AMERICAN JOURNALS
Open Access, Peer Reviewed Journals

American Journal of Business Management, Economics and Banking
ISSN (E): 2832-8078 Volume 49, June- 2026

FORECASTING STATE BUDGET REVENUE IN UZBEKISTAN: A BACKTESTED TREND-MODEL APPROACH FOR 2025–2027

Babaev Shavkat Bayramovich
Professor of Tashkent State
University of Economics, DSc
ORCID:0000-0002-1630-4784
shavkat0679@gmail.com
ORCID (0000-0002-1383-8334)

A B S T R A C T

Uzbekistan's post-2017 reforms left a short, structurally shifted revenue series that rules out ARIMA, so this paper builds transparent trend forecasts of state budget revenue for 2025–2027. Annual execution data for 2018–2024 (Ministry of Economy and Finance) are modelled with a log-linear constant-growth trend and additive-trend models (linear and Holt), ranked by an out-of-sample backtest (train 2018–2022, test 2023–2024) and checked against the approved 2025 budget. Revenue rose from 79.1 to 274.3 trln UZS (23.0% CAGR), with growth decelerating to 18.4% by 2024. The additive trend is far more accurate out of sample (MAPE 4.0% vs 14.9%) and its 2025 forecast (298.6 trln UZS) is within 3.2% of the plan (308.5); it projects about 299, 331 and 362 trln UZS for 2025–2027

K E Y W O R D S

Tax revenue forecasting; state budget; trend model; Holt exponential smoothing; backtesting; Uzbekistan. JEL: H68, C53, E62.

Introduction

Revenue forecasting is the quantitative backbone of public budgeting: expenditure ceilings, deficit targets and borrowing limits are all set against a projected revenue figure, and a material shortfall forces costly in-year corrections. The 2025 Uzbek Budget Law makes this explicit, providing for spending sequestration if half-year receipts fall short of the plan without prospect of recovery. Accurate and auditable revenue forecasts are therefore of direct policy value in Uzbekistan.

The Uzbek revenue base has been reshaped by a compressed sequence of reforms: the 2017 liberalisation of the foreign-exchange market, the 2019 Tax Code with sharp rate cuts (the value-added tax rate fell from 20% to 15% and later to 12%), the abolition of turnover-based charges, a broadening of the base, and rapid digitalisation of administration. In nominal terms, state budget revenue rose from 79.1 trillion UZS in 2018 to 274.3 trillion UZS in 2024. The same reforms, however, leave only seven post-reform annual observations, with a level shift in 2019 when state target funds were consolidated into the budget — a sample too short and too disturbed for the identification of an ARIMA process.

The methodological literature offers a clear menu. Where long or high-frequency series exist, the Box–Jenkins ARIMA family (Box & Jenkins, 1976) and its modern relatives (exponential smoothing,

TBATS, neural networks) are the workhorse; Streimikiene et al. (2018), for example, forecast Pakistan's tax revenue with such models, and similar exercises exist across emerging economies. Where series are short and reform-disturbed, tax-by-tax elasticity or buoyancy methods dominate (Jenkins, Kuo & Shukla, 2000; Legeida & Sologoub, 2003; Dudine & Jalles, 2017), and domestic methodological work has advanced revenue forecasting for Uzbekistan specifically (Xudoyqulov, 2019). Uzbekistan falls squarely into the second case, which motivates a transparent trend model whose assumptions can be tested out of sample rather than an opaque high-order specification.

Against this background, the paper's objective is deliberately narrow and concrete: to estimate, compare and validate univariate trend forecasts of Uzbekistan's state budget revenue for 2025–2027, and to determine which specification best matches both the recent regime and the Government's own budget plan. Section 2 sets out the data and methods, Section 3 reports the results, Section 4 discusses them, and Section 5 concludes.

2. Data and methods

2.1 Data

The forecast target is the actual execution of Republic of Uzbekistan state budget revenue, in trillion UZS, for 2018–2024, as reported by the Ministry of Economy and Finance in its budget-execution releases. The seven observations and their year-on-year growth are given in Table 1; where the State Tax Committee separately reports the tax-administered component, it is shown in the final column. For reference, revenue equalled 19.4%, 21.9% and 22.5% of GDP in 2018–2020 and 18.9% of GDP in 2024 (2024 GDP: 1,454.6 trln UZS)[1], so the ratio has moved within a 19–23% band. Two features of the series must be kept in view throughout: the 2018→2019 jump (+41.9%) partly reflects the 2019 consolidation of state target funds into the budget, and all figures are nominal, so domestic inflation (CPI 9.8% in 2024) is embedded in the trend.

Table 1. Uzbekistan state budget revenue, 2018–2024 (actual execution).[2]

Year	Revenue (trln UZS)	YoY growth (%)	Tax-administered receipts (trln UZS)
2018	79.1	—	—
2019	112.2	+41.9	—
2020	132.9	+18.5	—
2021	164.7	+23.9	127.9
2022	201.8	+22.5	—
2023	231.7	+14.8	165.9
2024	274.3	+18.4	199.5

As Table 1 shows, revenue grew without interruption — it more than tripled in six years — but the growth column already reveals that the pace was uneven and, after 2019, broadly declining. This slowing of the growth rate, rather than any reversal in the level, is the property that discriminates between the models estimated below.

[1] Macroeconomic aggregates: 2024 GDP 1,454.6 trln UZS; real GDP growth 6.5%; CPI inflation 9.8%. Source: State Statistics Committee of Uzbekistan; U.S. International Trade Administration, Uzbekistan Country Commercial Guide (2025), trade.gov.

[2] Data sources for the series. State budget revenue (actual execution), trln UZS: 2018 — 79.1 (19.4% of GDP), 2019 — 112.2 (21.9%), 2020 — 132.9 (22.5%) [National News Agency of Uzbekistan, uza.uz]; 2021 — 164.7, of which 127.9 tax-administered [Ministry of Finance, 2021 preliminary execution report, via norma.uz]; 2022 — 201.8; 2023 — 231.7, of which 165.9 from taxes [Ministry of Economy and Finance, 2023 preliminary results]; 2024 — 274.3 (18.9% of GDP), +18.3% y/y, tax-authority collections 199.5 [Ministry of Economy and Finance; kun.uz, 2 April 2025].

2.2 Models

Three univariate specifications are estimated. The first is a log-linear constant-growth trend, $\ln R_t = a + b \cdot t + e_t$, in which the implied constant annual growth rate is $\exp(b) - 1$. The second is a linear constant-increment trend, $R_t = \alpha + \beta \cdot t + e_t$. The third is Holt's linear exponential smoothing with an additive trend, which allows the level and slope to be updated adaptively. Here R_t is revenue and t is a time index equal to 0 in 2018. A geometric random-walk-with-drift benchmark is added for completeness.

2.3 Evaluation

Because in-sample fit is uninformative with only seven points, the models are ranked out of sample. Each is estimated on 2018–2022 and used to predict 2023 and 2024; accuracy is measured by the root mean squared error (RMSE), the mean absolute error (MAE) and the mean absolute percentage error (MAPE), the standard triplet in the forecasting literature (Streimikiene et al., 2018). As an independent external check, the 2025 point forecasts are compared with the revenue figure in the approved 2025 State Budget Law (308.5 trln UZS)[3]. Estimation and 95% prediction intervals (computed on the log scale and exponentiated) use Python 3 with the statsmodels library, and the charts are prepared in Microsoft Excel.

3. Results

3.1 Descriptive dynamics

Over 2018–2024 revenue grew at a compound annual rate of 23.0% (19.6% if the reform-driven 2019 jump is excluded). Growth was far from constant: it fell from 41.9% in 2019 to 18.5% in 2020, recovered to 22–24% in 2021–2022, and eased to 14.8% (2023) and 18.4% (2024). Figure 2 plots these year-on-year rates.

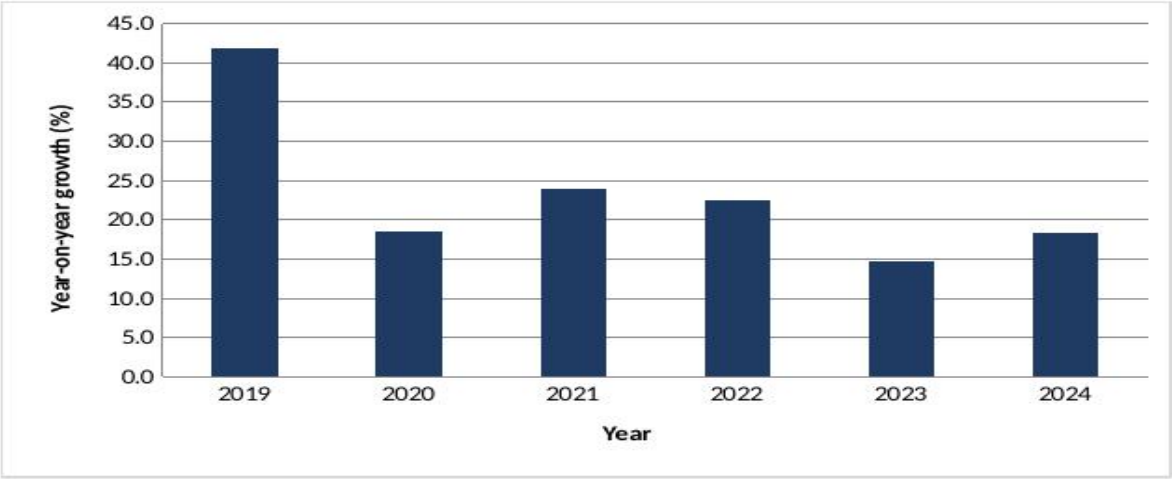

Figure 2. Nominal year-on-year growth of Uzbekistan state budget revenue, 2019–2024.[4]

[3] Law of the Republic of Uzbekistan 'On the State Budget of the Republic of Uzbekistan for 2025', signed 24 December 2024; approved state budget revenue 308.5 trln UZS.

[4] Chart drawn in Microsoft Excel; underlying values as in Table 1 (author's calculation).

Figure 2 makes the deceleration explicit. After the 41.9% reform spike in 2019 the growth rate settles into a declining path, and every subsequent rate lies below the 23.3% period mean except 2021. Economically, this is what one expects as one-off reform gains fade and disinflation proceeds; statistically, it is the reason a constant-percentage model is a poor description of the recent regime.

3.2 Estimation and in-sample fit

The log-linear model yields a slope of $b = 0.200$ (SE 0.012; $t = 17.2$; $p < 0.001$), i.e. an implied constant nominal growth of 22.1%, with $R^2 = 0.984$. The linear constant-increment model fits marginally better ($R^2 = 0.994$) with an average annual increment of about 31.9 trln UZS. In-sample the two specifications are therefore almost indistinguishable, which is precisely why in-sample fit cannot decide between them.

3.3 Model comparison and backtest

Table 2 reports the in-sample fit alongside the out-of-sample errors from the 2023–2024 backtest.

Table 2. In-sample fit and out-of-sample forecast accuracy (backtest: train 2018–2022, test 2023–2024).

Model	In-sample R^2	RMSE	MAE	MAPE (%)
Log-linear (constant growth)	0.984	40.1	38.4	14.9
Linear level (constant increment)	0.994	12.4	10.6	4.0
Holt (additive trend)	—	12.4	10.6	4.0
Geometric drift	—	37.8	35.7	13.8

RMSE and MAE in trln UZS. The additive-trend models attain the best value in every out-of-sample column.

The contrast in Table 2 is the paper's central result. In sample the models are nearly identical (R^2 of 0.98 against 0.99), but out of sample they diverge sharply: the additive-trend specifications predict 2023–2024 with an RMSE of 12.4 trln UZS, an MAE of 10.6 and a MAPE of 4.0%, whereas the multiplicative specifications (log-linear and geometric drift) miss by three to four times as much (RMSE 37.8–40.1; MAPE 13.8–14.9%). Figure 3 visualises the MAPE ranking.

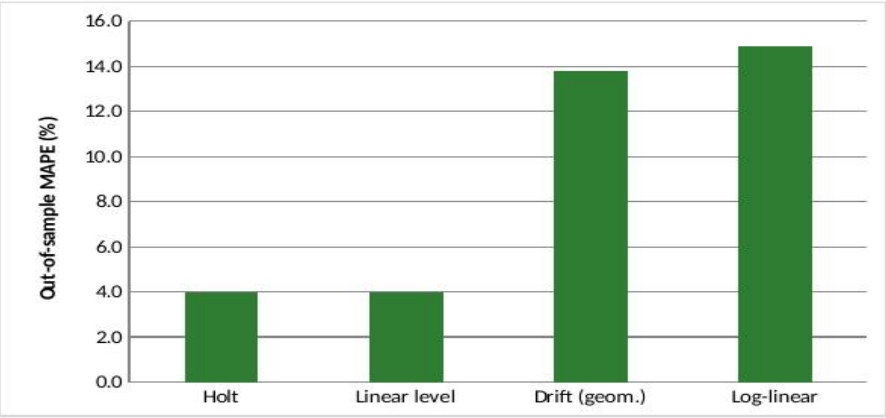

Figure 3. Out-of-sample MAPE by model (train 2018–2022, test 2023–2024).[5]

[5] Chart drawn in Microsoft Excel; MAPE computed by the author (Python/statsmodels).

Figure 3 shows the two additive models clustered near 4% and the two multiplicative models above 13%. The explanation is the deceleration documented in Section 3.1: a constant-percentage rule extrapolates the reform-era pace and overshoots the recent slowdown, while a constant-increment rule tracks it. On every criterion, therefore, the additive trend is preferred and is carried forward as the baseline forecast.

3.4 Forecasts and external validation

Table 3 reports the projections for 2025–2027 from the preferred additive model and from the log-linear model, together with the log-linear 95% prediction interval.

Table 3. Forecasts of state budget revenue, 2025–2027 (trln UZS).

Year	Additive (linear/Holt)	Log-linear (point)	Log-linear 95% interval
2025	298.6	352.2	287 – 433
2026	330.5	430.2	344 – 539
2027	362.4	525.4	411 – 672

Memo: approved 2025 State Budget revenue = 308.5 trln UZS.

Two things stand out in Table 3. First, the two models diverge increasingly over the horizon: the gap between them widens from about 18% in 2025 (298.6 against 352.2) to roughly 45% in 2027 (362.4 against 525.4), and the log-linear interval fans out to 411–672 trln UZS by 2027 — a spread that itself signals how fragile constant-growth extrapolation becomes at longer horizons. Second, and decisively, the additive 2025 forecast of 298.6 trln UZS lies within −3.2% of the Government's approved figure of 308.5, whereas the log-linear forecast exceeds it by +14.2%. The backtest and the independent plan comparison thus point the same way. Figure 1 presents the full picture.

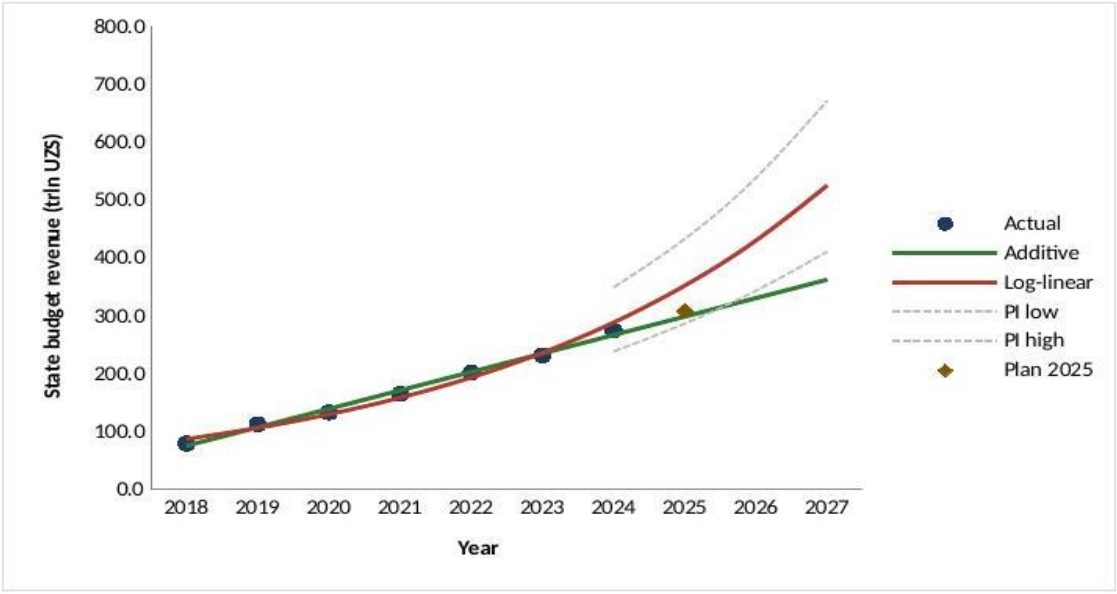

Figure 1. Uzbekistan state budget revenue: actual (2018–2024), fitted trends, and 2025–2027 forecasts with the official 2025 plan.[6]

[6] Chart drawn in Microsoft Excel; series computed by the author (Python/statsmodels). Actual data as in Table 1.

In Figure 1 the additive (green) line passes almost exactly through the marker for the official 2025 plan, while the log-linear (red) path and its prediction band rise visibly above both the additive line and the plan from 2025 onward. The visual confirms the numerical verdict: the additive trend is the credible baseline, and the log-linear path is best read as an upper scenario rather than a central forecast.

4. Discussion

The results carry three messages. First, Uzbekistan's roughly 20% nominal revenue growth is the joint product of double-digit inflation (CPI 9.8% in 2024), real output growth (6.5% in 2024), and reform-driven base broadening and stronger administration; as the one-off reform effects fade and disinflation proceeds, the percentage pace eases, which is exactly why the additive-trend model outperforms the constant-growth model in the recent regime. This is consistent with the buoyancy literature, in which emerging-market revenue tends to move broadly with nominal activity (Dudine & Jalles, 2017).

Second, the close agreement between the additive forecast (298.6 trln UZS) and the Government's 2025 plan (308.5 trln UZS) is mutually informative: it suggests both that the plan is realistic and that a simple, transparent trend model is a credible independent benchmark for the budget process. The log-linear overshoot is a cautionary result, showing how naive extrapolation of reform-era growth biases medium-term projections upward. Where richer data exist, ARIMA- and ETS-type models can of course be preferred (Box & Jenkins, 1976; Streimikiene et al., 2018); the contribution here is to show what is defensible when they cannot be identified.

Third, the study's limitations are real and bound its claims. The sample is short (seven annual points); the target is nominal, so part of the trend is inflation rather than a widening real base; the 2019 consolidation is a structural break; the models are univariate and omit drivers such as GDP, commodity prices and discretionary tax policy; and the prediction intervals are correspondingly wide. Natural extensions are to move to quarterly data to enlarge the sample, to add a buoyancy or error-correction specification linking revenue to nominal GDP, and to disaggregate the forecast by major tax (VAT, profit tax, personal income tax), each of which has its own dynamics.

5. Conclusion

Using seven years of official execution data, this paper shows that a parsimonious additive-trend model — not the seemingly natural constant-growth model — best forecasts Uzbekistan's state budget revenue in the current regime. It predicts about 299, 331 and 362 trillion UZS for 2025–2027, a path validated both by an out-of-sample backtest (MAPE 4.0%; RMSE 12.4) and by the approved 2025 budget (within 3.2%). The constant-growth model, which overshoots, is useful only as an upper scenario. For short-horizon fiscal planning in a reforming economy, transparent and backtested trend models are adequate, auditable, and preferable to opaque extrapolation.

References

1. Box, G. E. P., & Jenkins, G. M. (1976). Time series analysis: Forecasting and control. San Francisco: Holden-Day.
2. Dudine, P., & Jalles, J. T. (2017). How buoyant is the tax system? New evidence from a large heterogeneous panel (IMF Working Paper WP/17/4). International Monetary Fund.

3. Jenkins, G. P., Kuo, C.-Y., & Shukla, G. P. (2000). Tax analysis and revenue forecasting: Issues and techniques (Development Discussion Paper No. 2000-05). Harvard Institute for International Development.
4. Law of the Republic of Uzbekistan on the State Budget of the Republic of Uzbekistan for 2025 (signed 24 December 2024). Tashkent.
5. Legeida, N., & Sologoub, D. (2003). Modeling value added tax (VAT) revenues in a transition economy: The case of Ukraine (Working Paper No. 22). Institute for Economic Research and Policy Consulting, Kyiv.
6. Ministry of Economy and Finance of the Republic of Uzbekistan. (2019–2025). State budget execution reports, 2018–2024. Tashkent.
7. State Tax Committee of the Republic of Uzbekistan. (2025). Reports on tax receipts to the state budget, 2024 and January–September 2025. Tashkent.
8. Streimikiene, D., Ahmed, R. R., Vveinhardt, J., Ghauri, S. P., & Zahid, S. (2018). Forecasting tax revenues using time series techniques – a case of Pakistan. Economic Research-Ekonomska Istraživanja, 31(1), 722–754.
9. World Bank. (2024). World Development Indicators: Tax revenue (% of GDP), Uzbekistan (indicator GC.TAX.TOTL.GD.ZS). Washington, DC: World Bank.
10. Xudoyqulov, S. K. (2019). Improving the methodology of tax-revenue forecasting: Abstract of DSc dissertation (08.00.07). Tashkent.
11. Babayev Sh.B. Perfection of methodolory of forecasting of tax revenues from physical persons: foreign experience. Theoretical & Applied Science. Philadelphia, USA, 2019. №04(72). (International Scientific Journal Theoretical & Applied Science Journal Impact Factor ESJI: 8.716). http://t science.org/.).- P. 526-531.
12. Khudoykulov S.K., Babaev Sh.B. Directions for improving the process of forecasting the property tax of individuals// Web of scientist: international scientific research journal. ISSN: 2776-0979, Volume 3, Issue 6, June, 2022