Exchange Rate Changes and Money Demand in Albania: A Nonlinear ARDL Analysis

Bahmani Oskooee, *Miteza, Tanku*

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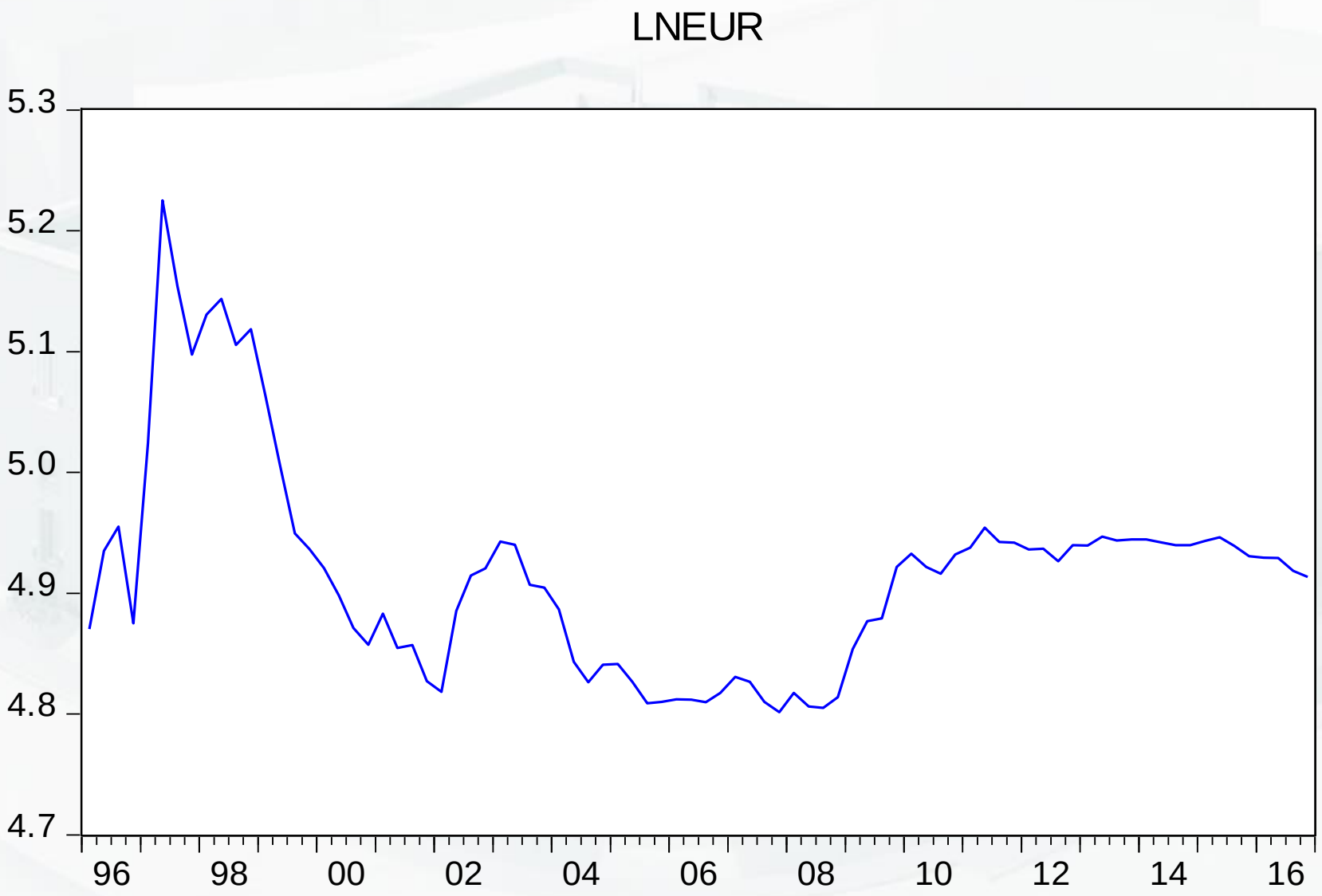
Preliminary draft, please do not quote.

Outline

- Motivation & Contribution
- Money Demand & Methodology
- Data and Results
  - *focus on exchange rate*
- 5. Conclusions

Motivation (Albanian Economy)

- BoA follows an Inflation targeting framework with two pillars
  - *Inflation forecast*
  - *Money growth*
- Exchange rate is a very important indicator in money and economic behavior
- Dollarization/Euroization is an important issue
  - *In both assets and liabilities*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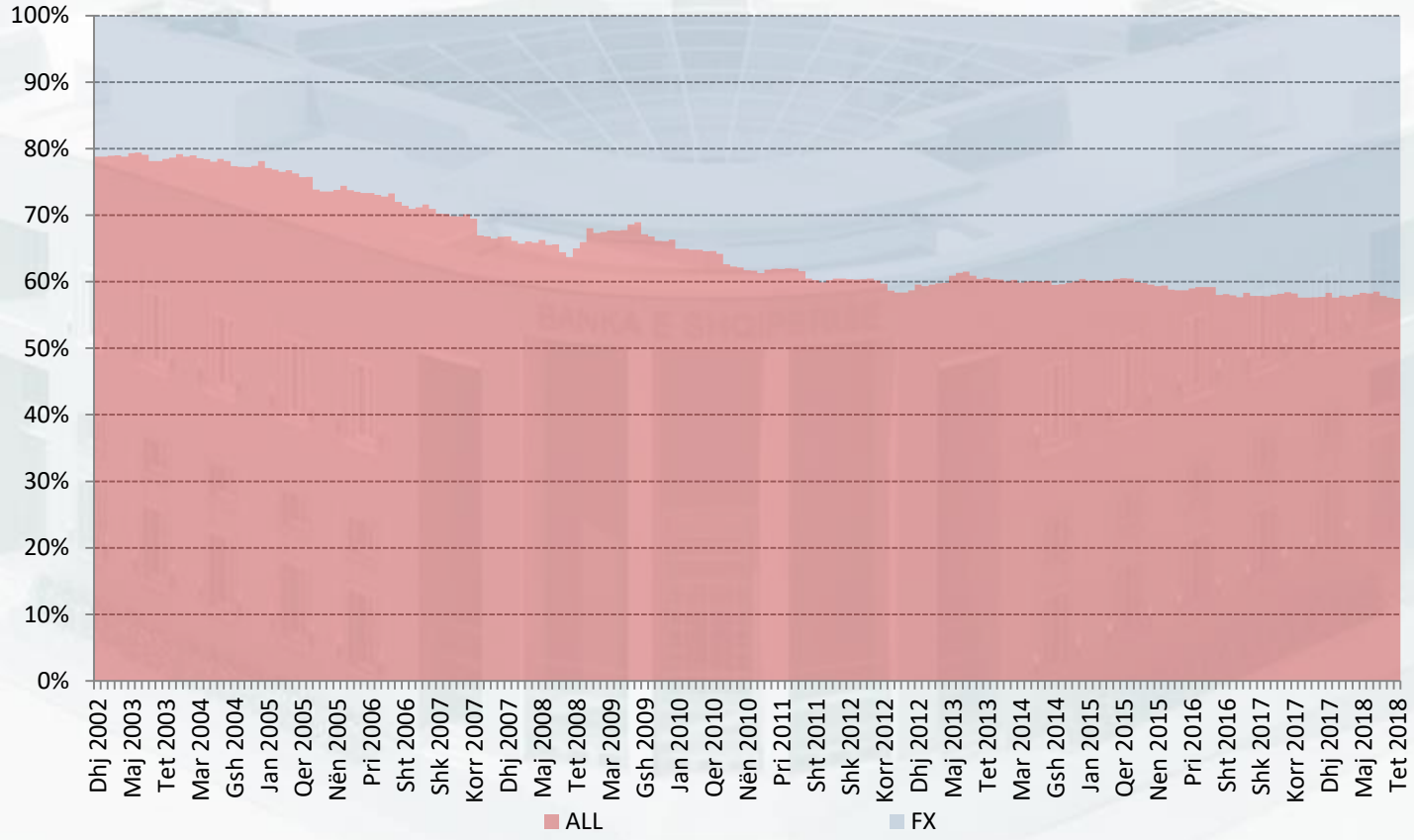
Euroization

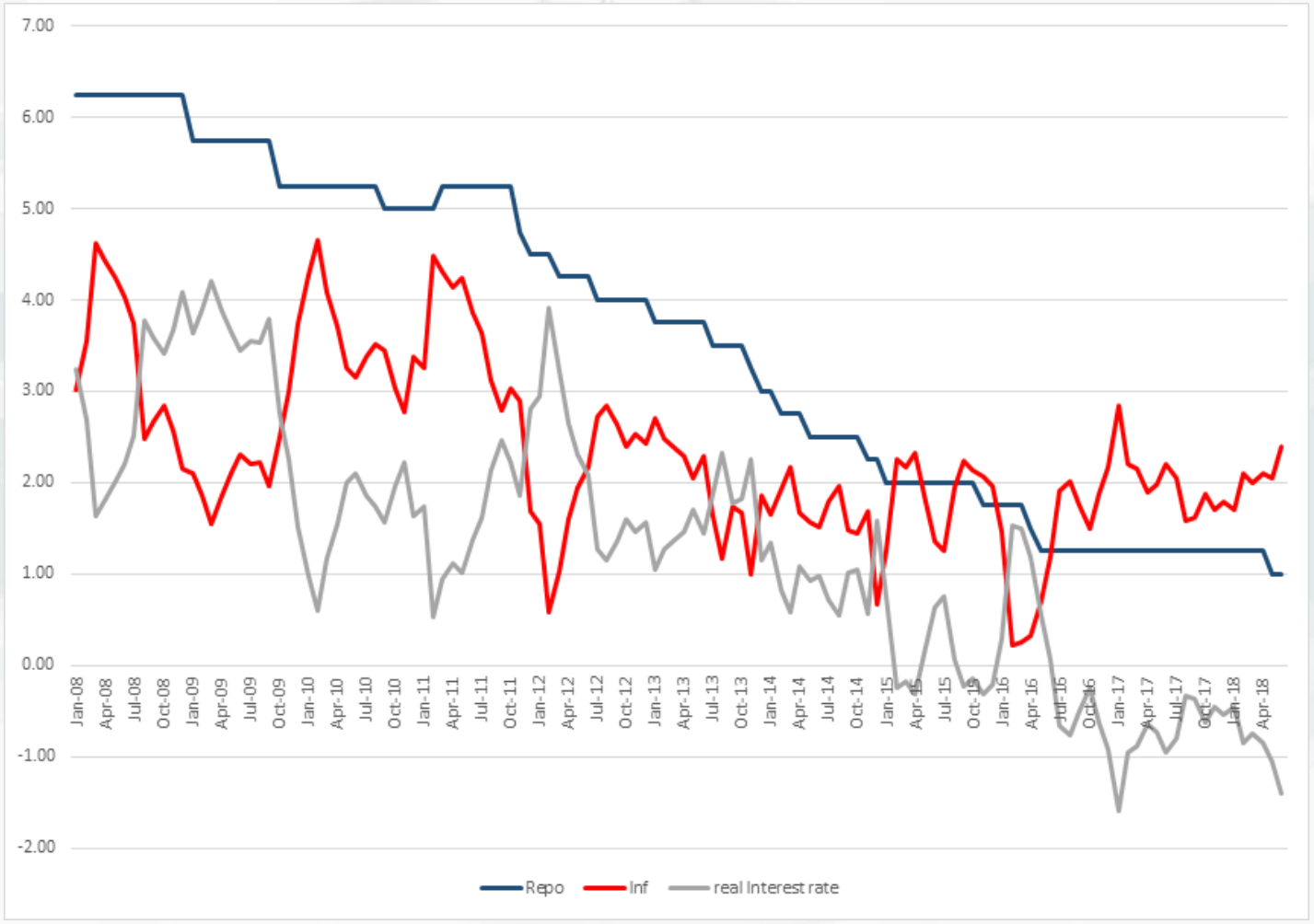


Motivation (Money Demand)

- Effective monetary policy requires a stable money demand for money supply changes to have a predictable effect on central bank targeted variables.

- Money demand for domestic currency remains low despite a prolonged and significant expansionary monetary

Interest Rates and Inflation



Objective of the study

- We test the short-and long-run effects of currency fluctuations on money demand in a small open dollarized/euroized economy Albania
  - *Specifically, we test the presence of asymmetric effects of exchange rate fluctuations on money demand*
  - *Use ARDL model*

Money Demand in Literature

- Studies
  - Mundell (1963) …
  - Shijaku 2016
  - Collaku 2015
- Methodology: cointegration approach
  - *Pesaran Shin and Smith (2001)*
    - ***ARDL***
  - *Shin, Yu and Greenwood-Nimmo (2014)*
    - ***NARDL(asymetric effects)***
  - *Bahmani and Bahmani (2015)*
    - ***NARDL in money demand***

Our Model

- Bahmani-Oskooee and Bahmani (2015)

$$LnM_t = a + bLnY_t + c\pi_t + dLnEX_t + \varepsilon_t$$

$$\begin{aligned}&\mathrm{Ln}\Delta \mathrm{M_t} \\ &= \alpha + \sum_{i=1}^{n1} \beta_i \Delta \mathrm{LnM_{t-i}} + \sum_{i=0}^{n2} \delta_i \Delta \mathrm{LnY_{t-i}} + \sum_{i=0}^{n3} \gamma_i \pi_{t-i} \\ &+ \sum_{i=0}^{n4} \eta_i \Delta \mathrm{LnEX_{t-i}} + \rho_0 \mathrm{Ln\,M_{t-1}} + \rho_1 \mathrm{LnY_{t-1}} + \rho_2 \pi_{t-1} + \rho_3 \mathrm{LnEX_{t-1}} + \xi_t\end{aligned}$$

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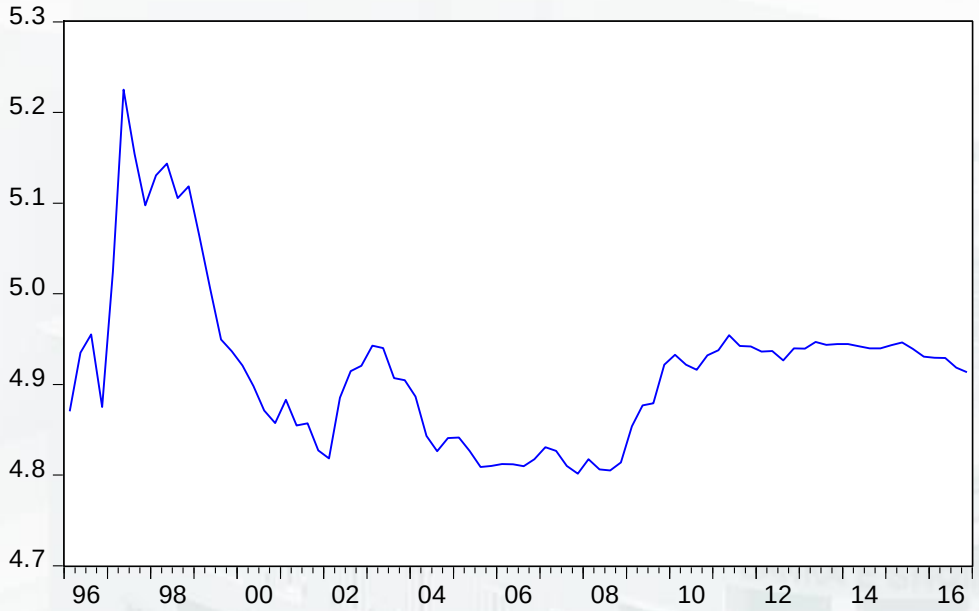

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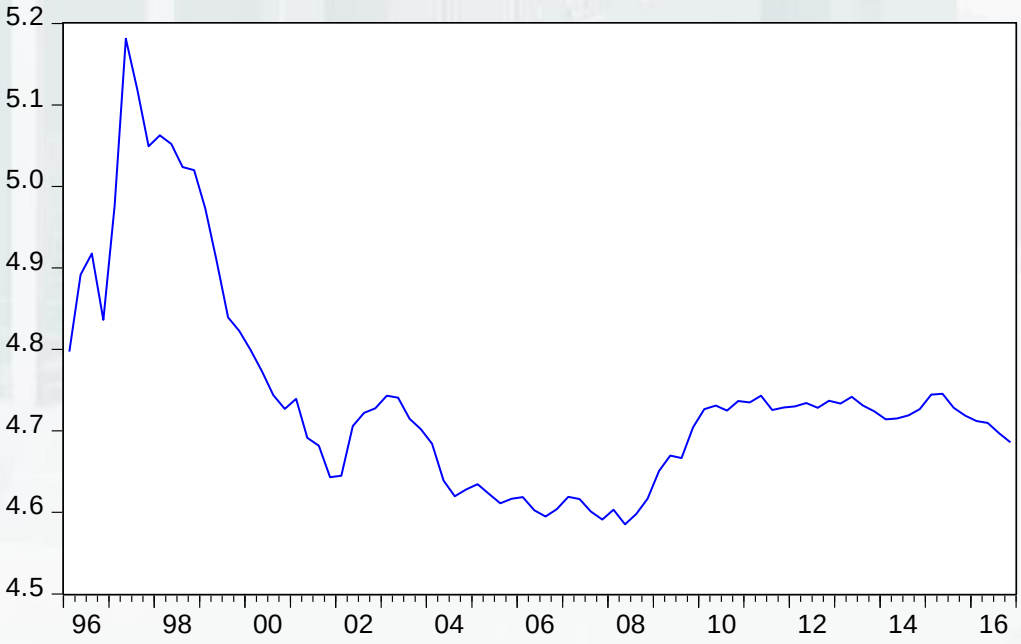


What Is New (for Albania)

- Redefine the exchange rate variable

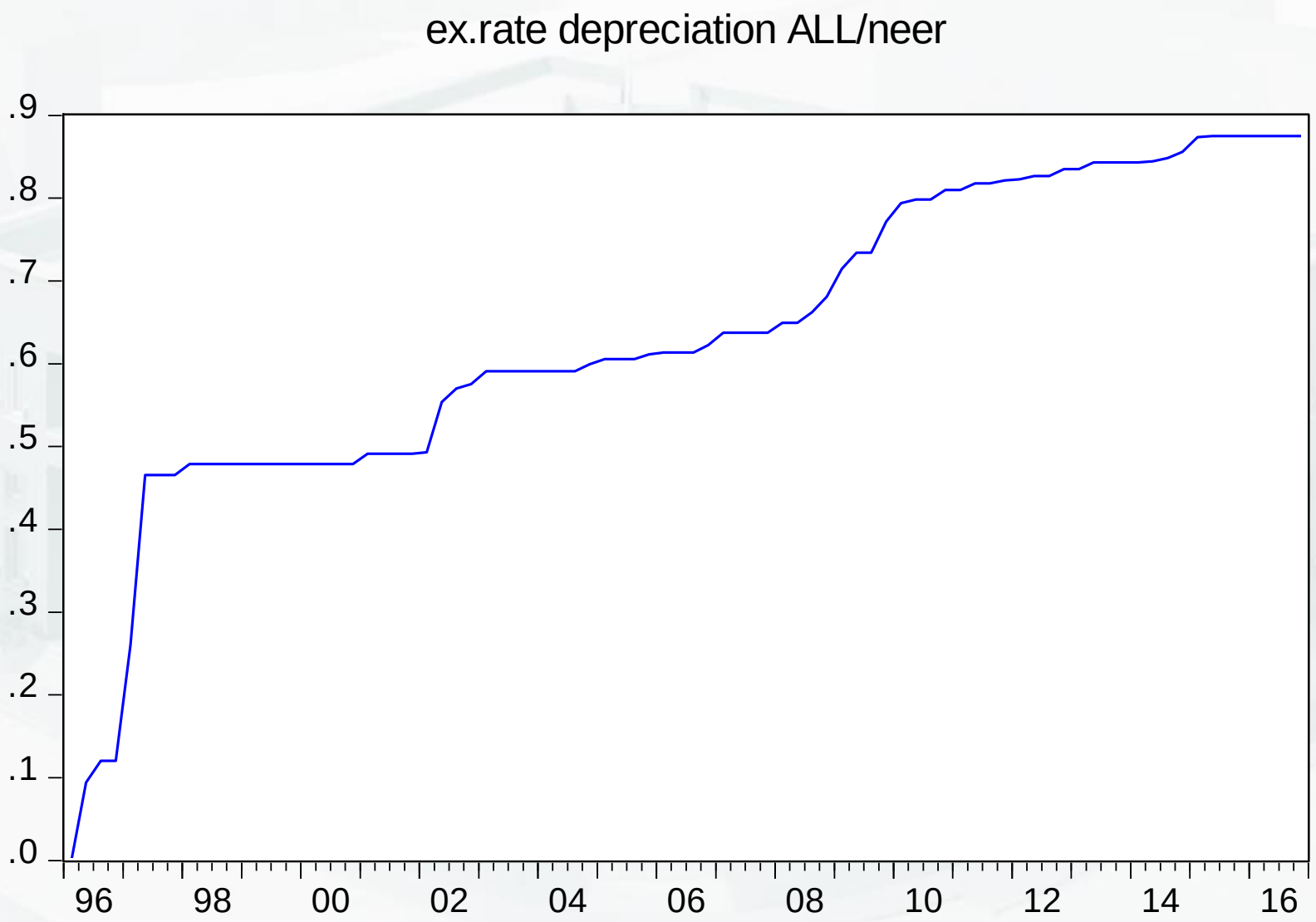
$$LnEX = LnEX_0 + LnEX_t^+ + LnEX_t^-$$

$where\ \ LnEX_t^+ \ \&\ LnEX_t^-$ are the partial sum processes of positive and negative changes in $LnEX_t$

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

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

$$Ln\Delta M_t = a + \sum_{i=1}^{n1} b_i \Delta LnM_{t-i} + \sum_{i=0}^{n2} c_i \Delta LnY_{t-i} + \sum_{i=0}^{n3} d_i \pi_{t-i} + \sum_{i=0}^{n4} e_i \Delta LnEX_{t-i}^+ + \sum_{i=0}^{n5} f_i \Delta LnEX_{t-i}^- + \theta_0 Ln\, M_{t-1} + \theta_1 LnY_{t-1} + \theta_2 \pi_{t-1} + \theta_3 LnEX_{t-i}^+ + \theta_4 LnEX_{t-i}^- + \xi_t$$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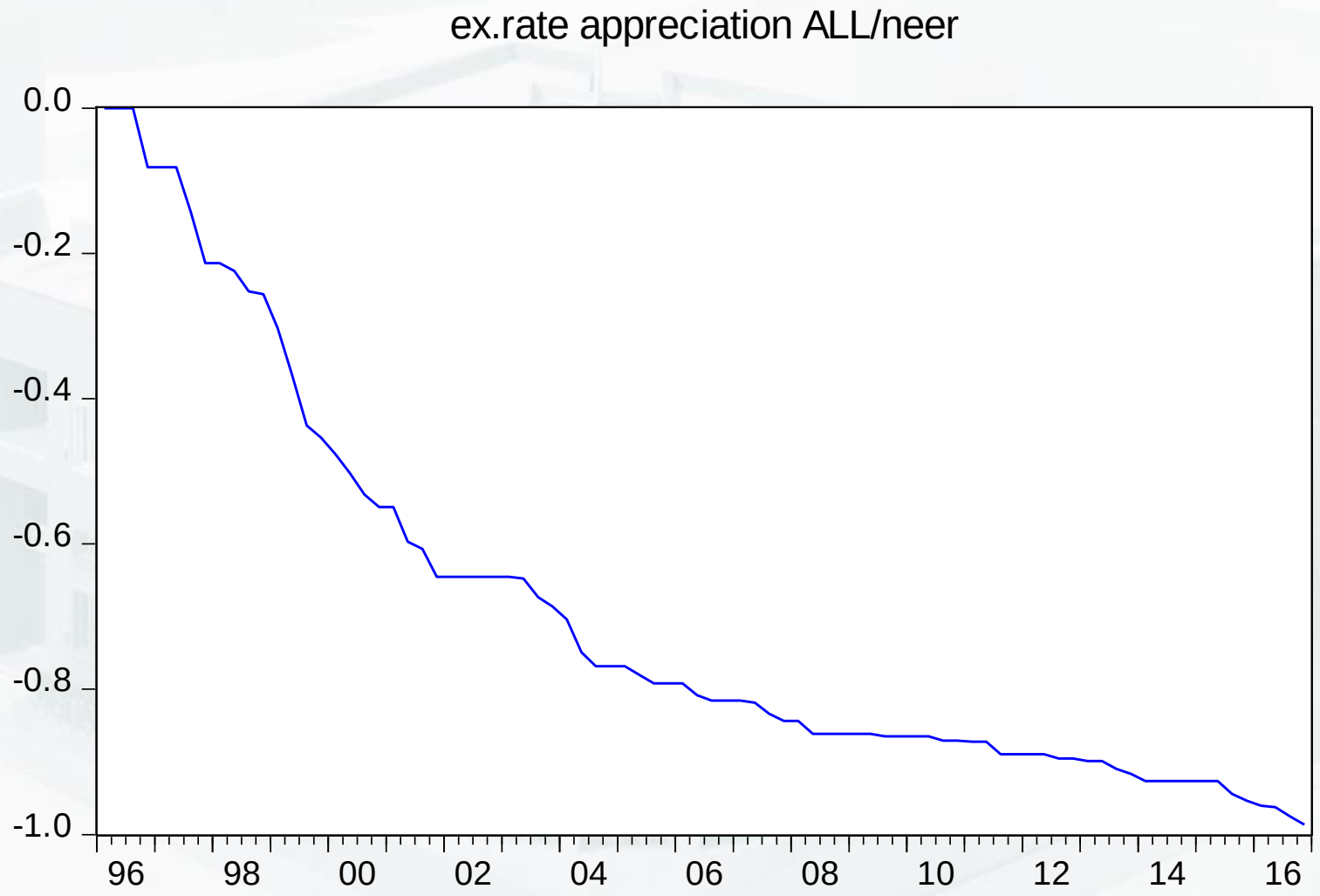
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Data

Table 1: Summary Statistics for All Variables

	M2	Ln(Pt/Pt-4)	Y	NEER
Mean	526.1	5.3	251,645.7	115.64
Maximum	736.5	39.3	373,990.6	177.89
Minimum	226.8	-1.6	116,531.4	98.04
Std. Dev.	161.7	8.3	72,364.0	16.57836
Skewness	-0.4	2.8	-0.2	1.81
Kurtosis	1.8	10.2	1.7	5.97

Augmented Dickey-Fuller test

		Variables					
		Ln M	Ln Y	Ln(P_t/P_{t-4})	Ln EX	Ln EXD	Ln EXA
With Constant	Level	-3.217(6)**	-1.13(3)	-5.13(5)***	-1.86(1)	-2.68(1)*	-3.63(8)***
	First Difference	-3.125(3)**	-5.47(3)***	-5.62(7)***	-7.56(0)***	-6.39(0)***	-6.64(1)***
With Constant and Trend	Level	-1.070(6)	-0.235(3)	-8.79(7)***	-1.87(1)	-8.97(3)***	-3.28(6)*
	First Difference	-4.49(5)**	-28.45(2)***	-6.42(7)***	-7.52(0)***	-6.53(0)***	-1.95(6)

Our study

- Bahmani-Oskooee and Bahmani (2015)

$$LnM_t = a + bLnY_t + c\pi_t + dLnEX_t + \varepsilon_t$$

$$\mathrm{Ln}\Delta \mathrm{M_t} = \alpha + \sum_{i=1}^{n1} \beta_i \Delta \mathrm{LnM_{t-i}} + \sum_{i=0}^{n2} \delta_i \Delta \mathrm{LnY_{t-i}} + \sum_{i=0}^{n3} \gamma_i \pi_{t-i} + \sum_{i=0}^{n4} \eta_i \Delta \mathrm{LnEX_{t-i}} + \rho_0 \mathrm{Ln\,M_{t-1}} + \rho_1 \mathrm{LnY_{t-1}} + \rho_2 \pi_{t-1} + \rho_3 \mathrm{LnEX_{t-1}} + \xi_t$$

Linear Model Estimation Results

Panel A: Short-run Coefficients

Lag order	0	1	2	3	4	5
ΔLnM		0.02	-0.06	-0.31**	0.20**	-0.14
		(0.21)	(0.67)	(4.19)	(2.54)	(1.64)
ΔLnY	0.15**	-0.14**	-0.11**			
	(6.08)	(4.11)	(4.53)			
$\Delta Ln(P_t/P_{t-4})$	-0.38**	0.37**	-0.35**	-0.02	-0.21**	
	(2.86)	(3.23)	(2.83)	(0.20)	(2.03)	
ΔLnEX	0.00	0.24**				
	(0.00)	(2.93)				

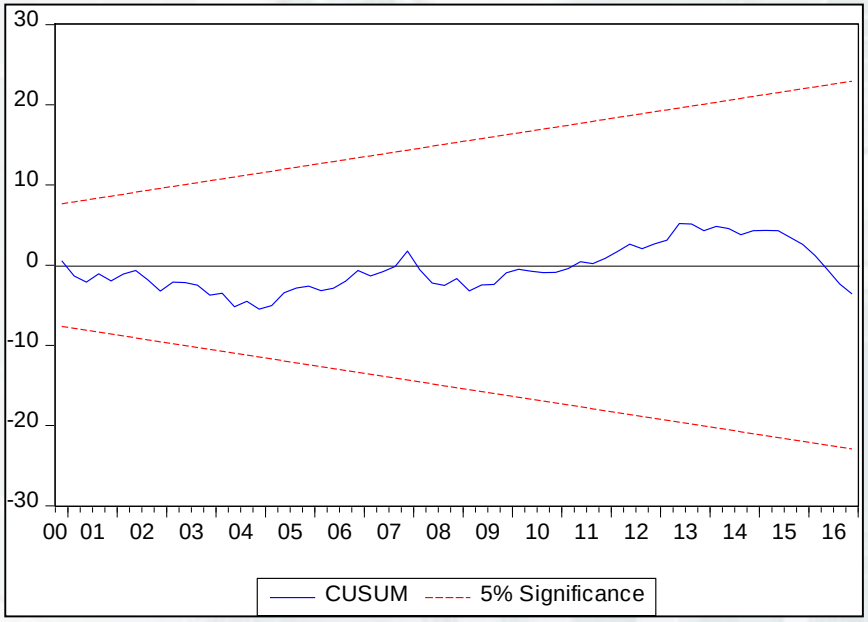
Panel B: Long-run Coefficients

Constant	LnY	$Ln(P_t/P_{t-4})$	LnEX
-7.82**	0.88**	-0.23	-0.30**
(8.36)	(14.82)	(1.12)	(3.20)

Panel C: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	Normality	$CUS/(CUS^2)$	Adj. R^2
7.16**	-0.37**	4.59	1.35	0.30	S/S	0.75
	(6.3)					

Stability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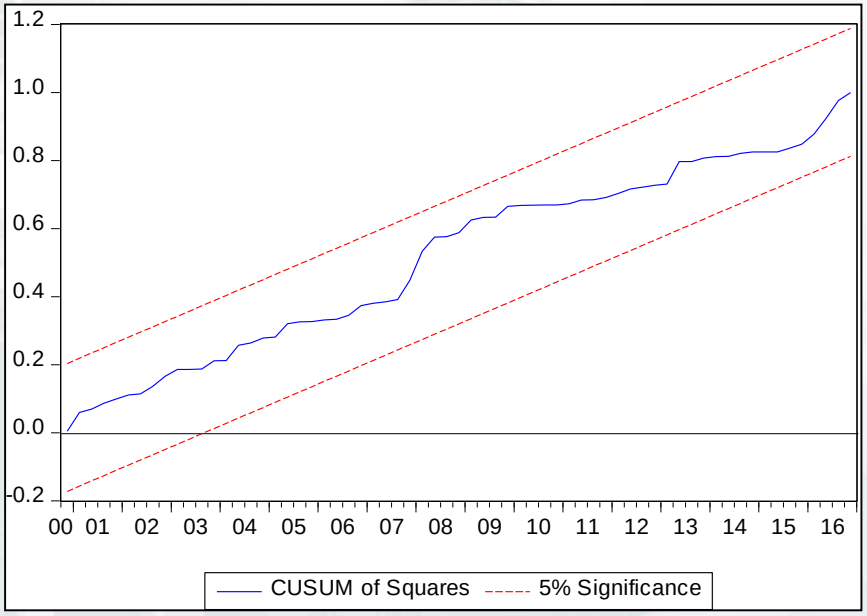
CUSUM
5% Significance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CUSUM of Squares
5% Significance

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- Redefine the exchange rate variable

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$$Ln\Delta M_t = a + \sum_{i=1}^{n1} b_i \Delta LnM_{t-i} + \sum_{i=0}^{n2} c_i \Delta LnY_{t-i} + \sum_{i=0}^{n3} d_i \pi_{t-i} + \sum_{i=0}^{n4} e_i \Delta LnEX_{t-i}^+ + \sum_{i=0}^{n5} f_i \Delta LnEX_{t-i}^- + \theta_0 Ln\, M_{t-1} + \theta_1 LnY_{t-1} + \theta_2 \pi_{t-1} + \theta_3 LnEX_{t-i}^+ + \theta_4 LnEX_{t-i}^- + \xi_t$$

Nonlinear Model Estimation Results

Panel A: Short-run Coefficients

Lag order	0	1	2	3	4	5
ΔLnM		0.39**	0.28**	-0.10	0.37**	
		(3.01)	(2.99)	(1.30)	(4.06)	
ΔLnY	0.13**	-0.65**	-0.70**	-0.46**	-0.31**	-0.18**
	(2.39)	(4.94)	(5.05)	(3.99)	(3.35)	(2.90)
$\Delta Ln(P_t/P_{t-4})$	-0.63**	0.33**				
	(5.43)	(2.90)				
ΔLnEXD	-0.62**	0.17	-0.44**	0.27**	-0.49**	
	(2.71)	(1.13)	(3.19)	(2.32)	(4.75)	
ΔLnEXA	0.81**	0.21	0.02	-0.01	0.32**	0.53**
	(3.90)	(1.08)	(0.09)	(0.10)	(2.44)	(3.85)

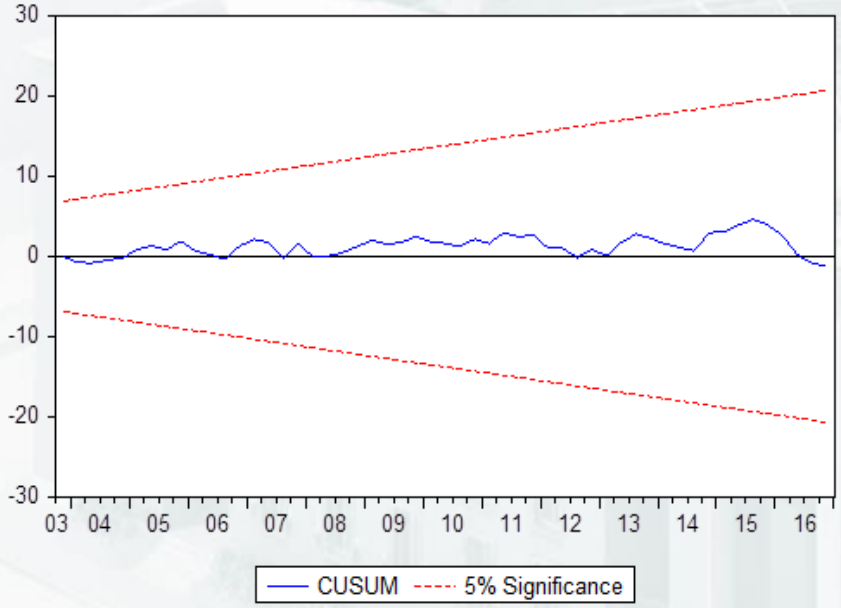
Panel B: Long-run Coefficients

Constant	LnY	$Ln(P_t/P_{t-4})$	LnEXD	LnEXA
-12.01	1.13**	-0.45**	-0.45**	0.01
(7.60)	(7.84)	(2.78)	(2.70)	(0.09)

Panel C: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	Normality	CUS /(CUS^2)	Adj. R^2	Wald-L	Wald-S
5.59**	-0.66**	3.23	4.51	1.02	S/S	0.81	17.543	4.32
	(6.68)							

Stability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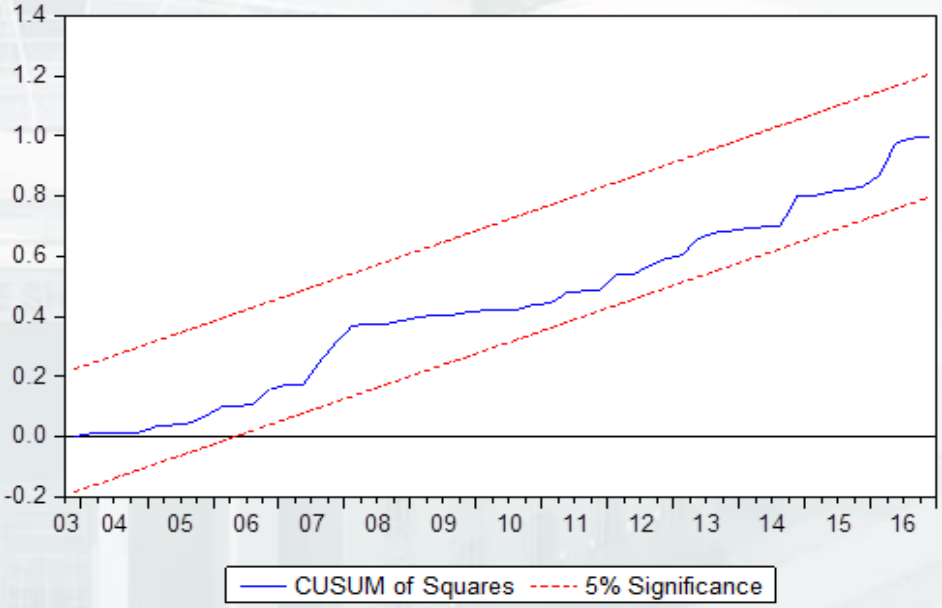
CUSUM
5% Significance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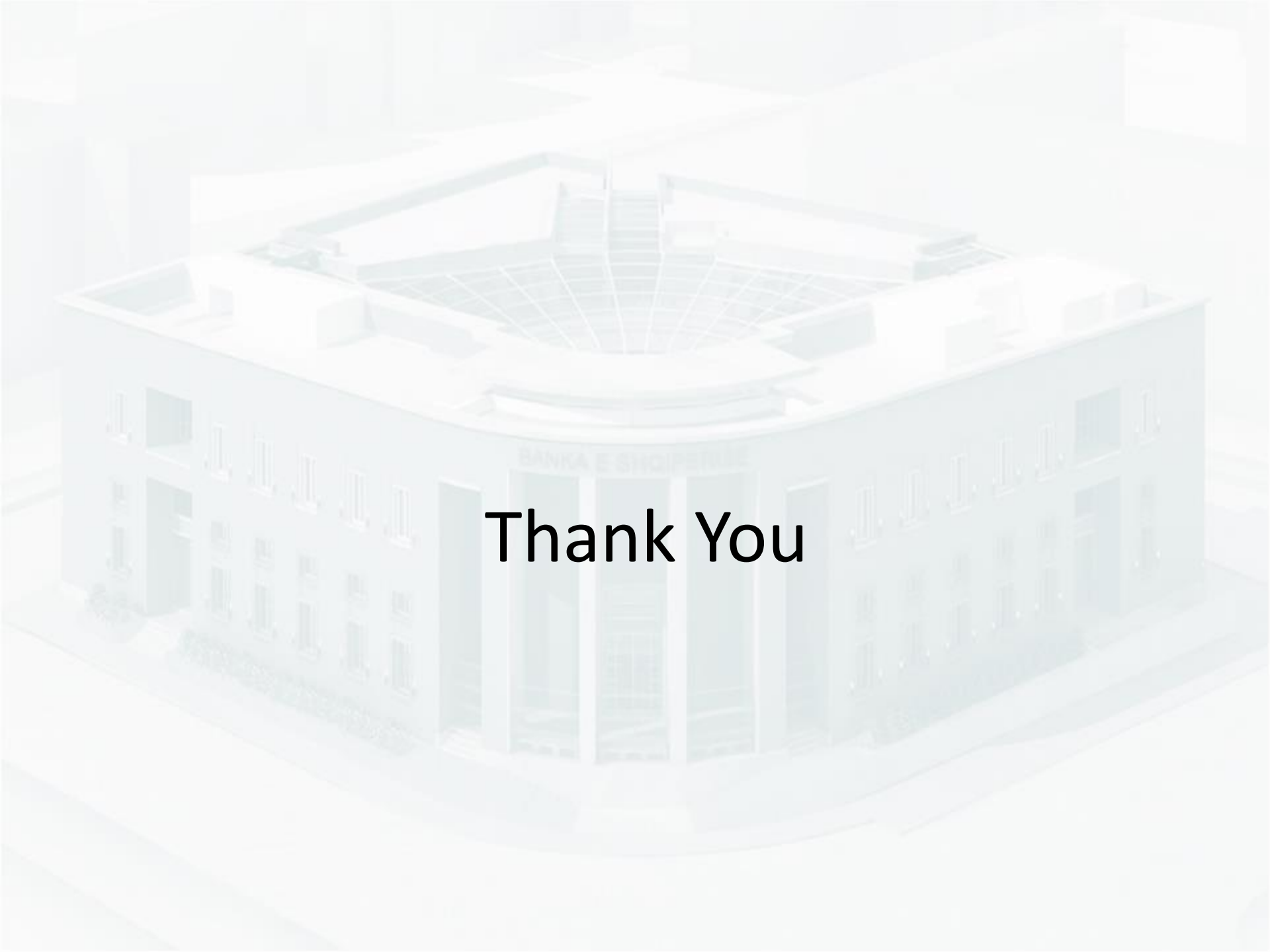
CUSUM of Squares
5% Significance

Conclusions

- We estimate the demand for money through a nonlinear adjustment in the ARDL model, which reveals exchange rate asymmetric effects on the demand for money in Albania.
- Results show that the long-run relationship between the exchange rate and money demand hinges on whether one assumes a linear, as opposed to a nonlinear, dynamic adjustment process to the long-run equilibrium.
  - ***Our findings for the exchange rate effects across these two models are different.***
- Both, the linear as well as the non-linear ARDL models, show a stable demand for money in the long-run.
  - ***In the linear specification, however, the inflation variable is not significant.***
  - ***The estimated long-run income elasticity is also different in both models***
  - ***income elasticity above unity is not consistent with the monetarist view*.**
- The exchange rate, the linear model specification supports the substitution effect, whereas ***the nonlinear model favors the substitution effect only in the case of depreciation***.
- This empirical investigation of money demand shows that considering nonlinear specifications for the money demand equation can result in very different policy implications for monetary authorities.



Thank You