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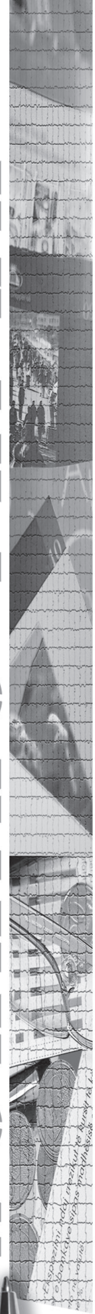

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# C O N T E N T

# *ABSTRACT*

The exchange rate has a significant influence on headline inflation. Our study aims to analyze the asymmetric effects of the exchange rate on different levels of inflation. We explore the asymmetric effects on inflation by using a Quantile Nonlinear Autoregressive Distributed Lag (Q-NARDL) model. This framework allows for the identification of asymmetric effects in both the short and long run, while accommodating nonlinear cointegration relationships between exchange rate movements and inflation across quantiles We find that the exchange rate influences headline inflation positively. The effects are not significant for currency appreciation. By contrast, depreciations tend to have a more pronounced inflationary effect, particularly at higher quantiles of inflation.

*KEYWORDS: Exchange rate; CPI inflation; asymmetric effects; quantiles; QNARDL*

*JEL CLASSIFICATION: F31, E31, C22*

## *ACRONYMS*

| | |
|---|---|
| *AIC* | *Akaike Information Criterion* |
| *CPI* | *Consumer Price Index* |
| *ERPT* | *Exchange Rate Pass-Through* |
| *IT* | *Inflation Targeting Regime* |
| *MP* | *Monetary Policy* |
| *NARDL* | *Non-linear Auto-Regressive Distributed Lag Model* |
| *QNARDL* | *Quantile Nonlinear Auto-Regressive Distributed Lag Model* |

# 1. INTRODUCTION

The exchange rate constitutes a critical transmission channel to domestic inflation through its influence on import and export prices, a mechanism commonly referred to as Exchange Rate Pass-Through (ERPT). Estimating the degree of ERPT for Albania is essential to assess how and to what extend fluctuations in the exchange rate affect domestic price dynamics. Given Albania's inflation-targeting monetary policy framework, a comprehensive understanding of the exchange rate–inflation relationship is crucial for ensuring price stability. The implementation of monetary policy, the size of the intervention and even the efficiency of its instruments under this regime is subject to  the role of exchange rate on inflation and inflation expectations (Tanku et al., 2007), particularly considering the high import content of the consumer basket (Skufi et al., 2024). Key challenges in this context include identifying the magnitude of ERPT, its persistence over time, and the potential non-linearity of the pass-through process.

Empirical literature has documented that ERPT may exhibit asymmetric behavior, implying that the impact of exchange rate appreciations on domestic prices may differ from that of depreciations, with the impact also varying depending on the prevailing inflation rate. This asymmetry can stem from various factors, including the direction and magnitude of exchange rate movements, macroeconomic conditions, public sentiment and the source of exchange rate volatility. These non-linearities are well documented in the literature. A nice review of potential non-linarites is offered by Delatte & López-Villavicencio (2012), Cheikh & Zaied (2020) and Colavecchio & Rubene (2020).

Although numerous studies have investigated the determinants of inflation in Albania (Hledik et al., 2021; Skufi & Kika, 2019; Istrefi & Semi, 2009; Tanku et al., 2007), to the best of our knowledge, the asymmetric nature of ERPT has not been explicitly addressed in the Albanian context. This paper aims to fill this gap by examining the asymmetric effects of exchange rate changes on headline inflation in Albania.

To this end, we employ the Quantile Non-linear Autoregressive Distributed Lag (QNARDL) model, which allows us to capture differential responses of inflation across its conditional distribution. The QNARDL framework, as proposed by Cho et al. (2015), enables the analysis of asymmetries both in the short and long run, while accounting for the non-linear cointegration relationships between exchange rate movements and inflation across various quantiles. Following Shin et al. (2014) we examine separately exchange rate depreciations from appreciation to investigate potential non-linearities in the direction of movement. This approach is particularly relevant in assessing whether the ERPT effect varies depending on the prevailing level of inflation, as well as the direction of exchange rate movement (depreciation vs. appreciation).

Our empirical findings indicate that exchange rate fluctuations exert a positive effect on inflation; however, the intensity and direction of this impact are not uniform across the distribution of inflation. Specifically, exchange rate depreciations tend to exert an inflationary effect, particularly at higher quantiles of inflation. Exchange rate appreciations on the other hand have little effect. These results underscore the importance of incorporating asymmetric dynamics in the assessment of ERPT, especially in the context of inflation-targeting regimes.

This study makes two key contributions to the existing literature. First, it expands the empirical literature on ERPT by providing country-specific evidence for Albania. Second, it introduces the QNARDL methodology to the analysis of ERPT, allowing for a nuanced examination of both short-run and long-run asymmetries, as well as their dependence on the level of inflation. In doing so, the study addresses an important policy question: does the degree of ERPT vary depending on whether inflation is high or low? Consequently, what should be the correct policy response in the presence of non-linearity?

Understanding these asymmetric dynamics is essential for effective monetary policy design, as it enables policymakers to better anticipate the inflationary or disinflationary consequences of exchange rate fluctuations and respond accordingly. By providing new empirical insights into the exchange rate–inflation relationship in Albania, this study contributes to the broader discourse on how central banks can manage inflation expectations and achieve price stability more effectively.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature; Section 3 describes the data and methodology; Section 4 presents the empirical findings; and Section 5 concludes.

## 2. REVIEW OF LITERATURE

The relationship between exchange rates and price indices is commonly conceptualized through the notion of ERPT. This concept has been extensively examined in both theoretical and empirical literature, focusing on the magnitude, timing, and determinants of the ERPT (Aron et al., 2014). Early literature focus is on exchange rate pass-through to import prices (Menon, 1995). Then, as the literature expand to the macroeconomic indicators, it has shown that the impact of exchange rate on inflation can be asymmetric. Katrakilidis & Trachanas (2012) state that ignoring the intrinsic non-linearities may lead to misleading inference in short and long-run. For instance, Bussière (2007), using linear models with non-linear terms, highlights that asymmetries in ERPT are present and vary in magnitude across nations. The source of asymmetry might be related to several sources such as: imports, the phase of business cycles, the level of inflation and its regime, and nature of the shock.

Import composition is an important dimension of ERPT. Using a multi-country dataset of 35 developed and developing countries, Gopinath (2015) finds that differences in ERPT are closely linked to the import share in consumption baskets. Countries with higher import content experience greater pass-through to consumer prices. Similarly, Ortega & Osbat (2020) show that a key driver of ERPT variation is, again, the import content of consumption, suggesting that openness to trade magnifies the inflationary response to exchange rate changes. Also, they highlight that the use of structural models tends to deliver a higher and more gradual ERPT to inflation.

That is to say that, substituting import for domestic goods and vice versa can impact ERPT.

Business cycles also shape ERPT. Ben Cheikh et al. (2018) show that the pass-through effect is state-dependent, with higher ERPT during economic expansions compared to recessions. Ortega & Osbat (2020) reinforce this view, emphasizing that economic conditions influence the degree and direction of pass-through, particularly in the euro area.

The level of inflation is another determining factor. Using a panel smooth transition regression model, Cheikh & Zaied (2020) find that in 10 emerging European countries, when inflation exceeds 4.5%, ERPT significantly increases, approaching full pass-through. This is consistent with earlier work by Gagnon & Ihrig (2004), Ben Cheikh (2012a), and Jasova et al. (2016), who show that both the level and variability of inflation affect the responsiveness of prices to exchange rate movements. López-Villavicencio (2017) further notes that in emerging markets, monetary policy and the prevailing inflation environment critically influence ERPT outcomes. Chroufa & Chtourou (2023) analyzing Tunisia through multiple-threshold non-linear ARDL and quantile Granger causality test find that exchange rate coefficients vary across quantiles and confirm a higher effect at high quantiles.

Inflation regime plays a central role. Empirical evidence shows that adopting an inflation targeting (IT) regime can significantly reduce ERPT. Caselli & Roitman (2016) find that in 28 emerging markets, ERPT is lower in countries with IT frameworks. Cheikh & Zaied (2020) go further, stating that the inflation regime is the most important macroeconomic determinant of pass-through intensity. In the context of Central and Eastern Europe, Hegerty (2017) shows that the Balkan countries are particularly vulnerable to exchange rate–inflation volatility linkages. Similarly, Arsić et al. (2022), focusing on former socialist countries in Europe and Central Asia, conclude that IT regimes improve macroeconomic performance, including more stable ERPT dynamics. On the other hand, Beirne & Bijsterbosch (2011) find that ERPT is higher in countries with fixed exchange rate regimes, with an average pass-through of 0.6

to consumer prices in Central and Eastern European EU member states.

Finally, the nature of the shock is one critical determinant of ERPT. Building on the theoretical foundation of Corsetti et al. (2008), several empirical studies demonstrate that ERPT is shock-dependent. Forbes et al. (2018) and Comunale & Kunovac (2017) provide compelling evidence that the response of inflation to exchange rate changes varies with the type of shock.

A considerable part of the literature focus on the sign of the exchange rate making use of non-linear technique. Employing NARDL model Delatte & López-Villavicencio (2012), Pham et al. (2023) and Kayamo (2021) find that prices react more to depreciations than appreciations. Delatte & López-Villavicencio (2012) find long-run asymmetries for advanced economies. Similar asymmetries are observed in the ASEAN-5 countries, where Pham et al. (2023) detect uneven inflationary responses to exchange rate shocks. Likewise, Kayamo (2021) finds that exchange rate depreciations and appreciations have significantly different effects on inflation both in the short and long run. Specifically, a 1% depreciation reduces inflation by 0.35%, while a 1% appreciation increases it by 1.75% in the case of Ethiopia. Additionally, using a local projection method on 28 emerging markets, Caselli & Roitman (2016) find that the pass-through effect becomes significantly larger during substantial depreciations, rising from 6% in a linear case to 18% and 25% when depreciation exceeds 10% and 20%, respectively. Similarly, Mendali & Das (2024) show that in India, depreciation has a stronger inflationary effect than appreciation. More extreme asymmetries are found by Husaini & Lean (2021) in Indonesia, Malaysia and Thailand, where depreciation leads to inflation while appreciation has little to no disinflationary effect.

Controversially, Bejaoui (2013) notes that appreciations are passed through more completely than depreciations in advanced economies. On the other side, Colavecchio & Rubene (2020) argue that the size, rather than the sign, of the exchange rate change better explains differences in pass-through across euro area countries.

With respect to Albanian economy, the ERPT in inflation is estimated to be around 0.4 by Skufi et al. (2024) and 0.5 by Hledik et al. (2021), both studies rely on semi-structural models. While Istrefi & Semi (2009) through a VAR model estimate the ERPT to be fast and almost complete. Even though they highlight that in specific periods it is incomplete and it has declined after the year 2000, mainly due to the market structure, the stability of the exchange rate, and the inflationary environment. Employing a linear model with binary variables Tanku et al. (2007) found that there is a substantial effect of ERPT on traded CPI and this effect tends to diminish during periods with low inflation. The asymmetric behavior of exchange rate on Albanian economy is analyzed also by Bahmani-Oskooee et al. (2020). Employing a NARDL model, they find an asymmetric impact of exchange rate on money demand. Although, there are few studies that estimate the impact of exchange rate on inflation in Albanian economy none of them analyze the asymmetric effect of appreciation and deprecation on CPI. Furthermore, we distinguish across different quantiles of inflation.

## *3. DATA AND MODEL*

The data that we use in our analysis consists of monthly frequency spanning from 2002 to 2024. The published data are sourced from the Albanian National Institute of Statistics (INSTAT, 2025) and from the Bank of Albania (BoA, 2025). Although most of the data are originally available at this frequency, GDP data are published only at a quarterly frequency. Thus, we use the Denton method (Chollette, 1984) to convert the quarterly frequency into a monthly frequency.

Referring to the literature, we determine inflation depending on monetary policy rate, foreign inflation, exchange rate, oil prices, economic activity, and money supply. Inflation is based in consumer price index (CPI_AL), which represent also the indicator targeted by the Bank of Albania. With the REPO rate being its main instrument. Foreign pressures are approximated with the harmonized consumer price index in euro area (HCPI_EA) and Brent oil price (P_OIL). The exchange rate is the Lek per Euro unit (LEK_EUR). The economic activity is approximated with the real GDP. Last, inflation is determined by the money supply approximated with the M2. Table 1 provides a summary statistics for inflation and its selected determinants.

*Table 1*
*Descriptive statistics of variables in OLS and QNARDL models.*

| | Mean | Median | Max. | Min. | Std. Dev. | ADF | PP |
|---|---|---|---|---|---|---|---|
| CPI_A[L1] | 89.7 | 90.2 | 118.6 | 66.5 | 13.8 | 2.2*** | 1.9*** |
| GDP2 | 122975.8 | 122941.9 | 182186.1 | 61677.5 | 26218.4 | -0.5*** | -1.4*** |
| HCPI_EA[1] | 94.3 | 94.7 | 121.1 | 76.4 | 11.2 | 0.9*** | 1.7*** |
| P_OIL[1] | 86.4 | 83.0 | 152.6 | 21.6 | 31.2 | -3.0* | -2.7** |
| REPO[3] | 3.6 | 3.3 | 8.5 | 0.5 | 2.1 | -3.0* | -2.4*** |
| LEK_EUR[1] | 128.4 | 126.8 | 142.2 | 98.3 | 10.6 | 0.9*** | 1.0*** |
| M2[2] | 657596.6 | 692706.9 | 1052575.0 | 321621.8 | 183259.9 | 0.7*** | 0.7*** |

*Note: Variables expressed in 1, 2, 3 are in indexes, million Lek and percent respectively. We use the ADF and PP tests with a constant on all the variables; ***, **, * represent statistical significance at 1 %, 5 % and 10 %. All variables exhibit unit root. Therefore, we use the level form of variables. For variables measured in 1 and 2 we use the natural logarithm in the regression models.*
*Source: Authors' calculations.*

This study employs the QNARDL approach to explore the relationship between exchange rate and inflation across quantiles. This method is based on the concept of quantile co-integration proposed by Koenker & Xiao (2006) and developed by Shin et al. (2014) and Cho et al. (2015). We choose this method because of its advantages. The main advantage of the QNARDL approach vis-à-vis earlier approaches is that it provides more efficient short-run and long-run coefficient estimates and allows through the distributed lag and the long-run dynamics a single common cointegrating vector across different quantiles of inflation. Also, QNARDL allows us to test for the possibility that the time series are cointegrated, but the relationship is not linear along inflation distribution (Cho et al., 2015), as well as direction of change in exchange rate (Shin et al., 2014). This technique allows relationships to exhibit only long-run asymmetry, only short-run asymmetry or combined short-and long-run asymmetries across quantiles.

Our aim is to test non-linearities, therefore we start by examining whether the effects of positive exchange rate shocks on inflation differs from the negative ones. Where a positive change represents a depreciation of the domestic currency, whereas a negative change corresponds to an appreciation. This classification of exchange rate shocks is consistent with the approach adopted by Bahmani-Oskooee et al. (2020). However, we deviate from their choice of exchange rate variable by employing the Lek per Euro exchange rate rather than the Lek per US Dollar, to better capture the dominant role of Euro in the Albanian economy. In line with their approach, we utilize partial sum decomposition to separate exchange rate variations into positive (LEK_EUR+) and negative (LEK_EUR-) components, as specified in Eq.1.

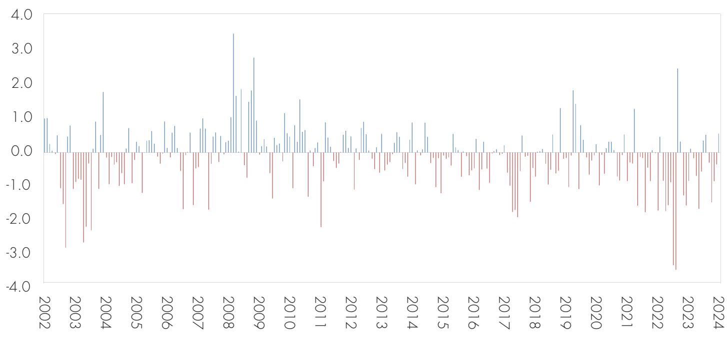
$$LEK\_EUR_t = LEK\_EUR_t^0 + LEK\_EUR_t^+ + LEK\_EUR_t^-$$

$$where \begin{cases} LEK\_EUR_t^+ = \sum_{j=1}^{t} \Delta LEK\_EUR_j^+ = \sum_{j=1}^{t} max(\Delta LEK\_EUR_j, 0) \\ LEK\_EUR_t^- = \sum_{j=1}^{t} \Delta LEK\_EUR_j^- = \sum_{j=1}^{t} min(\Delta LEK\_EUR_j, 0) \end{cases}$$

(Eq. 1)

Figure 1 presents the appreciations in red color and depreciations in blue color of the exchange rate, measured as the first differences of the exchange rate partial sum series over the period 2002 to 2024.

Figure 1
*Exchange rate appreciation and depreciation.*




Note: Values represent the first difference of LEK_EUR+ and LEK_EUR-. Positive values denote depreciation and negative values appreciation.
Source: Authors' calculations.

To model these dynamics, we employ the NARDL framework as proposed by Shin et al. (2014), expressed in its error correction form as follows:

$$\Delta CPI\_AL_t = \rho(CPI\_AL_{t-1} - \beta^+ LEK\_EUR^+_{t-1} - \beta^- LEK\_EUR^-_{t-1} - \phi_1 GDP_{t-1} - \phi_2 HCPI\_EA_{t-1} - \phi_3 REPO_{t-1} - \phi_4 M2_{t-1}) + \sum_{i=1}^{p-1} \gamma_i \, \Delta CPI\_AL_{t-i} + \sum_{j=0}^{q-1}(\delta_j^+ \Delta LEK\_EUR^+_{t-j} + \delta_j^- \Delta LEK\_EUR^-_{t-j}) + \alpha + \sum_{l=0}^{s-1}(\theta_{1l}\Delta GDP_{t-l} + \theta_{2l}\Delta HCPI\_EA_{t-l} + \theta_{3l}\Delta REPO_{t-l} + \theta_{4l}\Delta M2_{t-l}) + \sum_{m=0}^{r-1} \psi_m \, \Delta P\_OIL_{t-m} + \varepsilon_t \quad \text{(Eq. 2)}$$

where, $\Delta$ represents the first difference operator, $\rho$ is adjustment speed parameter, $\beta^+$ and $\beta^-$ are long-run asymmetric coefficients for exchange rate, $\phi 1$, $\phi 2$, $\phi 3$, $\phi 4$ are long-run symmetric coefficients for the rest of independent variables, $\delta j^+$ and $\delta j^-$ are short-run asymmetric coefficients for exchange rate, $\theta_{kl}$ is short-run coefficients for symmetric variables, $\psi m$ is short-run coefficients for oil prices, lag lengths $p, q, s, r$ can differ by variable, $\varepsilon$ is the error term.

Next, we allow for the relationship between variables to vary across different quantiles. According to Cho, et al. (2015), the QARDL approach by generalizing the NARDL process to a quantile regression context can be specified in the following form:

$$Q_{\Delta CPI\_AL_t}(\tau|\cdot) = \rho(\tau)(CPI\_AL_{t-1} - \beta^+(\tau) LEK\_EUR^+_{t-1} - \beta^-(\tau) LEK\_EUR^-_{t-1} - \phi_1(\tau) GDP_{t-1} - \phi_2(\tau) HCPI\_EA_{t-1} - \phi_3(\tau) REPO_{t-1} - \phi_4(\tau) M2_{t-1}) + \alpha(\tau) + \sum_{i=1}^{p-1} \gamma_i(\tau) \Delta CPI\_AL_{t-i} + \sum_{j=0}^{q-1}(\delta_j^+(\tau) \Delta LEK\_EUR^+_{t-j} + \delta_j^-(\tau) \Delta LEK\_EUR^-_{t-j}) + \sum_{l=0}^{s-1}(\theta_{1l}(\tau)\Delta GDP_{t-l} + \theta_{2l}(\tau)\Delta HCPI\_EA_{t-l} + \theta_{3l}(\tau)\Delta REPO_{t-l} + \theta_{4l}(\tau)\Delta M2_{t-l}) + \sum_{m=0}^{r-1} \psi_m(\tau) \Delta P\_OIL_{t-m} + \varepsilon_t$$

(Eq. 3)

where, $Q_{\Delta CPI_{AL\_t}}(\tau|\cdot)$, denotes the $\tau$-th conditional quantile of inflation given the independed variables, all parameters depend on the quantile $\tau$. The parameters reflect the heterogeneous impact of explanatory variables across the distribution of inflation, i.e. between low inflation episodes (lower quantiles) and high inflation episodes (upper quantiles).

## 4. RESULTS AND DISCUSSIONS

Before applying the QARDL model, we estimate the NARDL model (Eq. 2) to obtain the baseline results for comparison. The Akaike Information Criterion (AIC) determines the optimal lag length as (1, 2, 0, 1, 0, 2) for CPI_AL, GDP, HCPI_EA, REPO, M2, and LEK_EUR, respectively. Panel A of Table 2 presents the NARDL (1, 2, 0, 1, 0, 2) results. As shown in the table, the speed of adjustment to the long-run equilibrium ($\rho$) is negative and statistically significant at the 1% level, asserting the presence of the asymmetry in the cointegrating relationship (Shin et al., 2011). The magnitude of -0.38 suggests that approximately 38% of the deviation from long-run inflation equilibrium is corrected within one month, indicating a relatively fast adjustment process.

The estimated long-run coefficients of GDP, HCPI_EA, REPO, and M2—denoted as $\phi 1$, $\phi 2$, $\phi 3$, and $\phi 4$, respectively reveal further insights. The long-run effects of GDP (0.15) and HCPI_EA (0.28) on CPI_AL are both positive and highly significant, implying that domestic economic activity and euro area inflation have inflationary effects in Albania over the long term.

In contrast, the REPO rate exerts a negative and significant effect (-0.17), suggesting that tighter monetary policy effectively reduces inflation. Although the coefficient of M2 is negative (-0.08), it remains statistically insignificant, indicating that variations in broad money supply do not significantly influence inflation in the long run, at least within the estimated period. This result might be driven by the fact that Albania operate under an inflation targeting regime.

Table 2
Results of NARDL and QNARDL estimation

| Panel A: Results of NARDL estimation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $\rho$ | $\phi1$ | $\phi2$ | $\phi3$ | $\phi4$ | $\beta+$ | $\beta-$ | $\alpha$ |
| | -0.38*** | 0.15*** | 0.28*** | -0.17*** | -0.08 | 0.08*** | 0.05*** | -0.56*** |
| | (-9.89) | (6.77) | (8.78) | (-5.08) | (-7.52) | (5.22) | (4.21) | (-9.87) |
| **Panel B: Results of QNARDL estimation** | | | | | | | | |
| Quantile index ($\tau$) | $\rho(\tau)$ | $\phi1(\tau)$ | $\phi2(\tau)$ | $\phi3(\tau)$ | $\phi4(\tau)$ | $\beta+(\tau)$ | $\beta-(\tau)$ | $\alpha(\tau)$ |
| 0.1 | -0.31*** | 0.05*** | 0.24*** | -0.19*** | 0.00 | 0.04*** | 0.01 | -0.33*** |
| | (-5.96) | (4.60) | (4.34) | (-3.74) | (0.00) | (2.69) | (0.34) | (-5.98) |
| 0.2 | -0.22*** | 0.03*** | 0.16*** | -0.11*** | 0.01 | 0.05*** | 0.00 | -0.09 |
| | (-5.30) | (3.47) | (4.32) | (-3.12) | (1.00) | (2.72) | (0.02) | (-0.14) |
| 0.5 | -0.16*** | 0.00* | 0.10*** | -0.08*** | 0.00 | 0.05*** | -0.01 | 0.19* |
| | (-4.66) | (1.99) | (4.24) | (-3.23) | (0.81) | (4.61) | (-0.38) | (2.26) |
| 0.8 | -0.25*** | 0.01* | 0.21*** | -0.18*** | 0.01** | 0.06*** | 0.01 | 0.01 |
| | (-5.66) | (1.83) | (4.60) | (-4.05) | (2.35) | (3.87) | (0.34) | (0.07) |
| 0.9 | -0.49*** | 0.03** | 0.33*** | -0.24*** | 0.02** | 0.13*** | -0.02 | 0.31 |
| | (-7.70) | (2.08) | (4.44) | (-2.96) | (2.41) | (4.27) | (-0.61) | (1.00) |

Note: ***, **, * represent statistical significance at 1 %, 5 % and 10 %. T-statistics are in parentheses.
Source: Authors' calculations.

In terms of exchange rate asymmetry, the estimated long-run coefficients for positive and negative changes in the LEK_EUR exchange rate $\beta^{+}$ and $\beta^{-}$ are 0.08 and 0.05, respectively, both statistically significant. This highlights an asymmetric pass-through effect: a depreciation of the Lek (i.e., an increase in LEK_EUR) has a stronger inflationary impact than the disinflationary effect of an appreciation. Such asymmetry is consistent with the idea that currency depreciations feed through to consumer prices more forcefully than appreciations, in line with the findings of Delatte & López-Villavicencio (2012), Caselli & Roitman (2016), Pham et al. (2023) and Kayamo (2021).

To explore whether these dynamics differ across the inflation distribution, we estimate the QNARDL model (Eq. (3)), allowing parameter estimates to vary across different conditional quantiles of CPI_AL. The optimal lag length criteria according AIC is reported in Table 3.

*Table 3*
*Optimal lag length for QNARDL*

| Quantile index ($\tau$) | CPI_AL | GDP | HCPI_EA | REPO | M2 | LEK_EUR | P_OIL |
|---|---|---|---|---|---|---|---|
| 0.1 | 1 | 6 | 0 | 0 | 3 | 2 | 1 |
| 0.2 | 1 | 5 | 0 | 0 | 2 | 0 | 1 |
| 0.5 | 1 | 1 | 0 | 0 | 3 | 0 | 0 |
| 0.8 | 2 | 2 | 0 | 0 | 2 | 0 | 1 |
| 0.9 | 2 | 5 | 0 | 3 | 2 | 0 | 2 |

*Note: The AIC determines the optimal lag length.*
*Source: Authors' calculations.*

Table 4 presents the results of Bounds Test. For all the quantiles estimations F-statistic is higher compared to the critical values at all significance levels. Thus, we reject the null hypothesis of no levels relationship and conclude that CPI_AL, GDP, HCPI_EA, REPO, M2, and LEK_EUR are cointegrated.

*Table 4*
*Wild test*

| Quantile index (τ) | 0.1 | 0.2 | 0.5 | 0.8 | 0.9 |
|---|---|---|---|---|---|
| F-statistic | 4.46*** | 6.58*** | 4.91*** | 6.71*** | 6.33*** |
| | (-4.26) | (-5.57) | (-5.53) | (-5.82) | (-7.70) |
| | | | | | |
| Critical Values | | CV at 10% | CV at 5% | CV at 1% | |
| Stationary bound | | 2.03 | 2.32 | 2.96 | |
| | | (-2.57) | (-2.86) | (-3.43) | |
| Non-stationary bound | | 3.13 | 3.50 | 4.26 | |
| | | (-4.23) | (-4.57) | (-5.19) | |

*Source: Authors' calculations.*

Panel B of Table 2 reports the QNARDL results for five quantiles: $\tau$ = 0.1, 0.2, 0.5, 0.8, and 0.9. The adjustment coefficient $\rho(\tau)$ remains negative and statistically significant across all quantiles but varies in magnitude. Interestingly, the speed of adjustment is stronger at the tails, particularly at $\tau$ = 0.9 (-0.49) and $\tau$ = 0.1 (-0.31), suggesting that inflation returns to equilibrium more quickly during periods of high or low inflation than during moderate inflation (e.g., $\tau$ = 0.5, where $\rho$ = -0.16). These findings may deserve further consideration of policy interventions or mechanisms to boost market expectations during high inflationary episodes.

Regarding the long-run determinants, the effect of GDP and HCPI_EA persists across quantiles, though the influence of GDP becomes more pronounced at higher inflation levels. The HCPI_EA variable is consistently positive and significant, underscoring the persistent imported inflation pressures from the euro area, embracing the findings of Gopinath (2015) and Ortega & Osbat (2020). The REPO rate continues to exhibit a negative and significant effect, particularly at the upper quantiles, supporting its effectiveness as a monetary policy instrument during inflationary pressures.

As for exchange rate asymmetry, the coefficients $\beta^{+}(\tau)$ and $\beta^{-}(\tau)$ reveal a clear non-linear pattern. At lower quantiles (e.g., $\tau = 0.1$), the inflationary effect of depreciation is mild ($\beta^{+} = 0.04$), and appreciation has virtually no effect ($\beta^{-} = 0.01$). However, at higher quantiles, particularly at $\tau = 0.9$, the depreciation coefficient increases significantly to 0.13, while the appreciation effect remains negligible or even negative ($\beta^{-} = -0.02$). Our findings resemble with the results of Husaini & Lean (2021) of little to no effect of currency appreciation to inflation. This indicates that exchange rate pass-through becomes more asymmetric and stronger when inflation is already high, which is a critical insight for policy design in inflationary environments.

However, even in the upper quantiles ERPT is lower than the findings of Skufi et al. (2024) and Hledik et al. (2021), in line with the finding of Ortega & Osbat (2020) who suggest that structural models deliver a higher ERPT to inflation.

Overall, the QNARDL results provide strong evidence that the magnitude and nature of inflation drivers in Albania vary across the inflation distribution, which is consistent with the findings of Cheikh & Zaied (2020) and Chroufa & Chtourou (2023). Specifically, exchange rate shocks and external inflation pressures have more pronounced effects at the upper end, while domestic monetary policy remains consistently effective, as revealed by Arsić et al. (2022). These findings highlight the importance of adopting non-linear and state-dependent policy approaches to manage inflation risks effectively.

## 5. CONCLUSION

This study analyzes the ERPT in Albania using an asymmetric cointegrating model, with positive and negative partial sum decomposition of the nominal exchange rates across the inflation distribution. Utilizing the QNARDL model, we have demonstrated that exchange rate fluctuations have a significant impact on inflation, with notable asymmetries between depreciations and appreciations.

Our findings reveal that depreciations tend to have a more pronounced inflationary effect, particularly at higher quantiles of inflation, whereas appreciations exhibit a weaker or negligible disinflationary impact. This asymmetry underscores the importance of considering the direction and magnitude of exchange rate movements as well as the level of prevailing inflation in the formulation of monetary policy. From a policy-making perspective, this suggests that when exchange rate shocks occur during periods of high inflation i.e., in the upper tail of the distribution, faster and more forceful policy responses may be warranted to contain inflationary pressures and maintain macroeconomic stability. Recognizing and responding to these non-linearities could enhance the effectiveness of monetary policy in small open economies like Albania.

We contribute to the broader literature by providing country-specific evidence for Albania and introducing the QNARDL methodology to the analysis of ERPT.

Future research could explore the specific channels through which these asymmetries manifest in different economic contexts, enhancing our understanding of the interplay between exchange rates and inflation.

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