

Investigating the Behavioral Equilibrium Exchange Rate in Albania: The Role of Productivity, NFA, and Openness

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Abstract: In a small open economy such as Albania, the exchange rate significantly influences various economic dimensions, including price levels, the balance of payments, productivity, the stock of foreign assets, and the attraction of foreign capital.

This paper seeks to analyze exchange rate volatility within the framework of several macroeconomic determinants and their association with the real exchange rate (RER). Specifically, the study inspects exchange rate instability and its effects on macroeconomic variables that show statistically meaningful relationships with the RER. The analysis covers the period 2015–2024 and utilizes quarterly time series for each considered variable as independent and dependent measures. The examined macroeconomic variables include the real exchange rate, the relative productivity gap with trading partners, net foreign assets, trade openness, and government public spending. The Behavioral Equilibrium Exchange Rate (BEER) methodology is applied to assess how these key fundamentals shaped RER volatility over the sample.

Empirical findings corroborate earlier results showing that the RER deviates from its equilibrium, and they identify the relative productivity gap and net foreign assets as the primary drivers of RER volatility. Both factors exert negative influences, implying that their expansion strengthens the domestic currency vis-à-vis foreign currencies.

Moreover, RER volatility itself exerts a statistically significant effect on GDP and export volumes. Although divergence of RER from equilibrium appeared limited during the study interval, the business community remained vigilant about domestic currency movements against foreign currencies. This research enriches the exchange rate literature for small open economies by providing novel BEER-based empirical evidence from Albania. It also offers actionable insights for policymakers, firms, and investors to better appraise exchange-rate risk and to devise policies that favor stability and sustainable growth.

Keywords: *Real Exchange Rate, The difference in productivity, BEER, Volatility, Economic factors.*

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1. Introduction

Given the marked exchange rate swings observed globally over recent decades, a growing body of research has concentrated on identifying the drivers behind these movements. This paper contributes to that effort by examining exchange

rate equilibrium and the macroeconomic forces that jointly determine it, drawing on one of the RER equilibrium approaches and prior studies such as [11], [6], [10], [31]. Two principal methodologies have been predominantly used to

estimate equilibrium exchange rates influenced by macro fundamentals. One approach—the macroeconomic balance method—derives an exchange rate consistent with full capacity output and a sustainable current account, initially proposed by [31] and commonly referred to as the FEER. This framework has been extended and refined in subsequent contributions, including [19]. An alternative, which incorporates econometric analysis of equilibrium exchange rate behavior, is the BEER methodology. BEER produces a different deviation indicator from FEER: it quantifies the gap between the observed exchange rate and the value implied by estimated equilibrium relationships between the RER and macro fundamentals. The empirical literature shows applications such as [7], who used multifactor cointegration to construct BEER-based REER estimates for the US dollar, German mark, and Japanese yen. The immediate application yields the current deviation—the difference between the observed exchange rate and its level implied by contemporaneous values of fundamentals. Since fundamentals can be decomposed into short-run and long-run (permanent) components, it is often more informative to compute the total deviation—the gap between the observed rate and the rate implied by long-run fundamentals.

The real exchange rate (RER) has been recognized as a crucial macro indicator since the breakdown of the Bretton Woods system, which underscored that identical consumer-basket prices across countries need not hold. Consequently, the exchange rate is widely used as a gauge of competitiveness. Movements in the RER—appreciation or depreciation of the domestic currency against a basket of foreign currencies—can be driven by various domestic economic conditions, but pronounced and persistent deviations can materially affect the economy and firms active in international markets. Thus, exchange rate dynamics present both opportunities and challenges.

Empirical evidence links exchange rate behavior to production and economic development: currency depreciation typically boosts exports by making domestic goods more affordable abroad and curtails import demand; conversely, currency appreciation raises export prices and enhances the competitiveness of imports, potentially widening the trade deficit. During 2014–2024 Albania displayed relative nominal exchange rate stability against foreign currencies, with movements reflecting economic conditions in trading partners. Post-global-crisis dynamics (2008–2009) tended to show a nominal overvaluation, particularly vis-à-vis the US dollar, while the euro remained comparatively stable; this stance helped anchor inflation within central bank objectives. Factors frequently identified as both influencing and being influenced by exchange rate deviations include the productivity differential with partner countries, net foreign assets, export performance, external debt, government expenditures, foreign-currency borrowing, remittance inflows, and FDI. A stable macroeconomic environment, reinforced by exchange rate steadiness, can attract more foreign investment—an especially relevant channel for developing economies like Albania. Beyond methodological matters (e.g., RER definition and measurement), model choice depends on the study’s purpose and temporal coverage (or data frequency). The BEER framework separates long-run fundamentals affecting the RER from short-run dynamics such as interest-rate shifts, but it requires assessing whether included fundamentals are at their long-run or equilibrium levels. According to [6], the BEER approach yields an exchange rate deviation measure reflecting the gap between the prevailing exchange rate and the rate implied by the equilibrium relationship. Unlike FEER, BEER does not impose macroeconomic balance conditions but relies on current fundamentals to estimate the equilibrium RER. BEER comprises: (i) fundamentals with persistent effects on the RER; and (ii) uncovered interest parity (UIP) to capture short-run exchange rate behavior. This study adopts the BEER framework to estimate

equilibrium RER and identify drivers of its deviations. Assuming expected RER is driven mainly by long-run fundamentals, RER can be modeled under BEER as a function of a vector of selected long-run determinants and short-term interest-rate movements, expressed as:

$$q_t^{BEER} = f(Z_t, (r_t - r_t^*)) \quad (1)$$

The literature documents several BEER applications in recent years, e.g., [15], [9], [6], [13], among others.

The exchange rate matters because it directly affects relative prices of domestic versus foreign goods, i.e., the price of one currency expressed in units of another. Domestic economic developments therefore yield exchange-rate responses. Currency depreciation denotes a fall in its value; for instance, if the euro weakens against the lek, the lek has appreciated. Appreciation refers to an increase in the currency's value. RER movements substantially affect key macro variables: appreciation raises domestic-currency prices of exports and reduces export competitiveness, whereas depreciation has the opposite effect [22]. Depreciation can facilitate the sale of domestic goods abroad and render them more competitive relative to foreign suppliers. RER volatility also impacts firms engaged in cross-border activity by altering export receipts and import payment obligations.

2. Literature review

Equilibrium-model applications differ across countries, reflecting study aims and country-specific economic features. The BEER model offers flexibility in incorporating macro indicators relevant to a country's dominant economic phenomena. BEER determines RER equilibrium empirically through econometric methods rather than solely theoretical constructs. Research applying BEER for currency valuation, such as [32] in the Chinese context, highlights three essential choices: (i) selection of explanatory variables; (ii) the sample period; and (iii) cointegration estimation techniques. BEER has

been employed more frequently for developing than for advanced economies. Similarly, [12] identified and analyzed determinants of RER equilibrium. [14] developed a long-run RER equilibrium model including terms of trade, trade openness (as a proxy for monetary policy), steady-state net capital inflows-to-GDP, government spending-to-GDP, and export growth. [17] provided theoretical and empirical insights on equilibrium exchange-rate estimation models, estimation methods, and general model architecture. Many studies emphasize how fundamentals affect RER rather than defining their optimal levels [6].

Empirical BEER applications, especially in transition economies, often follow the stock-flow methodology to study RER equilibrium. Commonly examined fundamentals include terms of trade (tot), relative prices of tradables to non-tradables (tnt)—the Balassa–Samuelson effect—and net foreign assets (nfa).

$$\bar{q}_t = f(nfa, tot, tnt) \quad (2)$$

In [26], the authors analyzed RER equilibrium across eight West African countries (1970–2006) using variables such as terms of trade, government spending, openness, productivity (tradables versus non-tradables), and investment. [13] examined the influence of productivity, relative prices, and net foreign assets on the RER for 11 transition economies and a subset of OECD countries. Studies specific to Albania are scarce; one example is [30], who assessed the RER ALL/EUR equilibrium employing productivity, net foreign assets, government spending, openness, public debt, terms of trade, and remittances. [18] used BEER to evaluate RER volatility driven by productivity, net foreign assets, public debt ratio, and terms of trade.

Economic factors and their relationship with the RER .

Real exchange rate (RER)

When a country trades with k partner countries, the RER expression can be written as:

$$RER_t = \sum_{i=1}^k \alpha_i NER_{it} \quad (3)$$

where, α_i denotes the weight of country i , and NER_{it} denotes the nominal exchange rate of our country's currency with the currency of country i for period t .

In the case of analyzing the determination of the real exchange rate of our country with several partner countries with different official currencies, the equation that will be used is:

$$MRER_{jt} = \frac{\sum_{i=1}^k \alpha_i NER_{it} CPI_{it}^*}{CPI_{jt}} \quad (4)$$

where, $MRER_{jt}$ denotes the real effective exchange rate (or real multilateral exchange rate) in period t for country j ; NER_{it} denotes the nominal exchange rate of our country's currency with the currency of country i for period t ; $i = 1, \dots, k$ refers to the number of partner countries included in this study; α_i denotes the weight of partner country **calculated** to be included in the calculation of the real exchange rate; CPI_{it}^* denotes the price index of the basic consumer basket for partner country i during period t ; and CPI_{jt} denotes the price index of our country during period t . Meanwhile the author, [27] claims that many studies consider precisely the effective exchange rate, determined according to formula (4), instead of the real bilateral exchange rate.

The trade-weighted basket in this study covers the four largest trading partners by volume (G4): Italy, Greece, Germany, and Spain, all of which use the euro.

Productivity Difference (PROD)

A principal determinant is the productivity differential between tradable and non-tradable sectors, often framed as the Balassa–Samuelson (BS) effect. Formulated by Balassa and Samuelson (1964), this effect is considered a deviation from Purchasing Power Parity due to international price differences between tradables (manufacturing, agriculture, mining, transport)

and non-tradables (mostly services excluding transport). According to [11], the BS formulation yields the RER determination as the ratio:

$$RER = \frac{\text{Price of tradable goods}}{\text{Price of non-tradable goods}} \quad (5)$$

The exchange rate not only signals international competitiveness but also reflects production costs in the tradable sector. BS theory predicts that countries with highly productive tradable sectors tend to have higher non-tradable prices, and thereby higher overall price levels than countries with less productive tradable sectors [2].

Net foreign assets (NFA)

A country's NFA position mirrors its external liabilities and assets and is thus commonly associated with its balance-of-payments stance; changes in NFA correspond to current account balances [22]. Theoretical perspectives on NFA–RER links vary with factor dynamics and the time horizon. [20] describe the relationship between international transfers and RER as the “transfer problem,” arguing from a Keynesian viewpoint that heavily indebted nations must run sizable trade surpluses to service liabilities, which may necessitate exchange rate depreciation to achieve those surpluses.

Trade opening (OPEN)

Trade liberalization systematically reduces tariffs and non-tariff barriers among trading partners [21]. By lowering trade barriers, import prices fall, intensifying competition for domestic producers. Reduced domestic prices can contribute to exchange rate depreciation [24].

Public government spending (GOV)

Several studies investigate how government spending influences RER fluctuations. [23] showed that increased public expenditure tends to raise non-tradable goods prices because government spending is concentrated in that sector. Empirical work by [8] links higher government spending to real currency

appreciation. Public investment that raises tradable-sector productivity can appreciate the RER via the Balassa–Samuelson channel. Conversely, higher budgetary outlays may exert offsetting long-run effects; hence, the net impact can be ambiguous [29].

External debt (FDEBT)

External borrowing is often used to fill the gap between national savings and investment needs and to correct trade imbalances. When well-utilized, external funds can promote growth and reduce poverty in low-income countries [28]. This notion, sometimes referred to as the debt-cycle thesis, emphasizes external finance as a development tool. Empirical findings on external debt's impact on RER differ across studies, depending on debt levels, the sample period, and RER dynamics.

Monetary offer (MS)

Monetary theory, notably the monetary approach to exchange rates, links money supply expansions to exchange-rate movements under flexible regimes: the central bank equilibrates money demand and supply via exchange-rate adjustments [24]. Sustained money supply growth tends to depreciate the domestic currency proportionally. Monetary aggregates can thus be an instrument to mitigate exchange rate volatility: rising money

supply lowers the domestic price level and may curb RER fluctuations.

Albania's macroeconomic context and performance of key indicators

Albania's political-economic transition after the 1990s brought substantial challenges and has been the subject of extensive domestic and international research. The country's opening to regional and global markets helped shift it from transition to growth. [25] Estimate that from a low 1991–1992 base, Albania quickly moved toward higher domestic output and lower inflation, associated with initial market reforms. World Bank assessments for Southeastern Europe report positive GDP growth in recent years, with improved export performance (notably electricity) and gains in tourism supporting the recovery.

This study focuses on the links between several macroeconomic variables and RER deviations from equilibrium using the BEER approach. Additionally, it examines how RER volatility affects other macro variables theoretically linked to the RER. Official statistics for GDP growth, remittances (REM), investment inflows (FDI), export volumes (EXP), unemployment (Unemp), and inflation (CPI) are used to summarize recent performance.

Table 1- Performance of economic indicators during the study period

Economic indicators	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
GDP growth (%)	5.7	5.7	5.9	7.5	3.3	3.8	2.6	1.6	1.4	2.1
EXP Vol.*	530	631	786	918	751	1172	1406	1526	1732	1827
REM*	802	937	952	833	781	690	665	675	544	592
FDI*	209	250	464	610	689	789	717	727	923	812
Unemp. (%)	14.1	13.8	13.2	12.5	13.6	13.7	13.3	13	13	13.3
CPI (%)	2.4	2.4	2.9	3.4	2.2	3.6	3.5	2	1.9	1.63

*Expressed in millions of Euros

Source: Bank of Albania, INSTAT, Ministry of Welfare and Social Affairs.

3. Methodology

This paper empirically examines how selected fundamentals determine the RER equilibrium and, conversely, how RER movements affect key economic and financial variables over a ten-year span (2014–2024). Quarterly data for each variable were sourced from Albanian official institutions (INSTAT, Bank of Albania, etc.).

Scientific research questions:

- What are the principal drivers of the ALL/EUR exchange rate movements in Albania?
- Do these determinants have statistically significant effects on exchange rate deviations from equilibrium?
- Are these effects positive or negative over the study horizon?

The methodological approach is documented step-by-step, including statistical tests, data processing, hypothesis formulation, and interpretation aligned with Albania's economic realities during the sample period.

Basic tools for data analysis

BEER is framed as an econometric procedure that links macro fundamentals to the RER to quantify deviations from equilibrium. It allows computation of the gap between the observed RER and the equilibrium or BEER-implied RER. Implementing BEER requires a suite of statistical diagnostics, econometric estimation, and economic interpretation. All estimations were performed using EViews 9.5 to ensure contemporary data processing and accurate results for the phenomena under investigation.

Data collection methods

Seven macro variables are included in the BEER specification, with six treated as explanatory variables expected to move RER toward equilibrium. Variables are constructed as time series and entered in logarithmic form. Beyond estimating BEER, the authors examine the

RER's impact on Albania's broader macroeconomy. Secondary data were drawn from the Bank of Albania and INSTAT databases, Ministry of Finance reports, World Bank, Eurostat, and OECD sources—particularly for partner-country data. Published studies indicate growing use of BEER in recent years. The BEER determinants in this work are: productivity gap (PROD) between Albania and the four G4 eurozone partners (Italy, Spain, Greece, Germany), trade openness (OPEN), net foreign assets (NFA), external debt (FDEBT), government spending (GOV), and money supply (MS). Guided by literature expectations about these variables' effects on RER, the BEER reduced-form expression is specified as:

$$RER_t^{BEER} = f\left(\begin{matrix} - & + & +/ - & +/ - & +/ - & + \\ PROD' & OPEN' & NFA' & FDEBT' & GOV' & MS \end{matrix}\right) \quad (6)$$

This reduced-form aggregation represents the combined influence of several theoretical channels determining the exchange rate.

Data analysis methodology

The data-analysis and testing workflow comprises: descriptive statistics for each series and testing for normality via Jarque–Bera; stationarity checks using ADF and Phillips–Perron tests; cointegration assessment via the Johansen method with Trace and Maximum Eigenvalue tests; for cointegrated relationships, estimation using VECM for BEER and VAR, ARDL, or VECM as appropriate for macro-level estimations; joint significance checks via the Wald test; and diagnostic tests for serial correlation (Breusch–Godfrey), heteroskedasticity (Breusch–Pagan–Godfrey), and residual normality. The significance threshold for all models is set at $\alpha = 5\%$ ($p = 0.05$).

Functional form of the model:

$$RER_t = B_0 - B_1 PROD_t + B_2 OPEN_t + B_3 NFA_t + B_4 FDEBT_t + B_5 GOV_t + B_6 MS_t + \varepsilon_t$$

According to which the main hypothesis:

$$H_0: B_1 = B_2 = B_3 = \dots = B_n = 0$$

H_a : At least one of the parameters is different from zero

Or;

H_0 : No macroeconomic variable has a statistically significant effect on exchange rate deviation from equilibrium.

H_a : At least one considered economic factor is statistically significant in affecting exchange rate deviations.

Given Albania's transition-economy profile, BEER was chosen as the appropriate framework. This econometric model evaluates the equilibrium relation between RER and selected fundamentals and yields the RER deviation as the difference between observed RER and its BEER-estimated counterpart. Time-series econometric techniques are applied to the constructed series for each variable.

Descriptive analysis of time indicators

Table 2 summarizes the statistical information for each of the time indicators included in the model, for the entire time period (Q1 2014 – Q4 2024) with a frequency of 3-month time series.

Table 2 - Descriptive indicators of the series taken into study.

	No. of views	Min	the Max	Average.	Dev.stand	JB test	Prob (JB)
RER	43	126.52	145.32	136.07	5,784	3,816	0.148
PRODUCT	43	13,221	15,726	14,543	0.675	2,362	0.306
OPEN	43	0.210	0.388	0.299	0.042	0.707	0.701
NFA	43	1,796	3,220	2,406	0.368	1,444	0.485
FDEBT	43	0.902	3,402	1,964	0.799	3,322	0.189
Gov.	43	0.227	4,030	1,871	1.123	2,991	0.224
MS	43	7,578	11,928	9,897	1.325	3,333	0.188

Source: Author's calculations

Standard deviation is a notable statistic for RER at 5.784, indicating it experienced the largest variability over the sample. The Jarque–Bera test probabilities for all series exceed 0.05, implying each series does not reject normality at

conventional levels. Figure 1 presents graphical depictions of the series. Visual inspection alone cannot definitively determine each indicator's impact on RER but shows their trend behaviors over time.

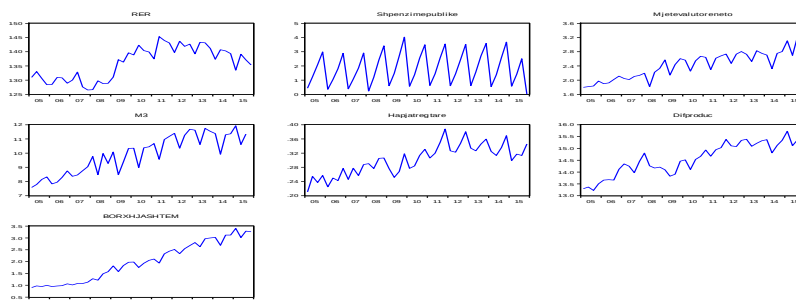


Figure 1 - Visual representation of the time series of studied indicators

Source: Bank of Albania, INSTAT and author's calculations

The RER recorded notable fluctuations between 2014 and 2024. Public spending exhibited modest year-on-year growth but noticeable intra-year variability; its peak coincided with episodes of larger domestic-currency depreciation against the euro. Other variables—NFA, MS (M3),

OPEN, PROD, and FDEBT—displayed upward trends with relatively moderate year-to-year dispersion.

Testing the statistical significance of variables through the Wald test

The Wald test assesses joint significance of coefficients (including lagged terms) over the long and short run.

The long-run null of no cointegration is: $H_0: C(1) = C(2) = \dots = C(6) = 0$, against the alternative that jointly these coefficients differ from zero.

Results are summarized below:

Table 3 - Wald test results on significance statistical the variables in period long-term

Wald test	Value	P-value
F-statistic	2.93	0.053
Chi-square	17.58	0.0074

Source: Author's calculations

With a chi-square p-value of 0.0074 (< 0.05), the null is rejected, indicating a long-run effect of the main variables on the RER. Short-run joint significance for three time lags per variable is presented next;

Table 4 - Wald test results on significance statistical the variables in period short

	F-statistic		Chi-square		hypothesis
	Value	P-value	Value	P-value	
LnNFA	2.95	0.075	8.85	0.031	$H_0: C(1)=C(2)=C(3) = 0$ Not confirmed.
LnMS	0.65	0.592	1.97	0.577	Not confirmed.
LnOpen	1.07	0.397	3.32	0.358	Not confirmed.
LnProduct.	1.15	0.367	3.46	0.325	Not confirmed.
LnDebt	0.56	0.65	1.68	0.64	Not confirmed.
LnGov.	1.39	0.291	4.18	0.241	Not confirmed.

Source: Author's calculations

These results indicate that Net Foreign Assets (NFA) shows statistical significance (chi-square $p = 0.031$), while other variables do not pass the short-run joint significance threshold. The finding that NFA is significant across lags supports its inclusion in the model. VECM estimation will further identify variables affecting RER with short-run dynamics.

Diagnostic model checks

Model diagnostics are essential for validating results. Residual serial correlation is tested via Breusch–Godfrey; heteroskedasticity via Breusch–Pagan–Godfrey; and normality by Jarque–Bera. Results follow.

Table 5 - Results of checks diagnostic

Tests	Test value	P-value	hypotheses
Serial correlation (Breusch -Godfrey)	6.86	0.076	H_0 : Errors NOT present serial correlation
Heteroskedasticity (Breusch -Pagan-Godfrey)	27.46	0.493	H_0 : Variance of errors IS homoscedasticity
normalcy (JarqueBera)	0.366	0.832	H_0 : Term distribution THE error IS normal

Source : Author 's calculation.

In the estimated model, diagnostics do not indicate problems: chi-square and p-values exceed 0.05, so null hypotheses are not rejected. Therefore, the model appears statistically sound

and its results robust for assessing short- and long-run drivers of RER equilibrium.

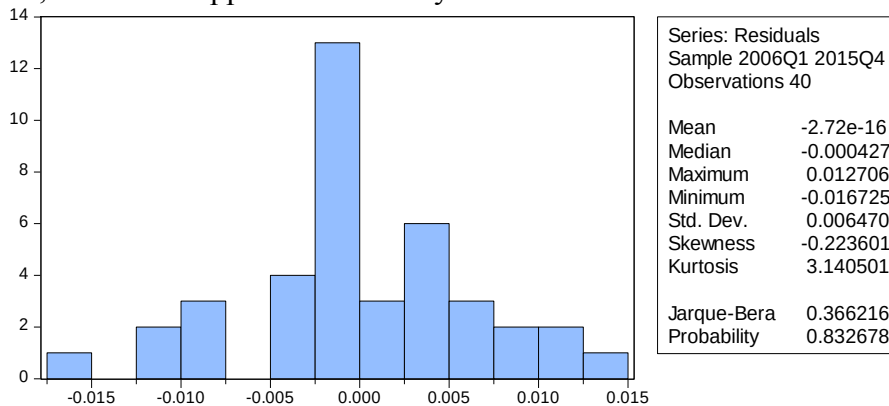


Figure 2 - Distribution dynamics normal THE Wastes according to JB test

Source : Author 's calculations

Estimation of the VECM model equation with OLS and economic interpretation

The model's F-statistic ($F = 4.76$; $\text{Prob}(F) = 0.0033 < 0.05$) confirms the importance of included factors. Hypotheses:

H_0 : No economic factor significantly affects exchange rate deviation (not supported).

H_a : At least one economic factor significantly affects exchange rate deviation (supported).

The R-squared of 0.914 indicates the model explains 91.4% of observed RER movements from equilibrium. The adjusted R-squared of 0.722, a more conservative metric, suggests additional explanatory variables outside the model account for the remaining 27.8%. The Durbin–Watson statistic of 2.34 indicates the model does not suffer from autocorrelation. VECM allows distinguishing long- and short-run effects; the following tables summarize t-statistics and p-values across three lags and long-run impacts to evaluate hypotheses per factor.

Table 6 - Important model estimation statistics

R^2	0.914
R^2 adjusted	0.722
F-statistic (prob)	4.76 (0.0033)
Dw-statistic	2.34

Source: Author's calculations

While the corrected value of $R^2 = 0.722$, which normally results in a lower value than R^2 but a more concise indicator, suggests that RER is also affected by other economic variables that are not included in the model and are part of the 27.8% not included in the model.

Another reference is the Durbin-Watson index, in order to show that our model does not suffer from autocorrelation, it records a value of 2.34 greater than the accepted value of 2.

Since the VECM model allows us to identify factors that have an impact on RER in both the long and short term, we next analyze the results of the statistical indicators, t-statistics and p-value, for each factor for the three time lags, in order to prove the validity of the H_0 raised for each factor.

Table 7 - Results of estimating the linear regression equation with the OLS method

variables	Short-term period						Long-term period		hypothesis (H_0)
	t-statistic			p-value			t-statistic	p-value	
<i>Time delays</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>1</i>	<i>2</i>	<i>3</i>			
LnGOV	1.88	1.99	1.99	0.08* ¹	0.07*	0.06*			H_{01} : It is confirmed
LnNFA	-2.72	-1.92	-0.74	0.018**	0.078*	0.47	2.12	0.055*	H_{02} : Not Proven
LnMS	0.65	-0.22	0.22	0.52	0.82	0.83	-0.6	0.55	H_{03} : It is confirmed
LnOPEN	-1.17	-1.29	-1.68	0.26	0.22	0.12	0.56	0.58	H_{04} : It is confirmed
LnPROD	1.5	0.97	1.27	0.15	0.34	0.22	-2.24	0.04**	H_{05} : Not Proven
LnFDEBT	1.04	1.01	0.83	0.31	0.33	0.42	0.99	0.33	H_{06} : It is confirmed

Source: Author's calculations

Table 7 summarizes key statistics for 2014–2024 and assesses the influence of macro factors on RER fluctuations. The model indicates that, at the 95% confidence level, the most influential determinants are: the productivity gap ($p = 0.04$)

with a long-run effect, and net foreign assets ($p = 0.018$) with a short-run effect. At the 90% confidence level, additional effects are observed: NFA also shows long-run relevance ($p = 0.055$), NFA exhibits a short-run effect with two lags (p

¹**-- statistically significant at 5% significance level; * -- statistically significant at 10% significance level

= 0.07), and government public expenditure displays short-run significance across its three lags ($p_1 = 0.08$; $p_2 = 0.07$; $p_3 = 0.06$).

Productivity differential (PROD):

Model results and hypothesis testing show the productivity gap significantly affects RER fluctuations in the long run, leading to rejection of the null that no variable influences RER deviations. The productivity differential, intended to capture a BS-like effect, emerges as a key long-run driver. Increasing relative productivity is associated with domestic currency appreciation; this theoretically reduces competitiveness of domestic goods, increasing import penetration and lowering exports. The negative sign on the coefficient ($t = -2.24$) aligns with theoretical expectations. The estimated elasticity indicates that a 1% rise in relative productivity corresponds to approximately a 1.49% RER overvaluation. Although the effect does not produce large RER swings, it is statistically meaningful and consistent with earlier Albania-specific and international studies [30], [18], [1], and [5], which highlight the BS effect in developing and transition economies..

Net Foreign Assets Factor (NFA):

NFA exhibits a statistically significant short-run effect at the 95% level and weaker long-run significance at the 90% level. Emphasis is placed on the short-run result as the most robust. The coefficient is negative (-2.72), indicating that higher NFA corresponds to RER appreciation (domestic currency strengthening). Quantitatively, a 1% increase in foreign assets associates with a 0.52% real appreciation of the lek in the model. In many countries, official net foreign assets equals net international reserves (NIR); [25] notes definitional nuances between NFA and NIR. Bank of Albania interventions in FX markets to stabilize the exchange rate and maintain reserve adequacy affect liquidity and - The R-squared of 0.914 indicates the included variables explain a large share of RER deviations; adjusted R-squared of 0.722 provides

can strengthen the RER. Long-run NFA effects are not strongly significant, in line with previous NFA–RER literature. Overall, productivity gains appear to be the principal driver of RER movements in transition economies

4. Conclusions

To address the hypotheses and methods detailed previously, the paper's principal conclusions are:

- Albania's exchange rate deviated measurably from its equilibrium during 2014–2024. BEER-based estimates indicate episodes of both undervaluation and overvaluation, but deviations generally remained within $\pm 2\%$ of the observed rate.
- BEER's advantage lies in distinguishing short- and long-run relationships. Net foreign assets emerged as a statistically significant determinant of RER fluctuations, with a negative effect—i.e., higher NFA lowers the ALL/EUR rate, signifying lek appreciation against the euro.
- Over the long run, the productivity differential between Albania and eurozone partners significantly affects the RER; its impact is negative as anticipated by the literature. Albania's comparatively low domestic output and high unemployment versus eurozone countries imply smaller productivity differentials reduce exchange-rate pressures; larger differentials contribute to depreciation, stimulating exports and export competitiveness.
- At the 10% significance level, public spending shows short-run significance and NFA exhibits some long-run relevance; both have positive impacts on RER fluctuation.
- The error-correction coefficient is 0.37, implying about 37% of the RER deviation from equilibrium is corrected in under two quarters. The model's findings align with other Albania-focused studies, suggesting the exchange rate has generally remained close to equilibrium.

a more conservative assessment. Fisher's statistic (4.76, $p = 0.0033$) reinforces the relevance of the included regressors.

5. Limitations of the study and recommendations

All empirical analyses have constraints, offering scope for further research. Limitations and recommendations here include:

- Reliance on secondary official data, which sometimes exhibited quality issues for the chosen period and quarterly frequency. This complicated consistent time-series construction across different sources. Better-quality, higher-frequency data would improve reliability.
- From a BEER perspective, the sample length (44 observations, 2014–2024) is relatively short. The limited observations constrain robustness;

longer time-series based on high-quality data are advised.

- Panel BEER estimations including other major partner countries with non-euro currencies could broaden the analysis beyond this paper's scope.
- Different measures of the relative productivity gap could be used; while alternative indices typically point to similar conclusions, the chosen ratio affects result sensitivity. Harmonizing country-level productivity measurement across consumption-basket constructs is challenging; this study used a consistent data source for partner-country productivity.
- Alternative econometric techniques could be employed to validate the second hypothesis and to study RER impacts on macro variables. Expanding the model with additional macro variables—remittances, market interest rates, foreign investment flows, etc.—is recommended to enhance explanatory power.

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