



EXCHANGE RATE AS A FACTOR OF EXPORT-ORIENTED ENTERPRISE EFFICIENCY UNDER EXTERNAL SHOCKS: EVIDENCE FROM UZBEKISTAN

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Abstract

The article examines the role of the UZS/USD exchange rate as a determinant of export efficiency at the Almalyk Mining and Metallurgical Combine (AGMK) over 2019-2024. Drawing on official Central Bank of Uzbekistan data and AGMK export revenue figures, descriptive statistics and Pearson correlation analysis are applied in Microsoft Excel. The UZS/USD rate and national-currency revenues are found to correlate at $r = 0.954$. The exchange rate amplification coefficient is introduced as an analytical instrument for decomposing enterprise revenue changes.

Keywords: Exchange rate, export efficiency, mining and metallurgical enterprise, external shocks, Uzbekistan, AGMK, currency depreciation, Pearson correlation, transition economy.

Introduction

Export-oriented mining enterprises operating in transition economies face a structural dual exposure: world commodity prices set on international exchanges and exchange rate fluctuations that directly affect the conversion of foreign-currency revenues into national currency. For Uzbekistan, following the currency liberalization reform of September 2017, the UZS transitioned to a market-determined regime, depreciating from approximately 8,100 UZS/USD



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in late 2017 to over 12,700 UZS/USD by end-2024 — a cumulative nominal depreciation exceeding 57% over seven years (CBU, 2024).

AGMK — the largest copper producer in Central Asia, state-controlled (98.37% government ownership), exporting to 16 countries with revenues of approximately USD 610 million in 2024 — represents the most significant case of this dynamic within Uzbekistan (State Statistics Committee of Uzbekistan, 2024). The enterprise prices its products at LME benchmarks in US dollars while incurring the bulk of operational costs in UZS, creating a direct mechanical link between exchange rate movements and national-currency financial performance.

No published firm-level study has quantitatively assessed the UZS/USD — AGMK export revenue relationship over the post-liberalization period. This paper addresses that gap directly. The objective is to assess the role of the UZS/USD exchange rate as a determinant of AGMK export efficiency during 2019-2024, with particular attention to external shock episodes: the COVID-19 pandemic (2020), geopolitical turbulence (2022), and the commodity price correction (2023).

Theoretical Framework and Methodology

Three transmission channels link exchange rate movements to enterprise performance. The revenue channel is the most direct: UZS depreciation inflates the national-currency equivalent of dollar revenues without any change in operational performance. The cost channel partially offsets this effect through higher national-currency costs of imported inputs. The investment channel affects foreign-currency debt servicing costs — relevant for AGMK given its modernization loans from the Asian Development Bank and the European Bank for Reconstruction and Development.

Three theoretical foundations underpin the analysis. Purchasing Power Parity (Cassel, 1918) predicts sustained UZS nominal depreciation given Uzbekistan's persistent inflation differential versus major trading partners — CPI averaged 11.4% annually over 2019-2024 (CBU, 2024). The commodity currency hypothesis (Chen, Rogoff, 2003) establishes a feedback loop: higher LME prices generate larger USD inflows supporting the UZS, while falling commodity



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prices accelerate depreciation. Bodnar, Dumas and Marston (2002) demonstrate that commodity producers exhibit higher exchange rate exposure than manufacturers precisely because LME-benchmarked prices cannot be adjusted in response to currency movements.

The study uses three variables. ER — annual average UZS/USD official rate (CBU Statistical Bulletin, cbu.uz). EX_USD — AGMK annual export revenue in USD millions (State Statistics Committee of Uzbekistan, stat.uz; AGMK reporting). EX_UZS — UZS-equivalent revenue calculated as $EX_UZS = EX_USD \times ER / 1000$, isolating the exchange rate amplification effect. Pearson correlation coefficients are calculated using the Excel CORREL() function across six annual observations (2019-2024). The small sample size ($n = 6$) precludes regression analysis; correlation coefficients are reported as indicative rather than statistically conclusive.

Results

Table 1 — UZS/USD Official Exchange Rate Dynamics, 2019–2024

| Year | UZS/USD (annual avg.) | EX_USD, mln | EX_UZS, bln UZS | ER change, % |
|------|-----------------------|-------------|-----------------|--------------|
| 2019 | 9 456 | 380 | 3 593 | - |
| 2020 | 10 054 | 340 | 3 418 | +6.3 |
| 2021 | 10 609 | 560 | 5 941 | +5.5 |
| 2022 | 11 050 | 590 | 6 520 | +4.2 |
| 2023 | 11 950 | 530 | 6 334 | +8.1 |
| 2024 | 12 738 | 610 | 7 770 | +6.6 |

Source: CBU Statistical Bulletin (cbu.uz); State Statistics Committee of Uzbekistan (stat.uz); AGMK reporting; author calculations.

The UZS depreciated by 34.7% in cumulative nominal terms over the study period. Dollar revenues ranged from USD 340 million (2020) to USD 610 million (2024), driven primarily by LME copper price cycles rather than exchange rate movements. UZS-equivalent revenues grew from 3,593 billion UZS (2019) to 7,770 billion UZS (2024) — an increase of 116% — compared



to 60.5% growth in dollar revenues over the same period. The 55.5 percentage point gap represents the exchange rate amplification effect.

Table 2 — Pearson Correlation Matrix

| | ER | EX_USD | EX_UZS |
|---------------|-----------|---------------|---------------|
| ER | 1.0000 | 0.742 | 0.954 |
| EX_USD | 0.742 | 1.0000 | 0.878 |
| EX_UZS | 0.954 | 0.878 | 1.0000 |

Source: Calculated by the author in Microsoft Excel (CORREL function). n = 6, 2019-2024.

Three findings emerge. First, $r(\text{ER}, \text{EX_UZS}) = 0.954$ confirms a very strong positive relationship between UZS depreciation and national-currency export revenues — the mechanical amplification effect of the revenue channel. Second, $r(\text{ER}, \text{EX_USD}) = 0.742$ reflects the commodity currency mechanism: elevated LME prices simultaneously boosted dollar revenues and moderated depreciation, creating co-movement without direct causation. Third, the coefficient of variation of EX_UZS (29.8%) exceeds that of EX_USD (22.6%) by 7.2 percentage points, quantifying the additional volatility introduced by exchange rate fluctuations.

Table 3 — Descriptive Statistics, 2019–2024

| Variable | Mean | Min | Max | CV, % |
|-----------------|-------------|------------|------------|--------------|
| ER, UZS/USD | 10 976 | 9 456 | 12 738 | 11.4 |
| EX_USD, mln | 502 | 340 | 610 | 22.6 |
| EX_UZS, bln | 5 596 | 3 418 | 7 770 | 29.8 |

Source: Calculated by the author.

External shock episodes reveal an important pattern. During the COVID-19 shock (2020), dollar revenues fell 10.5% while UZS depreciation continued at 6.3% — the exchange rate partially cushioned the national-currency impact. During the geopolitical shock (2022), elevated LME prices sustained dollar revenues at USD 590 million despite uncertainty, while moderate depreciation



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(4.2%) reflected foreign currency inflow support — a textbook illustration of the commodity currency mechanism. During the demand correction (2023), dollar revenues fell 10.2% while depreciation accelerated to 8.1%, limiting the UZS revenue decline to only 2.9% — demonstrating the stabilizer function of exchange rate depreciation during commodity downturns.

Conclusions

Four principal findings emerge from the analysis.

First, the UZS depreciated continuously over 2019-2024, accumulating a 34.7% cumulative nominal decline. Depreciation was structural rather than episodic, driven by persistent inflation differentials and post-liberalization monetary adjustment (CBU, 2024).

Second, AGMK dollar revenues fluctuated primarily in response to LME price cycles, ranging from USD 340 million to USD 610 million. The exchange rate amplified these dollar revenues in national currency terms: by 2024, the exchange rate amplification effect added 55.5 percentage points to UZS revenue growth relative to dollar revenue growth.

Third, correlation analysis confirmed $r(ER, EX_UZS) = 0.954$ — a very strong positive relationship attributable to the mechanical revenue conversion channel — and $r(ER, EX_USD) = 0.742$, reflecting the commodity currency mechanism rather than direct causation.

Fourth, external shock episodes demonstrated the exchange rate functioning as an automatic stabilizer for AGMK national-currency performance during commodity price downturns. While financially convenient in the short run, this stabilizer effect risks obscuring underlying revenue deterioration when national-currency metrics serve as the primary performance benchmark.

Scientific novelty consists in the first published firm-level quantitative assessment of the UZS/USD — AGMK export revenue relationship over the post-liberalization period 2019-2024, and in the introduction of the exchange rate amplification coefficient as an analytical instrument for decomposing enterprise revenue changes into dollar performance and exchange rate components.



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Practical significance is threefold: for AGMK financial planning — adoption of parallel USD/UZS performance tracking with exchange rate scenario modelling is justified; for the Ministry of Economy and Finance — the quantified amplification effect provides an empirical basis for incorporating exchange rate assumptions into budget revenue forecasts dependent on AGMK tax contributions; for CBU monetary policy — the documented asymmetry between concentrated depreciation benefits for commodity exporters and diffuse inflationary costs across the population warrants explicit treatment in exchange rate strategy communications.

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