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Investments as a Key Driver of Achieving the Sustainable Development Goals

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Abstract: This study examines the role of investments as a key driver in achieving the Sustainable Development Goals (SDGs) in Uzbekistan. The research analyzes the dynamics of fixed capital investments and their contribution to economic growth and sustainable development during 2009–2024. Using statistical data and econometric methods, including correlation analysis and the Engle–Granger cointegration approach, the study evaluates the long-run relationship between Gross Domestic Product (GDP) and the SDG Index. The findings reveal a strong positive relationship between investment growth and GDP expansion, confirming that increased investment activity contributes significantly to socio-economic development. The cointegration results indicate the existence of a stable long-term equilibrium relationship between GDP and sustainable development indicators. The study concludes that effective investment policies, improvement of the investment climate, attraction of foreign direct investment, and support for innovation are essential factors for achieving sustainable economic growth and the Sustainable Development Goals in Uzbekistan.

Keywords: investment, fixed capital investment, sustainable development goals, SDG Index, economic growth, GDP, foreign direct investment, cointegration analysis, investment policy, Uzbekistan

1. Introduction

Investments play a leading role in a country's economy. They support economic potential, contribute to the modernization of the economy, stimulate the growth of gross national product, and facilitate the development of new areas of economic activity. According to the report of the United Nations Conference on Trade and Development (UNCTAD), “to bridge the financing gap required to achieve the Sustainable Development Goals and address climate change, approximately USD 500 billion in international public finance and USD 500 billion in international private finance will be needed annually, with a significant share of these funds expected to come in the form of foreign direct investment” [1].

The President of the Republic of Uzbekistan emphasized that: “Our main goal is to transform Uzbekistan into a reliable and long-term partner for foreign investors” [2]. In his speech, the Head of State highlighted the following priority areas for expanding mutually beneficial cooperation with foreign investors:

1. **First, green energy.** Increasing the efficiency of the energy sector is a pressing issue for the entire region. Currently, 28 projects are being implemented in this area.
2. **Second, the banking and financial sector.** As a result of the reforms carried out in Uzbekistan, the number of private banks has increased, leading European banks have entered the domestic market, and a number of digital banks have emerged.
3. **Third, the joint development of mineral resources** has been identified as one of

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the priorities of mutually beneficial partnership.

4. **Fourth, the digital transformation of the country.** Over the past year, exports of IT services and software products have doubled, and the target is to increase their volume to USD 5 billion.

Among the foreign scholars whose works have attracted considerable attention from both the academic community and practitioners in Uzbekistan are G. Bierman and L. J. Gitman [3], M. D. Johnk [4], Zvi Bodie, Alex Kane, and Alan J. Marcus [5], William F. Sharpe, Gordon J. Alexander, and Jeffrey V. Bailey [6], N. Leventsev and G. Kostyunina [7], D. Mukha [8], M. Suleymanov and A. Mikhin [9], as well as a number of other researchers who have made significant contributions to the theory and practice of investment processes.

2. Methodology

Issues related to the essence, structure, and dynamics of investments, the sources of their financing, and their role in the functioning of a market economy have been extensively studied by numerous economists and scientific schools, including classical economics, Marxism, neoclassical economics, Keynesianism, neoclassical synthesis, and their modern extensions. Contemporary foreign researchers pay particular attention to investment markets and transactions, the analysis of various sources of investment, and investments in specific sectors and assets, including innovative industries. All these research areas are associated with addressing an important economic challenge – attracting investments and ensuring their efficient utilization.

3. Analysis and Result

In January–December 2024, investments in fixed capital amounting to UZS 493.7 trillion were utilized in the economy and social sphere of the Republic of Uzbekistan from all financing sources, representing 127.6% compared to the corresponding period of 2023. The highest growth rates among the sources of financing for fixed capital investments were observed in non-guaranteed foreign investments and loans, which reached 166.2% compared to 2023.

The dynamics of fixed capital investments over the last five years indicate a steady upward trend. The total volume of investments increased almost 2.3 times during this period. In particular, compared to 2023, the volume of investments increased by UZS 137.6 trillion in 2024. The growth rates of investments also demonstrate positive dynamics: while in 2021–2022 the growth rates amounted to 102.9% and 100.2%, respectively, they increased significantly to 123.4% and 127.6% during the last two years (Figure 1). In general, investment growth exhibited an upward trend until 2019, reaching 138.1%; however, due to external challenges, a slight decline to 95.6% was observed in 2020. Subsequently, the growth rate recovered to 102.9% in 2021 and continued to increase, reaching 122.1% at present [10].

In the structure of fixed capital investments by types of economic activity in 2024, the manufacturing industry occupied the leading position. As a result of the implementation of major investment projects—such as the construction of a gas chemical complex, the establishment of cement production facilities, the modernization of cotton processing equipment in the Andijan region, the construction of a chemical complex for the production of complex mineral fertilizers in the Samarkand region, and the organization of production of new automobile models a total of UZS 144.6 trillion was invested in this sector from all financing sources. This amount accounted for 29.3% of the total volume of fixed capital investments [11].

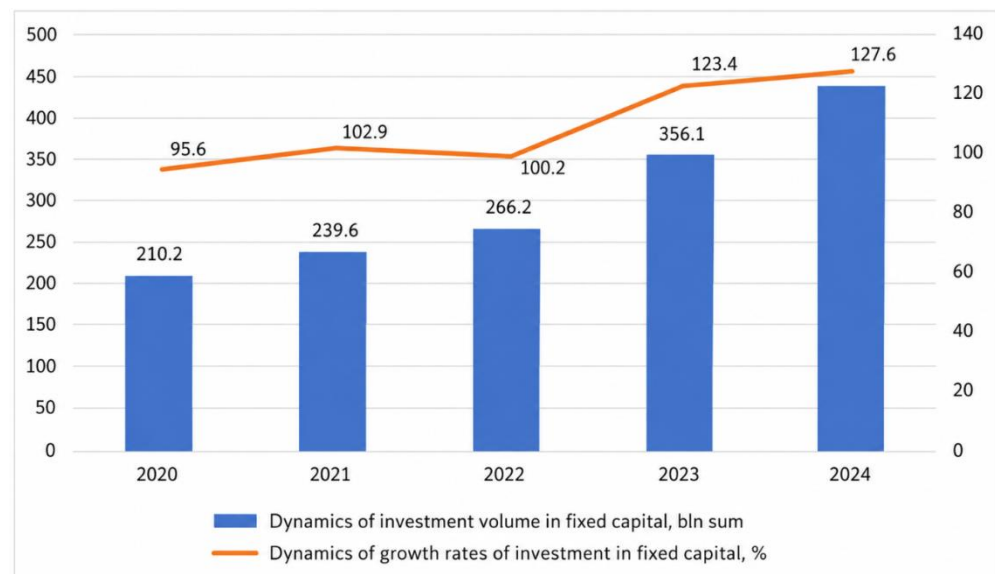


Figure 1. Trends in the Volume and Growth Rate of Fixed Capital Investments in Uzbekistan

Uzbekistan has become increasingly attractive to foreign investors due to improvements in its legislative framework, the introduction of tax incentives, and the maintenance of political stability. The main sources of foreign investment are countries such as Russia, China, the Republic of Korea, Japan, and the member states of the Commonwealth of Independent States (CIS). In addition, investments from the European Union and international financial institutions have been actively attracted. Uzbekistan has signed numerous cooperation and investment agreements with international financial institutions, thereby creating favorable conditions for capital inflows [12].

Furthermore, Uzbekistan is actively developing its tourism sector by investing in infrastructure development, improving service quality, and promoting tourist destinations and routes.

Thus, the dynamics of investment in Uzbekistan demonstrate positive trends, characterized by a steady increase in both domestic and foreign investments. Successful economic reforms and the creation of a favorable business environment have contributed to attracting capital to key sectors of the economy. Nevertheless, achieving even more significant results requires continued efforts to eliminate existing challenges and mitigate risks associated with investment activities.

Despite the positive trends and active measures aimed at improving the investment climate, Uzbekistan still faces a number of challenges that may hinder the attraction and effective utilization of investments.

Based on the statistical data presented in **Figure 2**, the impact of fixed capital investment on Gross Domestic Product (GDP), as well as the relationship between these indicators, is assessed. For this purpose, Equations (1) and (2) are employed.

$$R_T = \frac{\sum n_{xy} xy - n \bar{x} \bar{y}}{n \sigma_x \sigma_y} \quad (1) [11]$$

$$\bar{y}_x - \bar{y} = \rho_{yx} (\bar{x} - \bar{x}), \quad \rho_{yx} = R_T \frac{\sigma_y}{\sigma_x} \quad (2) [12]$$

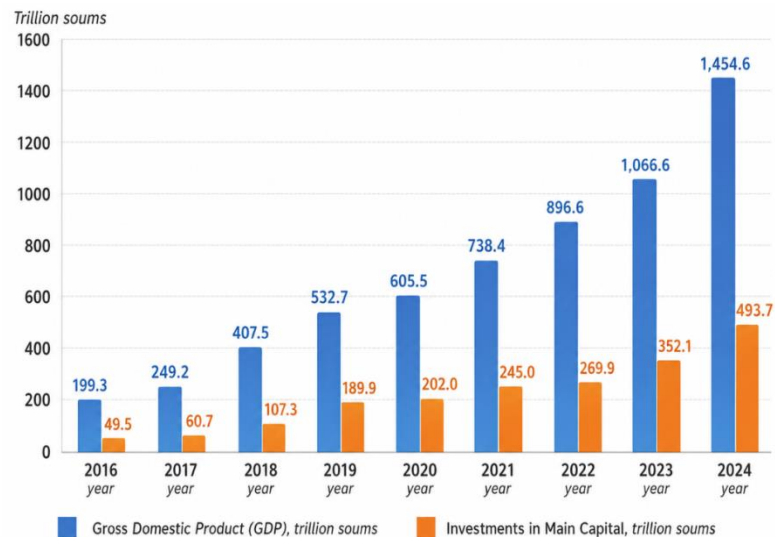


Figure 2. Gross Domestic Product and Fixed Capital Investment in Uzbekistan

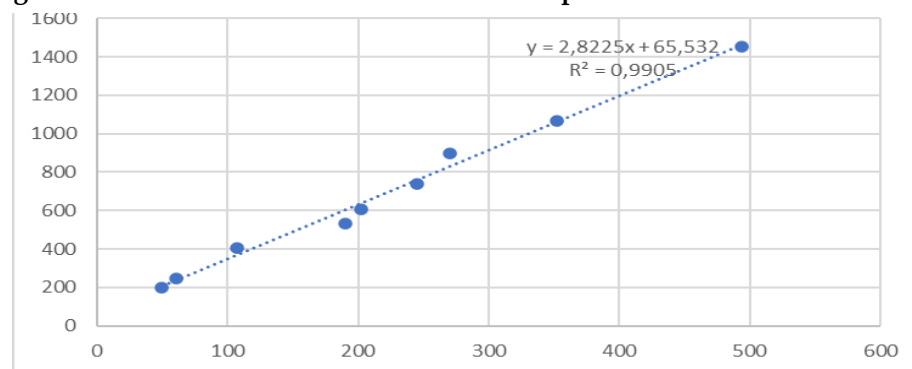


Figure 3. The Impact of Fixed Capital Investment on Gross Domestic Product

The results of the correlation analysis indicate a strong relationship between fixed capital investment and Gross Domestic Product (GDP). In particular, an increase in the volume of fixed capital investment leads to GDP growth, which, in turn, has a positive impact on the country's socio-economic development [13].

Table 1. Macroeconomic and Social Indicators (2009–2024)

Year	Gross Domestic Product (billion USD)	Foreign Direct Investment (million USD)	Unemployment Rate (%)	Sustainable Development Goals (SDG) Index (0–100)
2009	33.68	711	5.0	43.1
2010	49.10	1,630	5.4	45.1
2011	52.17	1,514	5.0	46.2
2012	67.51	563	4.9	46.9
2013	73.03	1,029	4.9	47.5
2014	80.75	733	5.1	48.1
2015	86.19	65	5.2	48.6
2016	81.77	67	5.2	51.3
2017	62.08*	94	5.8	54.2
2018	52.87	624	9.3**	60.1
2019	60.28	2,313	9.0	64.1

2020	60.22	1,733	10.5	66.4
2021	69.60	2,360	9.6	69.8
2022	81.44	2,544	8.9	70.3
2023	90.89	2,200	8.1	71.1
2024	114.97	2,800	5.5	72.6

Analysis of the Relationship Between GDP and the SDG Index

This section examines whether economic growth, measured by Gross Domestic Product (GDP), and sustainable development indicators, represented by the Sustainable Development Goals (SDG) Index, exhibit a stable long-term equilibrium relationship over the period 2009–2024. Both GDP and the SDG Index demonstrate a clear upward trend, which may lead to spurious regression results if standard Ordinary Least Squares (OLS) estimation is applied directly [14].

To address this issue, the two-step Engle–Granger cointegration approach is employed. During the analyzed period, GDP increased from USD 33.68 billion to USD 114.97 billion, while the SDG Index improved from 43.1 to 72.6. The persistent upward trends in both variables indicate non-stationarity, suggesting the presence of a potential long-run equilibrium relationship.

Therefore, it is appropriate to conduct cointegration testing to determine whether these two time series move together over time despite short-run deviations [15].

Model Specification; The long-run equilibrium relationship is defined as follows:

$$SDG_t = \alpha + \beta GDP_t + u_t$$

where:

SDG_t = SDG индекс

GDP_t = Gross Domestic Product (billion USD)

u_t = error correction (equilibrium error) term

The use of the sample suggests that $BB\Pi = 69.78$, $\overline{SDG} = 56.59$, The OLS slope coefficient can be estimated by substituting the data from Table 1 as follows:

$$\beta = \frac{\sum (GDP_t - \overline{GDP}) (SDG_t - \overline{SDG})}{\sum (GDP_t - \overline{GDP})^2} = 0.36$$

Constant term (intercept):

$$\alpha = \overline{SDG} - \beta \overline{GDP} = 56.59 - (0.36 \times 69.78) = 44.27$$

Thus, the estimated long-run relationship is as follows:

$$\hat{Y}_t = 44.27 + 0.36 GDP_t$$

An increase in GDP by 1 billion USD is associated with a 0.36-point increase in the SDG Index in the long run. This indicates that economic growth has a positive impact on sustainable development, although the effect is partial rather than absolute.

Residual Construction

Deviations from the long-run equilibrium are captured by the residuals:

$$\hat{u}_t = SDG_t - (44.27 + 0.36 GDP_t)$$

For example, in 2024:

$$\hat{u}_{2024} = 72.6 - (44.27 + 0.36 \times 114.97) = -13.06$$

The residuals fluctuate around zero, which indicates a temporary deviation from equilibrium rather than divergence.

Stationarity Test of Residuals (ADF Test)

The test equation is specified as follows:

$$\Delta \hat{u}_t = \gamma \hat{u}_{t-1} + \varepsilon_t \text{ где } \Delta \hat{u}_t = \hat{u}_t - \hat{u}_{t-1}$$

first difference of residuals, and the coefficient being tested in the test.

Hypotheses:

$H_0: \gamma = 0$ (the residuals contain a unit root; no cointegration is present)

$H_1: \gamma < 0$ (the residuals are stationary; cointegration exists)

Regression $\Delta \hat{u}_t = \gamma \hat{u}_{t-1} + \varepsilon_t$ was estimated using OLS, which yielded the following result: $\hat{\gamma} = -0.35$.

Then, the ADF t-statistic is calculated as follows:

$$t_{ADF} = \frac{\hat{\gamma}}{SE(\hat{\gamma})} = \frac{-0.35}{0.109} = -3.21,$$

где $SE(\hat{\gamma}) = 0.109$ standard error of $\hat{\gamma}$.

At the 5% significance level, the critical value for the residual-based ADF (Engle–Granger) test is typically around -2.95. The decision rule is to reject the null hypothesis if H_0 if $t_{ADF} < -2.95$.

where:

$$-3.21 < -2.95 \Rightarrow \text{отклонение } H_0$$

Thus, the residuals remain stationary, which confirms the relationship between GDP and the SDG Index.

Figure 4 presents the results of the cointegration analysis. The upper panel shows the time series of residuals ($\hat{u}_t$) from the cointegration regression, which fluctuate around zero, indicating the absence of a visible trend. The lower panel presents the results of the ADF test applied to these residuals (Engle–Granger approach), displaying the calculated t-statistic ($t_{ADF} = -3.21$) relative to the 5% critical value (-2.95). The rejection region for the null hypothesis (H_0) is highlighted in red.

Since the t-statistic falls within the rejection region, the null hypothesis of a unit root is rejected, confirming that the residuals are stationary and supporting the existence of cointegration between GDP and the SDG Index.

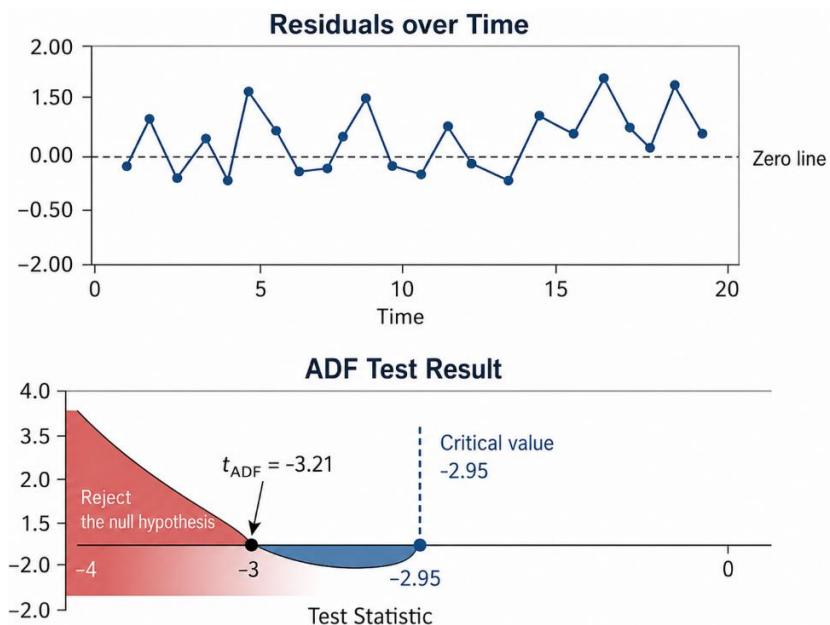


Figure 4. Results of the cointegration regression (top) and ADF test (bottom)

Economic Implications

- In the long run, GDP growth and the achievement of the SDGs do not diverge.
- Short-term shocks, such as instability in foreign direct investment inflows or pandemic-related disruptions, lead only to temporary deviations.

- Sustainable development is associated with economic growth, although improvements are not fully dependent on GDP alone.

4. Conclusion

Investment in economic modernization and development is a key prerequisite for achieving sustainable and successful growth. The relevance of such investments is evident in the context of current global challenges faced by the international economic community, including global transformations, technological innovations, and increasing social demands. Effective investment strategies ensure not only economic growth but also improvements in living standards, job creation, and sustainable development.

In order to create a favorable investment environment and attract both foreign and domestic investments in Uzbekistan, a number of strategic initiatives should be implemented. The main recommendations are as follows:

- **Improving the investment climate:** simplifying business registration procedures and obtaining necessary permits; developing a clear and stable regulatory framework that supports long-term investment planning.
- **Combating corruption:** strengthening anti-corruption measures; establishing effective mechanisms to prevent corruption, including independent inspections and audits of public processes; introducing transparent mechanisms for tenders and procurement, thereby increasing trust in the public system.

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