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Коинтеграционный анализ взаимодействия изменений обменных курсов доллара США и азербайджанского маната с турецкой лирой

Цель исследования. *В статье тщательно изучены предпосылки для проявления коинтеграционных связей на фоне колебаний обменных курсов AZN/TL и USD/TL в течение первой половины 2023 года в условиях, характеризующихся резким обесцениванием турецкой лиры.*

Материалы и методы. *В работе используются современные эконометрические методологии, в том числе тест коинтеграции Йохансена, тест причинности Грейнджера, векторная коррекция ошибок и другие соответствующие подходы.*

Результаты. *В исследовании были динамически проанализированы причины девальвации турецкой лиры, ее влияние на экономику Азербайджанской Республики и обменный курс AZN/TL. Коинтеграционная модель взаимного влияния была создана посредством точного применения эконометрических тестов. Коэффициент восстановления дисбаланса составил -0,933745, обеспечивающим возврат траектории в исходное состояние в последующий момент после отклонения от состояния равновесия. В случае разницы первого порядка USD/TL этот коэффициент составляет -0,242442, хотя и статистически является незначимым. Интерпретация полученной модели указывает на то, что обесценивание турецкой лиры по отношению к доллару не оказывает существенного влияния на колебания курса AZN/TL.*

Заключение. *Результаты исследования показывают, что хотя курс USD/TL и оказывает влияние на курс AZN/TL, экономика Азербайджанской Республики не пострадает серьезно от девальвации турецкой лиры.*

Ключевые слова: *обменные курсы, нестационарные ряды, тест коинтеграции Энгла-Грейнджера, коррекция ошибок, тест Йохансена.*

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Cointegration Analysis of the Interaction Between Changes in the Exchange Rates of the Us Dollar and Azerbaijani Manat With the Turkish Lira

Purpose of the study. *The article scrutinizes the prerequisites for the manifestation of cointegration associations amid the fluctuations in the AZN/TL and USD/TL exchange rates during the initial half of 2023, under the circumstances characterized by the precipitous depreciation of the Turkish lira.*

Materials and methods. The study employs contemporary econometric methodologies, encompassing the Johansen cointegration test, Granger causality test, vector error correction, and other pertinent approaches.

Results. *The research dynamically scrutinizes the underlying causes of the Turkish lira's devaluation, its impact on the economy of the Republic of Azerbaijan, and its influence on the AZN/TL exchange rate. A cointegration model of reciprocal influence was established through the accurate application of econometric tests. The imbalance recovery coefficient was found to be -0.933745, ensuring that the trajectory reverts to its original state in the subsequent moment after deviating from the equilibrium state. In the case of USD/TL the first order differences, this coefficient is -0.242442, albeit statistically insignificant. The interpretation of the established model indicates that the depreciation of the Turkish lira against the dollar does not exert a significant impact on the fluctuations in the AZN/TL exchange rate.*

Conclusion. *The findings of the research indicate that while the USD/TL does exert an influence on the AZN/TL, the devaluation of the Turkish lira does not significantly impact the economy of the Republic of Azerbaijan.*

Keywords: *exchange rates, non-stationary series, Engle-Granger cointegration test, error correction, Johansen test.*

Introduction. The policy changes implemented by the central banks of developed countries since the beginning of 2018 have had adverse effects on developing nations, leading to significant fluctuations in Turkey's financial markets in August 2018. These negative processes were exacerbated by external factors such as heightened risk perceptions in global markets, a trend of withdrawal from developing countries, escalating oil prices, and sanctions imposed on Turkey by the United States.

In September 2018, interest rates were raised to control the depreciation of the Turkish lira, causing both interest and currency shocks to the economy. The COVID-19 pandemic in 2020 further strained Turkey's economy, leading to a second currency shock and a significant slowdown in global capital and investment. The mutation of the virus in 2021, coupled with the peak energy crisis in Europe and inflationary pressures leading to potential interest rate hikes in Europe and the United States, increased exchange rate pressure on Turkey.

Turkey has pursued a policy of low exchange rates and high interest rates in recent years. However, this policy has led to a current account deficit due to increased imports. This deficit, along with high inflation, has become one of Turkey's persistent economic problems. Furthermore, there has been an increased dependence on imports for exports and a rise in foreign debt. Therefore, it can be argued that the exchange rate shocks experienced by Turkey in 2018 and subsequent years are indicative of a debt crisis.

The anticipation of interest rate hikes in the US led to new lows for the Turkish lira (TL). The dollar exchange rate rose from around 8.5 TL in November 2020 to over 26 lira in July 2023. This depreciation made TL one of the most depreciating currencies globally. Expectations of further interest rate cuts fueled a rush to currency by both foreign and domestic investors.

The increasing currency prices quickly impacted inflation, particularly affecting food, housing, and car markets. However, a government-announced TL deposit program indexed to foreign currency led to a noticeable decrease in exchange rates in late December. Despite this, the reduction of central reserves and changes in interest rates continue to negatively impact economic growth.

Increasing budget deficits due to borrowing and monetary expansion have heightened inflationary pressures. Particularly during the pandemic crisis, these deficits reached their highest levels and may lead to a future currency crisis in Turkey. It is evident that first-generation crisis theories, which suggest that increasing budget deficits and deteriorating macroeconomic indicators can lead to a currency crisis, have significantly contributed to explaining Turkey's recent currency crises.

In conclusion, Turkey is grappling with a currency crisis primarily caused by political issues. The macroeconomic consequences of excessive depreciation of TL persist in the form of higher inflation, budget deficit, and increased external debt costs. Despite strong returns reported by the banking sector, continued exchange rate volatility suggests that balance has not yet been achieved.

In the first half of 2023, Turkey's national currency experienced a sharp depreciation against freely convertible currencies. The USD/TL exchange rate reached a record high of 27.42. Despite the Turkish government's new economic policy, further depreciation of the national currency is anticipated.

Turkey, being a major trading partner of Azerbaijan, has an impact on the Azerbaijani manat and the country's overall economy. While oil and oil products constitute a significant portion of Azerbaijan's exports, growth in the non-oil sector has been observed in recent years. Notably, Turkey is a key destination for Azerbaijan's non-oil exports.

The significant depreciation of the currency of a country with which Azerbaijan has close commercial and economic ties stimulates imports from that country. This ensures that goods and products imported from that country are profitable and accessible. However, this is not observed in products imported from Turkey.

Economic, trade, and import-export transactions between Turkey and Azerbaijan do not reflect significant price differences due to the depreciation of the Turkish lira. The depreciation of Turkey's national currency complicates export activities from Azerbaijan to Turkey.

Although the depreciation of the Turkish lira stimulates imports from that country for Azerbaijan's economy and domestic consumer market, it makes exports more expensive and challenging. The sharp devaluation of Turkey's national currency does not have an efficient, profitable, effective character for the development of the real sector in Azerbaijan's economy. As Azerbaijan has close economic and trade relations with Turkey, goods imported from Turkey are cheaper. Since the Azerbaijani manat remains stable against the dollar, there are no fundamental economic factors for the manat to depreciate or appreciate against the Turkish lira.

Despite the depreciation of the lira, prices of products imported from Turkey have not decreased in Azerbaijan. Under normal economic conditions, reductions in prices of products imported from Turkey to Azerbaijan are expected; however, these reductions do not occur. The lira is expected to stabilize after a period of growth in about 2-3 years.

Despite the depreciation of the lira in Turkey, the cost of products produced in this country is increasing because Turkey imports raw materials and the depreciation of the lira makes imports more expensive. Therefore, it is not possible to lower the price when exporting to Azerbaijan a product produced at the expense of an imported product. For entrepreneurs engaged in non-oil exports, their country's

currency remains unchanged and strengthens against competing countries, negatively impacting exports.

To evaluate the prospects for expanding mutually beneficial commercial-economic, fuel-energy, and transport sectors, it is indeed crucial to conduct an econometric co-integration analysis of the interaction of the relevant aggregate indicators of foreign trade between the two strategic partners. This article examines the joint dynamics of the national currencies of the two countries in the context of AZN/TL and USD/TL.

The co-integration analysis of exchange rate changes between these two countries is particularly significant, as this change is considered a crucial factor in the development of inter-country commercial and economic relations.

The observation period for this study includes nominal indicators for AZN/TL and USD/TL exchange rates for the first half of 2023 [1-3]. The research employs econometric methodologies to examine the statistical relationship between multivariate non-stationary time series. These methodologies include the Johansen cointegration test, Granger causality study, reactions to shocks based on a vector error correction model (VECM), forecast performance, error variance decomposition, and statistical analysis methods necessary for constructing pair regression models. [4], forecast performance, error variance decomposition, statistical analysis methods necessary for the construction of pair regression models (variance analysis, correlation-regression analysis, statistical assumptions in data analysis) for the theoretical analysis of modeling calculations, two-dimensional vector auto-regression models and cointegration in these models, approaches to modern economic and mathematical modeling [5, p. 447-476], EXCEL software packages [6] and Eviews-12 software package [7] were used.

Analysis of recent publications. The study [8] explored the impact of the dynamics of the US dollar and Turkish lira exchange rate on the Turkish economy, with a particular focus on its effect on Turkey's import and export balance. Turkish companies face costs denominated in foreign currency due to the dollarization of liabilities, which could potentially limit the competitive advantage gained from currency depreciation on exports. The research primarily analyzed the relationship between real exchange rates and calculated the nominal and real effective exchange rate of the lira, which poses a threat to Turkish exports.

In the article [9], the asymmetric effects of a third country's exchange rate volatility on Turkey-Germany commodity trade were investigated. The study statistically analyzed annual time series data from 1980-2022 for Turkey's export (import) industry. Using the Autoregressive-distributed lag (ARDL) model, it was found that the third-country volatility using the lira-dollar has a significant short-term symmetric effect on Turkey's export (import) industry. In [10] , the TL/USD exchange rate was investigated using quarterly frequency data for the observation period from Q4 2005 to Q4 2017. The exchange rate determination mechanism of the monetary model was applied in the theoretical approach, and the multivariate ARDL bounds test was applied to the data for evaluation purposes. The results showed that the exchange rate has a cointegrative relationship, which was consistent with the principles of economic theory.

In [11] , a relatively new method of modeling as an error correction mechanism was used to show how overshooting can be tested in both the short and long term. In [12], it was investigated whether the Turkish currency market exhibits chaotic dynamics. The article focused on the currency basket of the Euro and US dollar with equal weight against the Turkish Lira. Lyapunov exponents (LE) included in the daily data of the currency basket from 01.05.2018 to 23.05.2022 were calculated.

In [13], the most appropriate model of exchange rate dynamics was built using computer modeling, mean-error indices of approximation, and mean square divergence with the Fourier series approach and time-dependent behavior in time series. This research is based on the daily observation of EUR/AZN currency exchange covering the years 02.03.2017 - 08.03.2018. In [14], a spectral analysis of RUB/AZN exchange rate changes was performed taking into account parabolic trends.

The main results of the study. To make accurate long-term forecasts using the procedures of the Eviews-12 software package, the conditions for the existence of co-integration relations between AZN/TL and USD/TL exchange rate changes are studied for the first half of 2023. The economic interpretations of the results are analyzed, and recommendations based on econometric approaches are provided.The descriptive statistics of the data are given in table 1.

Skewness is a measure that quantifies the asymmetry of a distribution. The positive values observed for AZN/TL (2.106065) and USD/TL (2.137394) indicate a right-sided asymmetry, meaning that the tail of the curve points towards the positive side. Kurtosis measures the thickness of the tails in a distribution. The high kurtosis estimates observed for AZN/TL (6.309153) and USD/TL (6.452088) suggest that the data have more extreme values than a normal distribution.

The dependence of the AZN/TL ratio on the USD/TL ratio and absolute valuations of balances during the period for the first half of 2023 is carried out using the Eviews-12 software package. This dependence is mathematically represented by a bivariate linear regression equation in table 2.

The calculated coefficients are statistically significant. The Darbin-Watson statistic indicates that

Таблица 1 (Table 1)

Описательная статистика
Descriptive statistics

	AZN/TL	USD/TL	RESIDUALS
Mean	11.68756	19.86147	0.022118
Median	11.28620	19.17820	0.011695
Maximum	15.33000	26.05020	0.733489
Minimum	10.99080	18.69710	2.61E-06
Std. Dev.	1.058537	1.796260	0.061630
Skewness	2.106065	2.137394	9.122169
Kurtosis	6.309153	6.452088	100.7957
Jarque-Bera	216.3895	227.6884	74638.81
Probability	0.000000	0.000000	0.000000
Sum	2115.448	3594.926	4.003332
Sum Sq. Dev.	201.6902	580.7792	0.683688
Observations	181	181	181

Таблица 2 (Table 2)

Линейная многомерная регрессия
Linear multivariate regression

Dependent Variable: AZN/TL				
Method: Least Squares				
Sample: 1/01/2023 6/30/2023				
Included observations: 181				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
USD/TL	0.583674	0.001396	418.1094	0.0000
RESIDUALS	0.926243	0.040687	22.76501	0.0000
C	0.074449	0.027724	2.685342	0.0079
R-squared	0.999021	Mean dependent var		11.68756
Adjusted R-squared	0.999010	S.D. dependent var		1.058537
S.E. of regression	0.033304	Akaike info criterion		-3.949859
Sum squared resid	0.197427	Schwarz criterion		-3.896845
Log likelihood	360.4622	Hannan-Quinn criter.		-3.928366
F-statistic	90833.02	Durbin-Watson stat		2.227843
Prob(F-statistic)	0.000000			

there is no autocorrelation between the residuals. The F-Fisher statistic shows that it is generally effective. The coefficient of determination in the table is higher than 99%. This indicates that the general formal model is highly accurate. In this case, there is a very high density of relationship between the dependent variable (AZN/TL) and the independent variable (USD/TL). To determine whether the model is robust and predictively significant, a sufficient number of additional tests should be performed.

According to Table 2, the formal linear bivariate regression equation describing the dependence of the AZN/TL rate on the USD/TL rate during the period for the first half of 2023 is as follows:

$$AZN/TL_t = 0.583673910115USD/TL_t + \\ + 0.926242944605RESIDUALS_t + \\ + 0.074485375794. \quad (1)$$

The stability of the estimated parameters of the model is assessed using the CUSUM test of the Eviews-12 software package. The recursive estimate of residuals (CUSUM) do not exceed the 95% confidence intervals, as indicated in figure 1. This confirms the high predictive capabilities of the fitted model. Therefore, the predictive tests performed demonstrate that the model is stable, correctly specified, and has stable predictive properties.

The test results of residuals are accurately represented in the figure 2 with standardized residuals graph. The correlation coefficient between exchange rates is 0.998084, indicating a high correlation.

Now, let's consider the issue of heteroskedasticity in the model. In the studied model, the heteroscedasticity was checked using the White Test based on observation results. The results obtained from this test are represented in table 3:

The tabular data show the heteroscedasticity of the residuals.

The stationarity of the factors was checked by the Augmented Dickey-Fuller test. The cases of the absence of a deterministic trend and the presence of a trend were investigated. Because of this

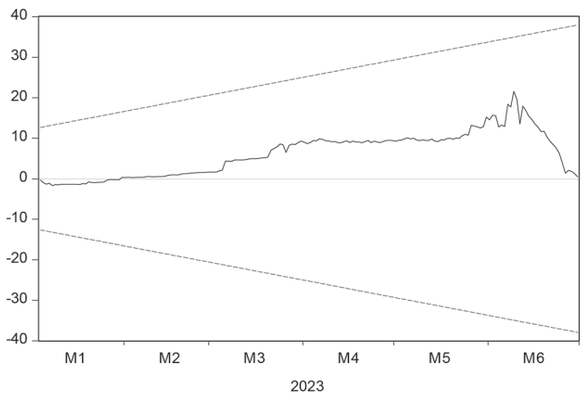

Fig.1. Stability diagnostics
Рис. 1. Диагностика устойчивости

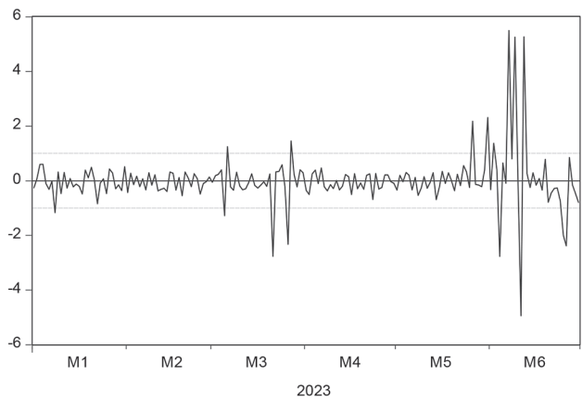

Fig. 2. Distribution of residuals
Рис. 2. Распределение остатков

Таблица 3 (Table 3)

Тест Уайта на гетероскедастичность
White Test for heteroscedasticity

F-statistic	12.34352	Prob. F(5,175)	0.0000
Obs*R-squared	47.19076	Prob. Chi-Square(5)	0.0000

$$\Delta(AZN/TL)_t = \varphi(AZN/TL)_{t-1} + \alpha_1 + \varepsilon_{1t}, \quad (2)$$

$$\Delta(AZN/TL)_t = \varphi(AZN/TL)_{t-1} + \alpha_2 + \beta_1 t + \varepsilon_{1t}, (3)$$

$$\Delta(AZN/TL)_t = \varphi(AZN/TL)_{t-1} + \alpha_3 + \varepsilon_{3t}, \quad (4)$$

$$\Delta(AZN/TL)_t = \varphi(AZN/TL)_{t-1} + \alpha_4 + \beta_2 t + \varepsilon_{1t}, (5)$$

models were evaluated.

Here, ε_{it}, $i = \overline{1,n}$ are independent random variables with mathematical expectation 0, distributed with the same normal law. Here, φ, α, ε are the evaluated parameters.

It should be noted that according to the results of tables 4 and 5, non-stationarity is canceled when $t_\varphi < t_{critical}$.

For *AZN/TL*

$t_\varphi = 2.897950 > t_{critical}$ is non-stationary for intercept specification,

$t_\varphi = 0.917142 > t_{critical}$ is non-stationary for trend and intercept specification .

We obtain the results shown in the following tables when evaluating the appropriate models for 1st order differences.

$t_\varphi = -13.18261 < t_{critical}$ at 1%, 5%, 10% critical values. The series is stationary at 1%, 5%, 10% significance level for intercept specification.

$t_\varphi = -13.86510 < t_{critical}$ at 1%, 5%, 10% critical values. The series is stationary at 1%, 5%, 10% significance level for trend and intercept specification.

For *USD/TL*

$t_\varphi = 3.934229 > t_{critical}$ is non-stationary for intercept specification.

$t_\varphi = 1.660464 > t_{critical}$ is non-stationary for trend and intercept specification.

We obtain the results shown in the following tables when evaluating the appropriate models for difference operators of the 1st order differences.

$t_\varphi = -12.82503 < t_{critical}$ at 1%, 5%, 10%. The series is stationary at 1%, 5%, 10% significance level for intercept specification.

$t_\varphi = -7.866348 < t_{critical}$ at 1%, 5%, 10%. The series is stationary at 1%, 5%, 10% significance level for trend and intercept specification.

The Granger causality test was conducted to ascertain the cause-effect relationship between the variables, based on the lag estimates. The results of the Granger tests indicate a bidirectional cause-and-effect relationship between the *USD/TL* and *AZN/TL* exchange rates at lag prices of m = 1,2,3,4. This relationship was found to be statistically significant at the 1% level. The results are represented in table 6.

Таблица 4 (Table 4)

Расширенный тест Дикки-Фуллера для AZN/TL
ADF test for AZN/TL

Null Hypothesis: AZN/TL has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
	Level			
	intercept		trend and intercept	
	t-Statistic	Prob.*	t-Statistic	Prob.
Augmented Dickey Fuller test statistic	2.897950	1.0000	0.917142	0.9999
Critical value 1%	-3.466786		-4.009849	
Critical value 5%	-2.877453		-3.434984	
Critical value 10%	-2.575332		-3.141481	
Null Hypothesis: D(AZN/TL) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
	1st difference			
	intercept		trend and intercept	
	t-Statistic	Prob.*	t-Statistic	Prob.
Augmented Dickey-Fuller test statistic	-13.18261	0.0000	-13.86510	0.0000
Critical value 1%	-3.466994		-4.010143	
Critical value 5%	-2.877544		-3.435125	
Critical value 10%	-2.575381		-3.141565	

Таблица 5 (Table 5)

Расширенный тест Дикки-Фуллера для USD/TL
ADF test for USD/TL

USD/TL has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
	Level			
	intercept		trend and intercept	
	t-Statistic	Prob.*	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	3.934229	1.0000	1.660464	1.0000
1%	-3.466786		-4.009849	
5%	-2.877453		-3.434984	
10%	-2.575332		-3.141481	
Null Hypothesis: D(USD/TL) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
	1st difference			
	intercept		trend and intercept	
	t-Statistic	Prob.*	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.82503	0.0000	-7.866348	0.0000
1%	-3.466994		-4.010143	
5%	-2.877544		-3.435125	
10%	-2.575381		-3.141565	

Таблица 6 (Table 6)

Тест причинности Грейнджера
Granger causality test

Null Hypothesis:	*m* = 1		*m* = 2		*m* = 3		*m* = 4	
	F-stat.	Prob.	F-stat.	Prob.	F-stat.	Prob.	F-stat.	Prob.
USD/TL does not Granger Cause AZN/TL	23.04	3.E-06	12.60	8.E-06	8.07	5.E-05	6.03	0.0001
AZN/TL does not Granger Cause USD/TL	14.15	0.00	7.53	0.0007	5.14	0.0020	3.84	0.0051

The "Akaike Information Criteria by Rank and Model" and "Schwarz Criteria by Rank and Model" sections provide supplementary information through the Akaike Information Criteria (AIC) and Schwarz Criteria (SC). Models with a single cointegration relationship (for instance, Rank 1) typically exhibit lower AIC and SC values compared to models with zero or two cointegration relationships, underscoring the significance of a cointegrating relationship.

A noteworthy outcome of the Johansen cointegration test is the presence of at least one cointegration relationship between the AZN/TL and USD/TL series when applying a linear trend with an intercept, significant at the 0.05 level. This finding indicates a long-term relationship between these series. The results are shown in table 7.

As a result, the following system was obtained by applying the error correction mechanism:

$$\begin{aligned} D(AZN/TL)_t = \\ = -0.93374530898(AZN/TL_{t-1} - \\ - 0.587176976971USD/TL_{t-1} - \\ - 0.000129801087892@TREND(1/02/03) - \\ - 0.00946658516105) + \\ + 1.21502051041D(AZN/TL_{t-1}) + \\ + 0.527593943182D(AZN/TL_{t-2}) + \\ + 0.36374805119D(AZN/TL_{t-3}) - \\ - 0.52973129401D(USD/TL_{t-1}) - \\ - 0.327014386468D(USD/TL_{t-2}) - \\ - 0.151483169808D(USD/TL_{t-3}) + \\ + 0.0147024861572, \end{aligned} \quad (6)$$

$$\begin{aligned} DUSD/TL_t = \\ = -0.242441721654(AZN/TL_{t-1} - \\ - 0.587176976971USD/TL_{t-1} - \\ - 0.000129801087892@TREND(1/02/23) - \\ - 0.00946658516105) + \\ + 2.63208735818D(AZN/TL_{t-1}) - \\ - 1.43319051956D(AZN/TL_{t-2}) + \\ + 0.849670287408D(AZN/TL_{t-3}) - \\ - 1.36188075245D(USD/TL_{t-1}) - \\ - 0.873718814641D(USD/TL_{t-2}) - \\ - 0.244876011259D(USD/TL_{t-3}) + \\ 0.0247619645216 \end{aligned} \quad (7),$$

Here, between courses

$$ECT_t = AZN/TL_t - 0.587176976971USD/TL_t - \\ - 0.0094665851605, \quad (8)$$

Таблица 7 (Table 7)

Тест Йохансена
Johansen test

Series: AZN/TL USD/TL					
Lags interval: 1 to 4					
Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data trend:	None	None	Linear	Linear	Quadratic
Test type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	NoTrend	Trend	Trend
Trace	2	2	2	1	1
Max-Eig	2	2	2	1	1
*Critical values based on MacKinnon-Haug-Michelis (1999)					
Information Criteria by Rank and Model					
Data trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Log Likelihood by Rank (rows) and Model (columns)					
0	281.5802	281.5802	283.4427	283.4427	287.4089
1	299.0291	299.4021	301.2555	301.6862	305.6521
2	301.2689	304.9629	304.9629	306.3636	306.3636
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-3.017957	-3.017957	-3.016394	-3.016394	-3.038737
1	-3.170785	-3.163660	-3.173358	-3.166889	-3.200592*
2	-3.150784	-3.170033	-3.170033	-3.163223	-3.163223
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-2.729731	-2.729731	-2.692140	-2.692140	-2.678455
1	-2.810503*	-2.785364	-2.777048	-2.752564	-2.768253
2	-2.718445	-2.701666	-2.701666	-2.658828	-2.658828

equality indicates a long-term equilibrium relationship. The Ramsey test for checking the specification of the established system of equations (6),(7), (8) shows that ECM model is correctly identified; Breusch-Pagan-Godfrey test did not reveal heteroskedasticity; the serial correlation test did not identify the problem; Jarqua - Bera test confirmed normal distribution (probability of all tests greater than 0.05).

Conclusion. In systems (6), (7), and (8), the t-statistics of the corresponding coefficient, denoted in parentheses beneath the assessment, are significant at the 1% level of significance. The cointegration relationship reveals that in the long term, a 1-point increase in the USD/TL rate corresponds to a -0.587177 point increase in the AZN/TL rate. The rate at which the exchange rate reverts to equilibrium following a disturbance from equilibrium due to a USD/TL shock is -0.933745. This suggests that the shock state at the previous moment is mitigated in the current moment, and the trajectory returns to its equilibrium state.

The corresponding coefficient on the USD/TL exchange rate is negative and increases to -0.242442. The computed t-statistic suggests that the estimate is not significant.

The modeling results suggest that depreciation of the lira does not have a direct and substantial impact on the Republic of Azerbaijan, primarily because products are predominantly traded in dollars. However, in a broader context, the impact of lira devaluation on Azerbaijan's economy will be minimal. There may be gains in certain areas and losses in others. From this perspective, it can be inferred that on average, the economy of the Republic of Azerbaijan will not be significantly affected by this currency devaluation.

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