THE INFLUENCE OF EXCHANGE RATE ON INFLATION IN ALBANIA: STUDY PERIOD 2010-2022

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Abstract &&

This paper studies the exchange rate in Albania and its relationship with inflation. Recently, the exchange rate has been emphasized as a shock absorber in the literature on transition nations, downplaying its costs to macroeconomic stabilization. However, the costs and benefits of a previous exchange rate instrument determine the decision to use a different exchange rate regime. The paper's first section presents a survey of the literature on the connection between inflation and the exchange rate. The performance of the ALL/EUR exchange rate is discussed, as the euro accounts for the majority of transactions in our country's trade with other countries. The study of the effect of the exchange rate on economic indicators such as inflation is the last part of the study, for which we developed a simple regression model to explain the relationship between the two variables.

Key words: Exchange rate, inflation, economic growth, the Albanian economy

JEL classification: E00, E4, E5

Introduction

Albania has used a flexible exchange rate regime since the early 1990s because of its limited international reserves and to avoid costly corrections of exchange rate deviations from "equilibrium" levels, which are common in fixed regimes. Albania is a small country, and most product prices are based on data from the international market. In this way, the exchange rate directly impacts the prices of imported goods purchased by local consumers. However, changes in the exchange rate can impact the prices of goods produced in the local economy. The exchange rate models concentrate on the real exchange rate, calculated by taking the nominal rate and adjusting it for inflation in the country and abroad. In developing countries, exchange rate fluctuations can have an impact on aggregate demand and investment expansion, whereas an overvalued currency has a negative

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impact on employment. However, the high external debt makes the debt itself vulnerable to RER movements. A persistently overvalued real exchange rate is an early warning sign of a currency crisis. As a result, economists focus on studying real exchange rate equilibrium and identifying economic variables that can steer an averted exchange rate toward equilibrium. Using a free exchange rate regime means that the price of foreign currencies, such as the euro against the Albanian lek, is determined by market conditions.

Literature review

In international economics, inflation and exchange rates are inextricably linked, with severe consequences for developed and developing economies. For decades, economists, policymakers, and financial analysts have been captivated by this intricate interplay as they unravel the complexities underpinning these two critical macroeconomic variables. Inflation, as a measure of the overall price rise in an economy, directly impacts a country's purchasing power and economic stability. Concurrently, exchange rates, which represent the relative value of one currency relative to another, significantly affect international trade, capital flows, and overall economic competitiveness.

Examining the papers reveals that they converge on specific themes while exhibiting notable differences.

1. **Interest Rates, Inflation, and Exchange Rates:** Akhtar, Hossain (2002) and Tony, Seno, Aji., Prayudi, Setiawan, Prabowo., Clarashinta, Canggih (2021) use Vector Autoregression (VAR) models to examine the causal relationship between interest rates, inflation, and exchange rates in their respective countries (Bangladesh and Indonesia).
2. **Impact of Financial Reforms and Monetary Union:** Akhtar, Hossain (2002) and Osama, Samih, Shaban., Mohammad, Al-Attar., Zaid, Al-hawatmah., Nafez, Nimer, Ali (2019) discuss the impact of financial reforms and monetary union membership on exchange rate volatility.
3. **Exchange Rate Shocks and Monetary Policy:** Akhtar, Hossain (2002) and Civcir, I., & Akçağlayan, A. (2010) highlight the importance of considering the implications of exchange rate shocks in monetary policy decision-making.
4. **Exchange Rate and Inflation in Specific Countries:** David, Barlow (2005) and Domac, Iker, Elbirt, and Carolos (1999) analyze the depreciation of exchange rates in response to inflation in their respective countries (Hungary and Albania).
5. **Real Exchange Rate (RER) Determinants:** Edmira, Cakrani., Pranvera, Resulaj (2012) and Sulo, Haderi., Harry, Papapanagos., Peter, Sanfey., Mirela, Talka (1999), focus on factors influencing the real exchange rate in Albania.

6. **Inflation Persistence and Exchange Rate Regimes:** Michael, Bleaney (2000) and Thórarinn, G., Pétursson (2009), the relationship between exchange rate regimes and inflation persistence.
7. **Inflation Targeting and Exchange Rate Regimes:** Ebeke, C. H., & Fouejieu, A. (2018) and Thórarinn, G., Pétursson (2009), the relationship between inflation targeting and exchange rate regimes
8. **Exchange Rate Volatility and Inflation Volatility:** Eliphas, Ndou., Nombulelo, Gumata (2017) and Thórarinn, G., Pétursson (2009) investigate the relationship between exchange rate volatility and inflation volatility.

While some findings may share the same themes, each study offers unique insights and results based on the specific context and methodology.

Authors	Country	Main Findings
Akhtar, Hossain (2002)	Bangladesh	Inflation resulted in currency depreciation, but this effect weakened after financial reforms. Depreciation‘s impact on inflation was insignificant.
Civcir, I., & Akçağlayan, A (2010)	Turkey	Exchange rate shocks had a robust transmission, impacting CBRT policy responses. Exchange rate movements significantly impacted monetary policy.
David, Barlow (2005)	Hungary	The exchange rate depreciated in response to inflation, with a decreasing depreciation rate over time due to gradual official devaluation.
Domac, Iker, Elbirt, Carolos (1999)	Albania	Inflation is influenced by factors like monetary aggregates, exchange rates, government credit, and real income—long-run inflation related to money supply and exchange rate.
Dr. Veer, Virendra, Singh., Dr. Swami, Prasad, Saxena (2022)	India	Unidirectional causality: interest rates influenced exchange rates and inflation, with little effect on inflation
Osama, Samih, Shaban., Mohammad, Al-Attar., Zaid, Al-hawatmah., Nafez, Nimer, Ali (2019)	Jordan	This study examines the negative correlation between exchange rates and CPI inflation rates. CPI rates had a direct opposite effect on the determination level of exchange rates.
Indirasari, Cynthia, Setyoparwati., Munawar, Ismail (2016)	Indonesia	The exchange and SBI rates significantly impacted inflation, while the money supply did not.

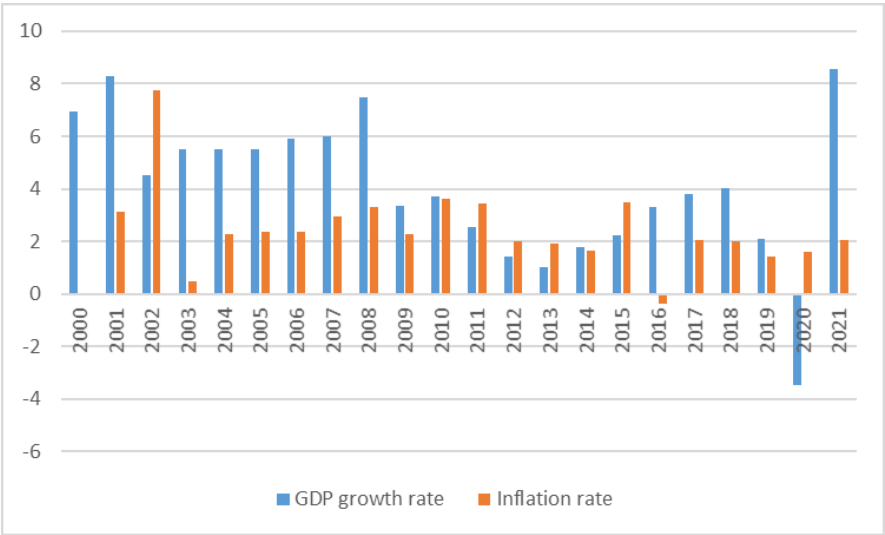
Jorge, Carrera, Guillermo, and Vuletin (2003)	Multinational	They examined the relationship between exchange rate regimes and short-term volatility of the effective real exchange rate.
Michael, Bleaney (2000)	Multinational	Inflation is more persistent under floating exchange rates, but there is no significant difference in inflation persistence across different exchange rate regimes.
Ebeke, C. H., & Fouejieu, A (2018)	Multinational	Countries using inflation targeting had more flexible exchange rate regimes.
Edmira, Cakrani., Pranvera, Resulaj (2012)	Albania	Trade openness and real income per capita were statistically insignificant in determining the level of the RER in Albania. Other variables were critical.
Eliphas, Ndou., Nombulelo, Gumata (2017)	Multinational	Exchange rate volatility impacts inflation volatility. Depreciation shocks have a more substantial impact on overall and permanent volatility in inflation.
Phuc, Hien, Nguyen (2023)	Vietnam	USD/VND exchange rate had a pass-through influence on the import price index (IMP), producer price index (PPI), and consumer price index (CPI).
Sulo, Haderi., Harry, Papapanagos., Peter, Sanfey., Mirela, Talka (1999)	Albania	Remittances significantly impacted the exchange rate and inflation, but the exchange rate effect of remittances faded after about four months.
Thórarinn, G., Pétursson (2009)	Multinational	There is no significant correlation between inflation targeting strategy and excessive currency volatility. Membership in a monetary union reduces excessive exchange rate volatility.
Tony, Seno, Aji., Prayudi, Setiawan, Prabowo., Clarashinta, Canggih (2021)	Indonesia	Interest rates did not affect inflation. Inflation affected interest rates. Between Interest rates and exchange rates, there is a significant relationship.

The nominal exchange rate and inflation during the last ten years

The exchange rate regime determines the influence of exchange rates on inflation. In a flexible exchange rate regime (as in Albania), any fluctuation in the exchange rate can significantly impact the price level via aggregate demand and supply. If the local currency is undervalued, the price level is directly influenced by imported goods purchased by local consumers. This occurs in the case of small

countries that take the product's price from the international market as a given, i.e., they meet most of their demand through imports. The weakening of the currency will also impact the prices of imported inputs: firms will have to pay more for them, resulting in higher production costs and prices. As a result, the overall price level in the economy will rise. On the demand side, if domestic products become more affordable than foreign ones, net exports will rise because domestic consumers will shift their demand for imported products to domestic products, and foreigners may increase demand for these products. As a result, aggregate demand will rise, increasing the general level of prices. The level of imported inflation, which enters the economy due to the consumption of imported goods, is affected by changes in the exchange rate. A lek depreciation would raise their price and increase imported inflation. The exchange rate influences inflationary expectations and real inflation by exerting pressure on determining the level of prices in the economy.

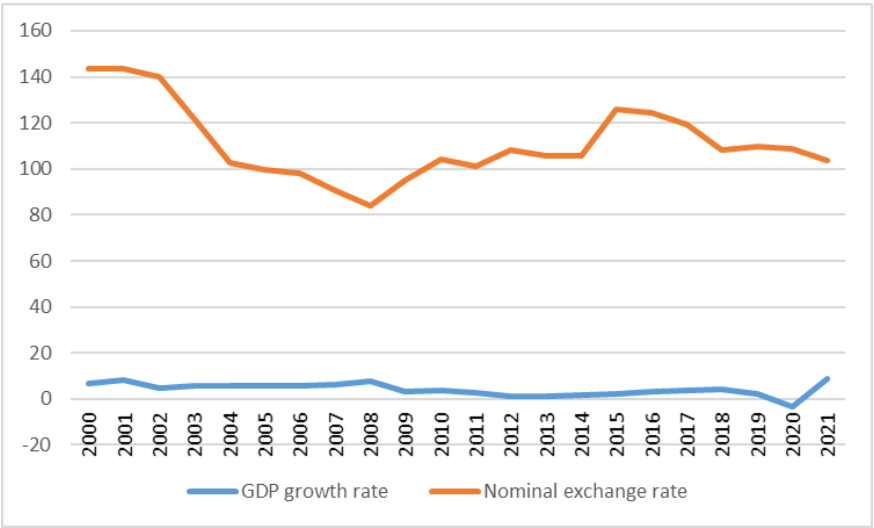
Graph 1. GDP growth rate and inflation



Source: World Bank Indicators, 2022

In general, from 2000 to 2022, the Albanian economy faced many challenges, including the global crisis of 2008 and the consequences of the pandemic in 2019. However, in general, inflation and the increase in consumer prices have been relatively controllable, while in recent years, there has been an upward trend in the general level of prices. Economic stability, the increase in production and export, and the decrease in the cost of imports have been the main factors influencing the decrease in inflation in Albania. The graph below shows the fluctuation trends of the exchange rate of the lek against the euro during the last years.

Graph 2. GDP growth rate and nominal exchange rate



Source: World Bank Indicators, 2022

The chart below shows the fluctuation trends of the lek exchange rate. During 2010, 1 EUR was exchanged for 139.33 ALL, a relatively high exchange rate compared to last year (depreciation of the lek against the European currency). This could be because Albania's economy was in the process of reviewing and reforming economic policies. During 2012-2014, the European currency appreciated even more against the lek, reaching an average exchange rate of 1 EUR= 140 ALL. Albania was experiencing a period of slow economic growth in this period, but there was also the risk of a global debt crisis. Another factor that strengthened the European currency is its membership in the EU and its adaptation to the common European market.

The period between 2015 and the following days is characterized by gradually strengthening the lek against the European currency, thus reaching an exchange rate at the lowest value: 1 EUR= 115 AL (in June 2023). During this period, the average exchange rate was approximately 1 EUR, equal to 127.8 ALL.

According to this analysis, in these 20 years, the exchange rate between the lek and the euro has changed significantly, but it has shown a general trend of decreasing rate. This can be explained by various factors, such as the country's economic policies, the global situation, economic growth, and challenges in the field of public finances.

Metodology:

This study uses regression analysis using the least squares method to examine how the nominal exchange and inflation rates relate.

In the regression analysis, the **dependent** variable is the nominal exchange rate, and the **independent** variable is the inflation rate. This study uses a sample size of 22 observations and data from 2000 to 2021.

The heteroskedasticity tests used in the study are the White-Hinkley and the Breusch-Pagan-Godfrey tests. An additional test used in the study is the Augmented Dickey-Fuller test, which determines whether a unit root exists.

Dependent Variable: NOMINAL_EXCHANGE_RATE
Method: Least Squares

Sample: 2000 2021
Included observations: 22
White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	120.9250	4.710365	25.67210	0.0000
INFLATION_RATE	-4.003665	1.378511	-2.904341	0.0088

R-squared	0.188901	Mean dependent var	111.0286
Adjusted R-squared	0.148346	S.D. dependent var	16.35575
S.E. of regression	15.09392	Akaike info criterion	8.352969
Sum squared resid	4556.528	Schwarz criterion	8.452155
Log-likelihood	-89.88266	Hannan-Quinn criteria.	8.376334
F-statistic	4.657911	Durbin-Watson stat	0.781850
Prob(F-statistic)	0.043245	Wald F-statistic	8.435198
Prob(Wald F-statistic)	0.008769		

In this table, we have the output of a linear regression analysis. The coefficients, standard errors, t-statistics, and probabilities for each variable used in the regression are also presented in the table.

The regression equation is as follows:

$$\text{NOMINAL\_EXCHANGE\_RATE} = 120.9250 - 4.003665\ \text{INFLATION\_RATE}$$

R-squared (R2) is used to evaluate how well the independent variable or variables account for variation in the dependent variable. The independent variables

explain the nominal exchange rate's fluctuation in this instance to a degree of approximately 18.9%, or roughly 0.189 R-squared. The model's R-squared value is relatively low. *With a coefficient of -4.003665 and a t-statistic of -2.904341, the inflation rate variable is also statistically significant. Accordingly, a one-unit increase in the inflation rate corresponds to a decline in the nominal exchange rate of roughly 4.00 units, all other factors being equal*. Higher inflation rates result in lower exchange rates, according to the negative sign, which denotes an inverse relationship. The significance of the regression model is assessed using the F-statistic. The low p-value (0.043) and high F-statistic (4.657911) indicate that the regression model is statistically significant overall at a threshold of 5%.

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.000567	Prob. F(1,20)	0.9812
Obs*R-squared	0.000623	Prob. Chi-Square(1)	0.9801
Scaled explained SS	0.000511	Prob. Chi-Square(1)	0.9820

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares

Sample: 2000 2021
Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	209.3273	113.5476	1.843520	0.0801
INFLATION_RATE	-0.895025	37.60117	-0.023803	0.9812

R-squared	0.000028	Mean dependent var	207.1149
Adjusted R-squared	-0.049970	S.D. dependent var	298.5745
S.E. of regression	305.9435	Akaike info criterion	14.37119
Sum squared resid	1872028.	Schwarz criterion	14.47037
Log-likelihood	-156.0830	Hannan-Quinn criteria.	14.39455
F-statistic	0.000567	Durbin-Watson stat	0.951006
Prob(F-statistic)	0.981246		

To ensure the reliability of statistical models, econometricians frequently utilize the Breusch-Pagan-Godfrey test.

Breusch-Pagan-Godfrey Test:

- The F-statistic is extremely small (0.000567) and has a high p-value of 0.9812. This suggests insufficient data to reject the null hypothesis, indicating that heteroskedasticity is not strongly supported.
- Another test statistic for the Breusch-Pagan-Godfrey test is obs*R-squared. There is also little evidence of heteroskedasticity, as indicated by its extremely low size (0.000623) and high p-value (0.9801).
- Scaled explained sum of squares: This is an enlarged version of the defined sum of squares. Like the other statistics, it has a meager value (0.000511) and a high p-value (0.9820), suggesting little evidence of heteroskedasticity.

INFLATION_RATE is -0.895, with a standard deviation of 37.60. The t-statistic (-0.0238) is very small, and the p-value (0.9812) is high, indicating that the inflation rate is not a statistically significant predictor of the squared residuals.

Null Hypothesis: D(INFLATION_RATE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-10.50564**	**0.0000**
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLATION_RATE,2)
Method: Least Squares

Sample (adjusted): 2002 2021
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLATION_RATE(-1))	-1.686062	0.160491	-10.50564	0.0000
C	0.000356	0.423079	0.000841	0.9993

R-squared	0.859779	Mean dependent var	-0.132000
Adjusted R-squared	0.851989	S.D. dependent var	4.915819
S.E. of regression	1.891226	Akaike info criterion	4.206967
Sum squared resid	64.38126	Schwarz criterion	4.306541
Log-likelihood	-40.06967	Hannan-Quinn criteria.	4.226405
F-statistic	110.3685	Durbin-Watson stat	2.454426
Prob(F-statistic)	0.000000		

The null hypothesis that D(INFLATION_RATE) has a unit root was tested with an Augmented Dickey-Fuller (ADF) test. The ADF test statistic is -10.50564, and the p-value is 0.0000, indicating strong evidence against the null hypothesis. D(INFLATION_RATE) lacks a unit root. This means that the inflation rate series is stationary and does not show a systematic trend or pattern over time.

D(INFLATION_RATE(-1)): -1.686062

This coefficient is linked to the lag in the first differenced inflation rate. It is statistically significant, with a very low p-value (0.0000), indicating that the lagged differenced inflation rate is a good predictor of the current differenced inflation rate.

C (Intercept): 0.000356

The coefficient for the constant term. It is not statistically significant (p-value is very high at 0.9993), implying that the constant term is unnecessary.

R-squared: 0.859779

This means the model explains 86% of the second differenced inflation rate variation.

F-statistic: 110.3685

This is a measure of the overall significance of the regression model. The very low p-value (0.0000) indicates that the model as a whole is statistically significant.

Null Hypothesis: D(NOMINAL_EXCHANGE_RATE_UNIT_ROOT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.213941	0.0342
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NOMINAL_EXCHANGE_RATE_UNIT_ROOT,2)
Method: Least Squares

Sample (adjusted): 2002 2021
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NOMINAL_EXCHANGE_RATE_UNIT_ROOT(-1))	-0.731677	0.227657	-3.213941	0.0048
C	-1.527629	2.081063	-0.734062	0.4724

R-squared	0.364618	Mean dependent var	-0.245000
Adjusted R-squared	0.329319	S.D. dependent var	11.15337
S.E. of regression	9.134064	Akaike info criterion	7.356538
Sum squared resid	1501.760	Schwarz criterion	7.456111
Log-likelihood	-71.56538	Hannan-Quinn criteria.	7.375976
F-statistic	10.32942	Durbin-Watson stat	1.901448
Prob(F-statistic)	0.004813		

The null hypothesis states that the variable D(NOMINAL_EXCHANGE_RATE_UNIT_ROOT) has a unit root, indicating that it is non-stationary.

Test Statistic: **Augmented Dickey-Fuller** -3.213941. This metric gauges the time series variable's trend strength. This is evidence against the presence of a unit root because it is harmful and above the critical values in this situation.

The reported p-value is 0.0342, less than the typical 0.05 significance level. At the 5% significance level, the null hypothesis—the existence of a unit root—is rejected.

Dependent Variable: D(NOMINAL_EXCHANGE_RATE_UNIT_ROOT,2). This indicates that the dependent variable in the regression is the second differenced nominal exchange rate (adjusted for unit root).

• **D(NOMINAL_EXCHANGE_RATE_UNIT_ROOT(-1))**: -0.731677

The lagged first differenced nominal exchange rate is associated with this coefficient. It is statistically significant with a very low p-value (0.0048), indicating that the lagged, differenced nominal exchange rate is a good predictor of the current differenced nominal exchange rate. According to the negative sign, this implies that the independent and dependent variables negatively impact each other.

C (Intercept): -1.527629. The constant term coefficient. It is not statistically significant (p-value is 0.4724), indicating that the constant term is unnecessary.

The **R-squared** value is 0.364618, indicating that the lagged variable accounts for approximately 36% of the variation in the dependent variable.

The **F-statistic** for the regression model is 10.32942 with a probability of 0.004813, indicating that it is statistically significant.

Results of the paper:

- This paper investigates the correlation between Albania's inflation and exchange rate over the 2010–2022 study period.
- The study examines how the exchange rate affects economic metrics like inflation using a straightforward regression model.
- The paper presents the output of a linear regression analysis, including coefficients, standard errors, t-statistics, and probabilities for each variable used in the regression .
- Exchange rate in Albania is stationary, important for modeling with inflation.
- Long-term link between exchange rate and inflation possible.
- Inflation rate is stable, not affected by trends or shocks.

- High inflation tends to revert to lower rates.
- No heteroskedasticity in the model. Model fits well, no evidence of heteroskedasticity.
- Negative correlation between exchange rate and inflation.
- Inflation significantly impacts exchange rate.
- Other factors influence exchange rate alongside inflation.

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