

The Asymmetric Effects of Exchange Rate on Inflation: A Quantile NARDL Approach

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BCC 13th Annual Conference

18-19 September 2025, Geneva, Switzerland

Why Study Exchange Rate Pass-Through (ERPT)?



Inflation Targeting:

Exchange rate changes influence domestic inflation, particularly considering the high import content of CPI (Skufi, et al., 2024)



Literature on Albania

Traditional models & assume symmetry and homogeneity in ERPT (Hledik, et al., 2021; Skufi et al., 2019, Tanku, et al., 2007)



Research Question

Does the degree of ERPT vary depending on whether inflation is high or low?

What should be the correct policy response in the presence of non-linearity?

Approach and Contribution:

Approach

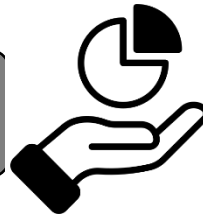
Quantile Nonlinear Autoregressive Distributed Lags

Shin et al. (2014) & Cho et al. (2015)

Vis-à-vis earlier approaches QNARDL allows us to test for the possibility that the time series are cointegrated...

...but the relationship is not linear along direction of change in exchange rate

...and the relationship is not linear along inflation levels



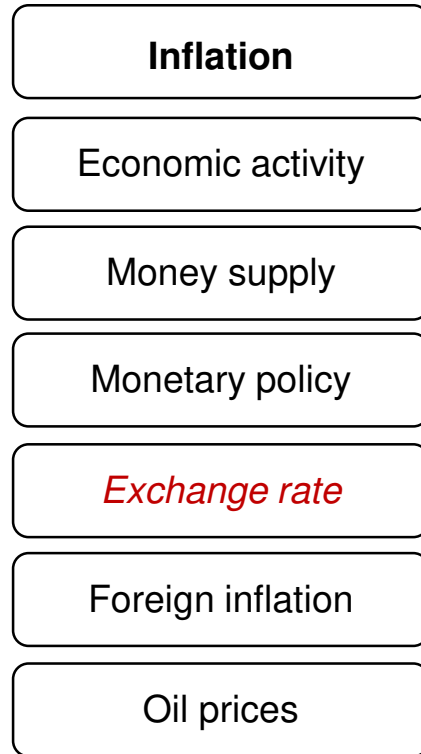
Contribution

Introduces a novel methodology to the analysis of ERPT

Expands the empirical literature on ERPT by providing country-specific evidence

Quantifies the asymmetry (depreciation vs. appreciation) and heterogeneity (across inflation quantiles)

Model Variables:



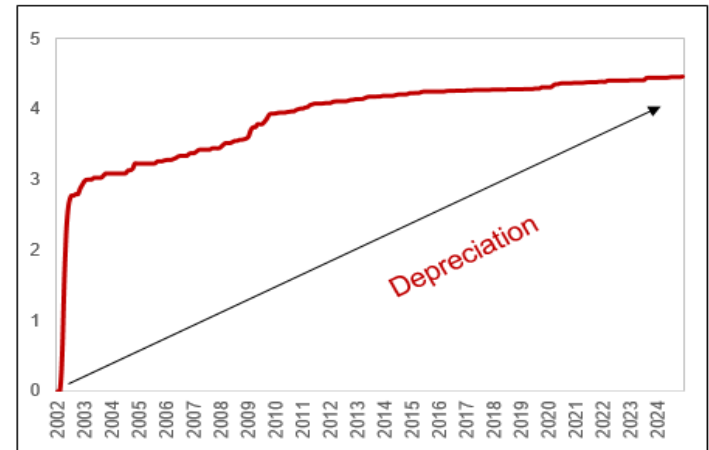
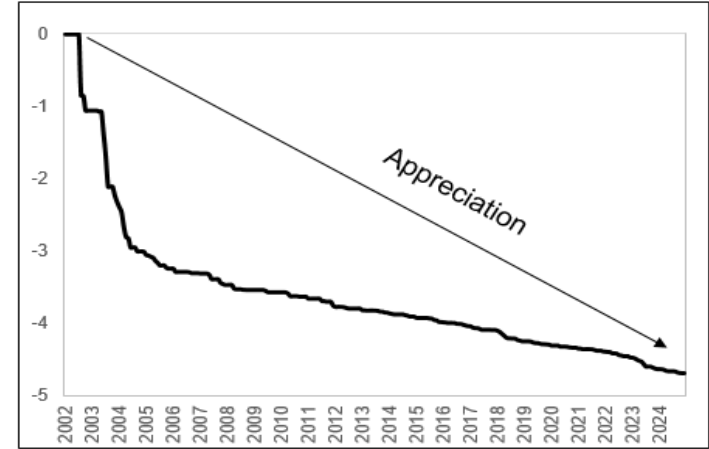
QNARDL

Exchange rate partial sum decomposition

$$LEK_EUR_t = LEK_EUR_t^0 + LEK_EUR_t^+ + LEK_EUR_t^-$$

$$LEK_EUR_t^+ = \sum_{j=1}^t \Delta LEK_EUR_j^+ = \sum_{j=1}^t \max(\Delta LEK_EUR_j, 0)$$

$$LEK_EUR_t^- = \sum_{j=1}^t \Delta LEK_EUR_j^- = \sum_{j=1}^t \min(\Delta LEK_EUR_j, 0)$$



Source: Authors' calculations.

Note: The partial sum is calculated on LEK_EUR natural logarithm values.

QNARDL Model:

Empirical representation

$$Q_{\Delta CPI_AL_t}(\tau|\cdot) = \rho(\tau)(CPI_AL_{t-1} - \beta^+(\tau)LEK_EUR_{t-1}^+ - \beta^-(\tau)LEK_EUR_{t-1}^- - \phi_1(\tau)GDP_{t-1} - \phi_2(\tau)HCPI_EA_{t-1} - \phi_3(\tau)REPO_{t-1} - \phi_4(\tau)M2_{t-1} + \alpha(\tau) + \sum_{i=1}^{p-1} \gamma_i(\tau)\Delta CPI_AL_{t-i} + \sum_{j=0}^{q-1} (\delta_j^+(\tau)\Delta LEK_EUR_{t-j}^+ + \delta_j^-(\tau)\Delta LEK_EUR_{t-j}^-) + \sum_{l=0}^{s-1} (\theta_{1l}(\tau)\Delta GDP_{t-l} + \theta_{2l}(\tau)\Delta HCPI_EA_{t-l} + \theta_{3l}(\tau)\Delta REPO_{t-l} + \theta_{4l}(\tau)\Delta M2_{t-l}) + \sum_{m=0}^{r-1} \psi_m(\tau)\Delta P_OIL_{t-m} + \varepsilon_t$$

where:

CPI_AL – inflation, LEK_EUR – exchange rate, GDP – economic activity, $HCPI_EA$ – foreign inflation, $REPO$ – monetary policy, $M2$ – money supply, P_OIL – oil price, τ – conditional quantile, ε – error term, t – time index, p, q, s, r – lags, the rest are parameters

Optimal lag length

Quantile index (τ)	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.

Main findings:

Long-Run Asymmetry across Quantiles:

High inflation amplifies ERPT

Adjustment is faster at the tails:

Inflation stabilizes quicker in extreme conditions
May call for more responsive policy under extreme inflation

Depreciation Effects (β^+):

Strong and statistically significant
Increase with higher inflation quantiles

	β^+ (depreciation)	β^- (appreciation)
$\tau = 0.1$		
$\tau = 0.2$		
$\tau = 0.5$		
$\tau = 0.8$		
$\tau = 0.9$		

Appreciation Effects (β^-):

Mostly insignificant
Confirm asymmetric pass-through

Policy Takeaways:



IMPORTANT

ERPT is state-dependent: stronger during high inflation episodes

Depreciation shocks require closer policy attention

Conventional symmetric models may underestimate exchange rate risks

It is recommended to integrate asymmetry into monetary policy frameworks



Future work:

Specific channels through which asymmetries manifest

Sectoral inflation breakdown

Role of expectations and imported inflation

Thank you for attention!

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