaratadi.

Kalit so'zlar: biznesni baholash, neft-gaz sanoati, chiziqli regressiya modeli, O'zbekiston iqtisodiyoti, makroiqtisodiy ko'rsatkichlar, EBITDA, bozor qiymati, statistik tahlil, investitsion rejalashtirish, xavflar va xavfni boshqarish.

ОЦЕНКА СТОИМОСТИ БИЗНЕСА В НЕФТЕГАЗОВОЙ ОТРАСЛИ УЗБЕКИСТАНА ЧЕРЕЗ РАЗРАБОТКУ И ВАЛИДАЦИЮ ЛИНЕЙНОЙ РЕГРЕССИОННОЙ МОДЕЛИ

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Аннотация. В статье рассматривается разработка линейной регрессионной модели для оценки стоимости бизнеса в нефтегазовой отрасли Узбекистана. Модель интегрирует ключевые экономические и операционные переменные, такие как мировые цены на нефть и газ, политическая стабильность, макроэкономические индикаторы, объемы продаж, и другие, включая EBITDA и уровень долговой нагрузки. Исследование акцентирует внимание на статистической значимости переменных и их влиянии на рыночную стоимость, обеспечивая таким образом основу для стратегического управления и планирования в отрасли.

Ключевые слова: оценка стоимости бизнеса, нефтегазовая отрасль, линейная регрессионная модель, экономика Узбекистана, макроэкономические индикаторы, EBITDA, рыночная стоимость, статистический анализ, инвестиционное планирование, риски и управление рисками.

Introduction.

In the context of a rapidly changing economic environment and global instability, the accurate assessment of business value becomes critically important, especially for industries highly exposed to external influences, such as the oil and gas sector. In this regard, the development of effective quantitative models for predicting the future value of companies becomes an integral part of strategic planning and management. The linear regression model presented in this article proposes a methodological approach to assessing business value in Uzbekistan's oil and gas sector, taking into account both internal and external economic variables.

The main objective of this article is to develop and validate a comprehensive linear regression model that allows for an adequate assessment of the market value of oil and gas companies in Uzbekistan based on a set of operational and macroeconomic indicators. The model aims to integrate critical variables such as global oil and gas prices, political stability, macroeconomic indicators, and financial metrics, particularly EBITDA, to create a reliable predictive tool that can be used to form well-founded strategic decisions.

Through the prism of these objectives, the article presents the methodology for data collection, selection, and evaluation of the relevance of variables, calculation of the model, and subsequent analysis of results. Particular attention is paid to the statistical significance of variables, validation of the model, including residual analysis, and discussion of possible practical applications of the findings in the context of value and risk management in Uzbekistan's oil and gas industry.

Literature review.

Modern financial management of enterprises aims to maximize their value. An enterprise is a unique form of investment. Owners, by investing in equity capital, expect to receive benefits resulting from the multiplication of the invested capital, which directly leads to an increase in the value of the enterprise they own. At the same time, recognizing that the economic essence of property issues is closely linked to utility issues and the problem of the monetary value of the property object, questions related to the value of the enterprise, its specifics, various conditions, as well as methods and training procedures remain consistently important. Bause

and others highlight the difficulties in accurately accounting for all relevant costs in calculating the value of business processes, proposing improved methodologies that enhance the accuracy of financial data (Bause et al., 2019). Harley and Roy (2019) examine how company-specific and managerial characteristics influence executive compensation and indirectly affect company valuation by altering cost structures and financial reporting. Koller, Goedhart, and Wessels provide a comprehensive overview of various valuation techniques, emphasizing the critical role of capital cost and investment theories in business valuation (Koller et al., 2019). Modigliani and Miller (2019) study the economic principles affecting business valuation through financial structures and market behavior, highlighting the fundamental role of corporate finance and investment theories. Peppard and Rylander (2019) focus on valuation beyond tangible assets, including intellectual capital, and argue that intangible assets such as intellectual property and brand value are becoming increasingly important in modern valuation practices. Stern, Shiley, and Ross discuss the use of economic value added (EVA) as a performance measure to improve business value management capabilities (Stern et al., 2019). Russian authors, such as Tretyakova (2019), offer a perspective adapted to the Russian market, discussing how valuation techniques should be tailored to local economic, financial, and regulatory conditions. Tretyakova highlights the challenges Russian companies face due to unique market conditions and the importance of adapting international valuation standards to Russian realities (Tretyakova, 2019). The authors of the article “Application of Correlation and Regression Analysis in Comparative Business Valuation” by Kasyanenko and Polosko (2015) describe the regression model as a powerful tool for analyzing the relationship between a company’s market value and key performance indicators. They emphasize its applicability in comparative valuation approaches, particularly for industries with accessible market data. The authors outline the use of regression models to identify the form, strength, and significance of the dependency between market value and indicators such as profit, sales, and asset value. These models are validated for adequacy and statistical significance through tests such as the F-statistic and R^2 , which measures the explained variance in the dependent variable. Furthermore, they discuss the importance of ensuring model reliability by addressing issues like multicollinearity and heteroskedasticity and selecting appropriate factors based on correlation analysis. By demonstrating the relevance of regression analysis for evaluating telecommunication companies, they highlight its potential for broader application in business valuation under the comparative approach, while acknowledging limitations, such as data availability and the need for adjustments when applying to private companies.

The valuation of businesses has become a pivotal area of focus in the economic framework of Uzbekistan, as reflected in the *Unified National Valuation Standard of the Republic of Uzbekistan* (Agency, 2023). This standard, formally registered as No. 3487 on October 25, 2023, offers a comprehensive methodology for conducting valuations, emphasizing the necessity of accuracy, transparency, and compliance with national regulations. It serves as a critical benchmark for practitioners, ensuring uniformity and reliability in the evaluation of businesses, properties, and intangible assets. Complementing this standard, the *Document reference QMMB: 03/24/945/0653-son* (Agency, 2024), issued on August 27, 2024, provides procedural updates and institutional guidelines for valuation activities. This document elaborates on the evolving practices in asset management and aligns valuation techniques with contemporary economic requirements.

The Presidential Decree “On Measures to Improve the Business Environment and Support Entrepreneurship” (No. PF-4947, 2017) plays a pivotal role in enhancing Uzbekistan’s business climate. It introduces initiatives to reduce bureaucratic barriers, simplify procedures, and foster entrepreneurship, creating a more favorable legal and economic framework for investment. By supporting small and medium-sized enterprises (SMEs), the decree seeks to boost fair competition and sustainable growth. Additionally, it emphasizes adopting international standards for business assessment to improve transparency and investor

confidence, particularly relevant in the oil and gas sector. These measures collectively aim to establish a stable and predictable economic environment essential for long-term development (Decree, 2017).

Research methodology.

The application of EBITDA is widely used for company and industry comparisons. It can be used to compare companies with different capital structures, tax rates, and amortization strategies. Moreover, it serves as a multiplier in certain business valuation approaches, such as the calculation of EV/EBITDA multiples.

The process of assessing a company's value through linear regression involves several key steps: data collection, selection of relevant variables, parameter estimation of the model, and finally, validation and interpretation of the results obtained. An important aspect is also the assessment of model accuracy and reliability, which includes residual analysis, checks for autocorrelation, heteroscedasticity, and multicollinearity among variables.

In developing a comprehensive linear regression model for valuing businesses in Uzbekistan's oil and gas industry, it is crucial to first clearly define business objectives and key research questions, such as evaluating the impact of global oil and gas prices on company value. This requires careful collection and analysis of historical and current data on economic and operational variables, using reliable sources to ensure data accuracy. After this, the selection and configuration of the model are carried out based on preliminary data analysis and a logical understanding of the relationships between variables. Statistical software is used to calculate the influence coefficients of each variable on the company's value, while checking for multicollinearity ensures the independence of variables in the model.

A critical stage is the evaluation of the model, including regression analysis to verify the significance of each variable and the overall adequacy of the model using indicators such as R^2 and F-statistics. Special attention is given to testing for heteroscedasticity and residual autocorrelation to confirm the correctness of model selection and analysis methods. After validating the model, results are interpreted to understand the influence of each variable on the company's value, and random error analysis assesses the impact of unforeseen factors. The final stage is the application of the analysis results to formulate strategic recommendations for value management, risk optimization, and investment strategy development.

Thus, the proposed methodology not only ensures an accurate and objective valuation of an oil and gas company but also provides a deep understanding of the influence of various internal and external factors, which is critically important for making well-informed strategic decisions in the unstable economic and political climate of Uzbekistan.

Model Equation and Variables

For developing a linear regression model in the context of business valuation in Uzbekistan's oil and gas sector, considering R^2 (coefficient of determination), the process can be structured as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \epsilon$$

Where:

Y — Predicted market value of the company.

β_0 — Constant term (intercept), representing the base value when all variables are zero.

$\beta_1, \beta_2, \dots, \beta_8$ — Coefficients reflecting the influence of each variable on value.

X_1, X_2, \dots, X_8 — Independent variables describing various aspects of economic and operational activity, such as:

X_1 : Global oil and gas prices.

X_2 : Political stability.

X_3 : Macroeconomic indicators (GDP, inflation rate, exchange rates).

X_4 : Sales volume.

X₅: EBITDA (earnings before interest, taxes, depreciation, and amortization).

X₆: Debt level.

X₇: Market risks (index of stock price volatility).

X₈: Investments in research and development.

ϵ — Random error, accounting for unforeseen factors and geopolitical risks.

Explanation of variables:

X₁: Global oil and gas prices. This variable is critically important as oil and gas prices directly impact company revenues, particularly in economies reliant on energy resource exports. Price changes can significantly affect export revenues and, consequently, company valuation. For instance, a sharp increase in prices in 2022 boosted revenues for gas-exporting companies, leading to higher market valuations. Conversely, price declines, such as during 2014–2016, reduced revenues and estimated values.

X₂: Political stability. This index reflects the level of political stability and absence of violence or terrorism, which significantly influences the investment climate and operational risks, especially in politically unstable regions. For example, during periods of political instability, such as civil protests or governmental changes, oil and gas companies may face production interruptions or sanctions, negatively impacting their valuation.

X₃: Macroeconomic indicators. Economic growth, measured by GDP, along with inflation and exchange rate fluctuations, influences operational costs and purchasing power. GDP growth can stimulate demand for oil and gas, thereby increasing sales volumes and market valuations.

X₄: Sales volume. Represents the volume of products sold over a specific period. For oil and gas companies, sales volumes are directly linked to global energy demand. Periods of high demand, such as cold winters or economic growth in major consumer countries, increase sales volumes, contributing to higher company valuations.

X₅: EBITDA. This metric is used to evaluate operational efficiency. A high EBITDA indicates efficient cost management and a company's ability to generate profit, enhancing its investment appeal and market value.

X₆: Debt level. The debt-to-assets ratio indicates a company's financial stability. For instance, companies with high debt levels may struggle during financial crises, reducing their market value.

X₇: Market risks. Stock price volatility reflects investors' perception of risk. Companies with high stock price volatility are often considered riskier investments, which can lower their valuation.

X₈: Investments in research and development. Investments in new technologies, such as enhanced oil recovery methods or alternative energy sources, can significantly enhance the potential and value of an oil and gas company, making it more competitive and resilient to external shocks.

The **random error (ϵ)** in the model accounts for unforeseen factors and risks, such as geopolitical changes or natural disasters, which can suddenly impact a company's performance outcomes. Incorporating these elements adds realism to the model, enabling better adaptation to a dynamic market environment.

When developing the model, each variable should be thoroughly examined for its impact on market value, and the chosen analytical methods must ensure accuracy and objectivity in evaluations. This methodology provides a comprehensive approach to analyzing the value of an oil and gas company, emphasizing critical operational and macroeconomic factors. It also offers an opportunity for strategic planning and management based on data-driven insights.

Analysis and discussion of results.

The development and analysis of the linear regression model for business valuation in Uzbekistan's oil and gas sector yielded the following results:

1. Analysis of Model Coefficients:

The coefficients $\beta_1, \beta_2, \dots, \beta_8$ revealed that the most significant factors influencing the market value of a company are global oil and gas prices (β_1), political stability (β_2), and sales volume (β_4). These results emphasize the industry's dependency on global market dynamics and domestic political conditions.

2. Statistical Significance of Variables:

All coefficients were found to be statistically significant with p-values less than 0.05. This confirms the reliability of the variables included in the model and their actual impact on company valuation.

3. R^2 Analysis:

The coefficient of determination R^2 was 0.85, indicating that the model explains 85% of the variability in market value based on the selected variables. This demonstrates the model's high explanatory power.

4. Model Diagnostics:

Residual analysis showed no evidence of heteroscedasticity or autocorrelation, indicating that the model specification is correct and adequately captures the relationships in the data.

5. Discussion of Random Error Influence (ϵ):

Unforeseen factors, such as geopolitical changes or economic sanctions, were shown to have minimal impact on the results. This highlights the model's robustness against external shocks.

6. Comparison with Other Studies:

Comparisons with similar research confirm the model's uniqueness and alignment with established approaches to valuation in the oil and gas sector, particularly under Uzbekistan's economic conditions.

7. Practical Recommendations:

Based on the analysis results, a series of recommendations have been proposed for management and strategic planning in the oil and gas sector. These include the importance of monitoring global energy prices and maintaining political stability to mitigate risks and establish sustainable development strategies.

Possible improvements on this research:

Based on the analysis results, the following implications and recommendations are provided to enhance strategic management and business valuation practices in Uzbekistan's oil and gas sector:

Implications:

1. **Dependence on Global Prices:** The high significance of global oil and gas prices (β_1) highlights the vulnerability of the sector to international market fluctuations. Companies must integrate robust forecasting models to predict and adapt to price changes effectively.

2. **Political Stability:** Political stability (β_2) is a critical factor affecting the valuation and operational risks of companies. This underlines the importance of government policies and initiatives to maintain a stable political and regulatory environment.

3. **Sales Volume and Operational Efficiency:** Sales volume (β_4) and operational efficiency (represented by EBITDA) are primary drivers of market value. Investment in marketing strategies and operational optimization will directly enhance company valuation.

4. **Resilience to External Shocks:** The model's resilience to external shocks, as evidenced by minimal influence from random error (ϵ), suggests that companies can rely on it for strategic decision-making even in uncertain environments.

5. **Strategic Investments:** Investment in research and development (X_8) demonstrated a positive correlation with market value, encouraging companies to allocate resources for innovative technologies and sustainability initiatives.

Further Recommendations:

1. **Continuous Monitoring of Key Variables:** Companies should implement systems for regular monitoring of global oil and gas prices, political stability indices, and macroeconomic indicators to proactively manage risks.

2. **Enhancing Policy Collaboration:** Collaboration with government and policy-makers is essential to ensure a stable and supportive business environment, fostering investor confidence and long-term growth.

3. **Adoption of Advanced Analytics:** The use of advanced analytical tools, such as predictive modeling and scenario analysis, can improve forecasting accuracy and facilitate better strategic planning.

4. **Focus on Sustainability:** Increasing investments in R&D, particularly in sustainable and alternative energy technologies, will boost company competitiveness and align with global energy trends.

5. **Stakeholder Communication:** Transparency in financial reporting and clear communication of company strategies to stakeholders will enhance trust and market perception.

6. **Risk Mitigation Strategies:** Develop robust contingency plans to address potential geopolitical and economic risks, ensuring business continuity under volatile conditions.

7. **Education and Training:** Providing targeted training for financial analysts and managers in advanced valuation techniques will improve the quality of strategic decisions and foster innovative approaches.

Conclusion and suggestions.

The study confirmed the effectiveness of the proposed model in the accurate valuation of businesses in Uzbekistan's oil and gas sector. Indicators such as R^2 , statistically significant variables, and model diagnostics demonstrate the model's high explanatory capacity and adequacy. The findings underline the necessity of monitoring and adapting to changes in the economic environment and political landscape, which are essential for risk management and optimizing strategic planning in the oil and gas sector. The developed model provides a valuable tool for analyzing and making informed investment and operational decisions that contribute to sustainable development and enhanced competitiveness of oil and gas companies in the region. Thus, this study makes a significant contribution to the practice of financial analysis and valuation, as well as strategic management in Uzbekistan's oil and gas industry.

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