The Long-run Impact of Inflation on Savings in Turkiye

Prof.Dr. JülideYalçınkaya KOYUNCU[1]

[1]Bilecik Şeyh Edebali Üniversitesi, İİBF, İktisat Bölümü, julide.yalcinkaya@bilecik.edu.tr, ORCID: 0000-0001-7930-4901

Abstract: This study examines the long run association between inflation and gross savings in Turkiye for the period of 1974-2023. ARDL estimation technique was utilized in all analyses. ADF unit root test findings indicated that variables of gross savings and consumer price inflation are integrated order one whereas economic growth variable is integrated order zero. ARDL bounds test implemented for cointegration analysis disclosed the presence of cointegration relationship among the variables of gross savings, consumer price inflation, and economic growth. Negative statistically significant coefficient estimation for inflation variable and positive statistically significant coefficient estimation for economic growth variable were obtained. In other words, if consumer price inflation jumps by 1% then gross savings drop by 0.2437% and if economic growth increases by 1% then gross savings augment by 0.0980%.

Keywords: Savings, Inflation, Stationarity, ARDL Method.

1. INTRODUCTION

Savings in an economy are determined by several factors. Among the other determinants of savings, inflation may play an important adverse role on savings. Purchasing powers of individuals' incomes decline dramatically during the high inflation periods, and thus the share of income allocated to savings declines as well at that period. Therefore it will be interesting research question to address the relationship between inflation and savings.

There are studies in the literature identifying negative influence of inflation on savings. For instance, Den Haan (1990), inthe benchmark calibration of the model, calculated that a rise of the inflation rate from 0% to5% decreases savings by almost 10%.Heer and Süssmuth (2007), in their model, identified a similar negative quantitative impact of inflation on savings. Even though Dash and Kumar (2018).did not find a nonlinear association between inflation and savings, they found that inflation has a linear and significant negative effect on savings. Dayal-Gulati and Thimann (1997) in their study covering nine Latin American countries showed that inflation decreases savings. Lahiri (1989) by modeling the dynamics of saving for eight Asian countries using the life-cycle overlapping-generations framework found that both anticipated and unanticipated inflation possess an adverse impact on savings in some countries. D'Acunto et al. (2015) by using household survey data indirectly showed that a higher inflation rate is associated with a lower saving rate.

In this study I examine the long-run impact of inflation on gross savings in Turkiye by using an annual dataset for the period of 1974-2023. Regarding to the long run coefficient estimations, if consumer price inflation increases by 1% then gross savings decrease by 0.2437% and if economic growth goes up by 1% then gross savings go up by 0.0980%.

The second part explains data and methodology, third part provides and discusses estimation result, and the last part concludes.

2. DATA and METHODOLOGY

This study explores the long-run relationship between inflation and savings in Turkiye for an annual data set covering the period of 1974-2023 by utilizing ARDL estimation technique. Since purchasing power of individual's income drops drastically during the high inflation period, the share of income allocated to savings declines at that period. Therefore a negative interaction between inflation and savings was expected. The variable of saving (SAVING) is given by gross savings (current US$), the variable of inflation (INFLATION) is given by inflation of consumer prices (annual %), and the control variable of economic growth (GROWTH) is given by GDP per capita growth (annual %).As economic growth means more per capita GDP, a positive coefficient for GROWTH variable is anticipated. All variables were obtained from WDI of the World Bank. The logarithmic forms of all variables were used in all analyses.

I estimated the following model for cointegration analysis implemented via ARDL bounds test:

$$\Delta \mathrm{SAVING}_t = \alpha_0 + \sum_{i=1}^{p} \delta_i \Delta \mathrm{SAVING}_{t-i} + \sum_{i=0}^{q} \phi_i \Delta INFLATION_{t-i} + \sum_{i=0}^{r} \gamma_i \Delta GROWTH_{t-i} + \theta_0 \mathrm{SAVING}_{t-1} + \theta_1 INFLATION_{t-1} + \theta_2 GROWTH_{t-1} + \varepsilon_t \quad (1)$$

In Equation 1 above: θ_0, θ_1, and θ_2 symbols show long-term coefficients; δ_i, ϕ_i, and γ_i symbols represent short-term coefficients; Δ symbol stands

for first degree difference operator; $\alpha_0$is constant term of regression model, and ε_t is white noise error term of regression model.

H_0:$\theta_0=\theta_1=\theta_2=0$ is the null hypothesis of ARDL bounds test and indicates the absence of co-integrating relationship among the variables of SAVING, INFLATION, and GROWTH. H_1: $\theta_0\neq\theta_1\neq\theta_2\neq 0$ is the alternative hypothesis of ARDL bounds test and points out the presence of co-integrating relationship among the variables of SAVING, INFLATION, and GROWTH. As long asF-statistic value of ARDL bounds test bigger than the critical value of upper limit at a given significance level then this will imply that there is co-integrating association among the variables of SAVING, INFLATION, and GROWTH. Otherwise it cannot be concluded so.

The following model was estimated to get short-run and long-run coefficients:

$$\text{SAVING}_t = \beta_0 + \sum_{i=1}^{p} \alpha_i \Delta \text{SAVING}_{t-i} + \sum_{i=0}^{q} \mu_i \Delta INFLATION_{t-i} + \sum_{i=0}^{r} \pi_i \Delta GROWTH_{t-i} + \gamma ECM_{t-1} + \varepsilon_t \quad (2)$$

In Equation2 above: α_i, μ_i, and π_i notations display dynamic coefficients returning the model back to the balance in the long run; ECM term shows error correction term of regression model; γ notations is the speed of adjustment at which the model returns back to long run in response to a shock occurred in short run. The speed of adjustment term must be statistically significant and have a negative sign.

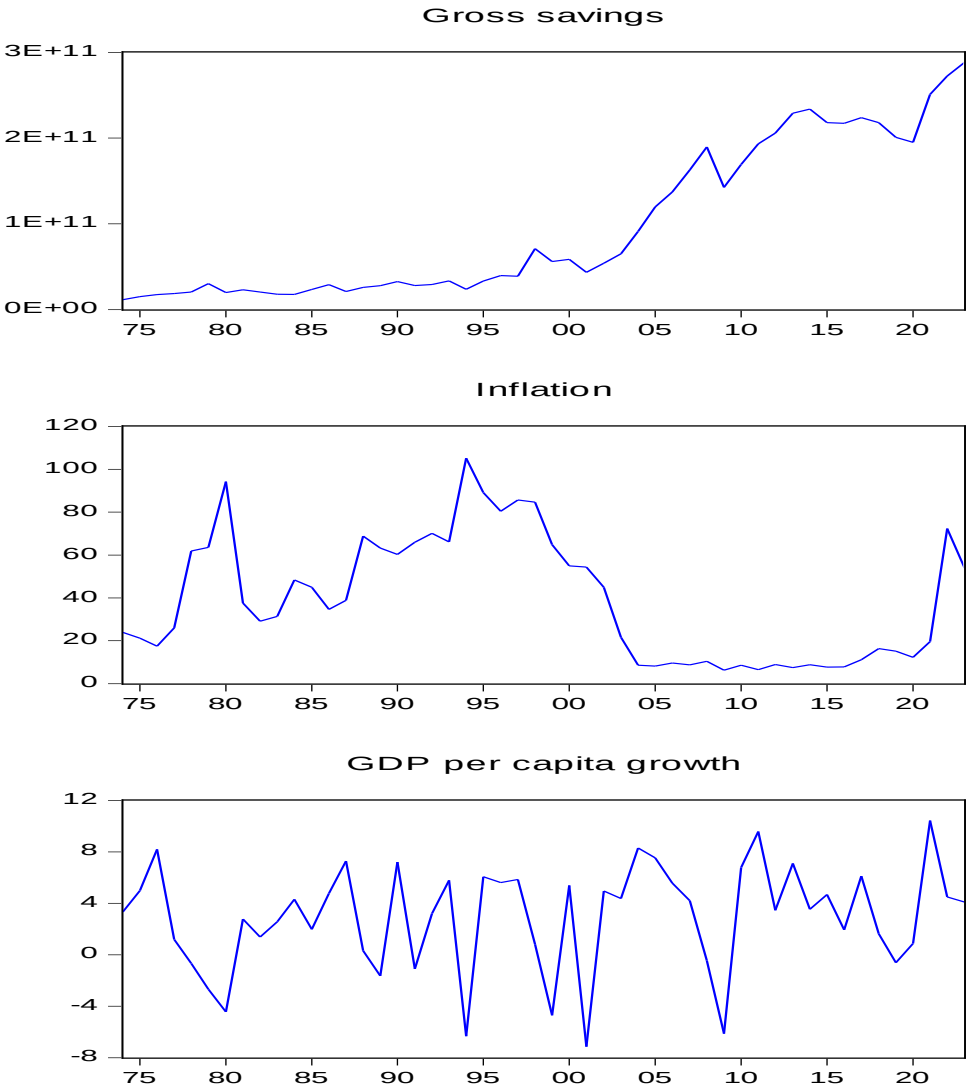
Table 1 below reports descriptive statistics for the variables of SAVING, INFLATION, and GROWTH.

Graph 1 below shows how the series of gross savings, inflation of consumer prices, and economic growth behave over the estimation period of 1974-2023. As seen from the Graph 1, savings in Turkiye go up between 1974 and 2003 but this increase is quite gradual until early 2000s, after that savings increase sharply. Inflation firstly goes up until 1995, drops after 1995 and increases again at 2020. GDP per capita series behaves like a stationary series with almost no tendency.

Table 1: Summary Statistics

	SAVING	INFLATION	GROWTH
Mean	9.81E+10	39.23624	2.937014
Median	4.87E+10	33.00017	3.813216
Maximum	2.88E+11	105.2150	10.42940
Minimum	1.14E+10	6.250977	-7.138251
Std. Dev.	8.88E+10	28.90957	4.146130
Skewness	0.681926	0.475325	-0.672011
Kurtosis	1.862180	1.973654	2.958413
Jarque-Bera	6.572344	4.077339	3.766930
Probability	0.037397	0.130202	0.152062
Sum	4.91E+12	1961.812	146.8507
Sum Sq. Dev.	3.86E+23	40952.40	842.3291
Observations	50	50	50

Graph 1: Series over time



3. ESTIMATION RESULTS

Augmented Dickey-Fuller(ADF) unit root test results were provided in Table 2. As indicated by the ADF unit root test findings, SAVING and INFLATION variables are integrated order one (i.e., I(1)) while GROWTH variable is integrated order zero (i.e., I(0)).

Since the variables of SAVING, INFLATION, and GROWTH are not integrated two or more, they meet the requirement of ARDL bounds test and hence I employed ARDL bounds test for cointegration analysis.

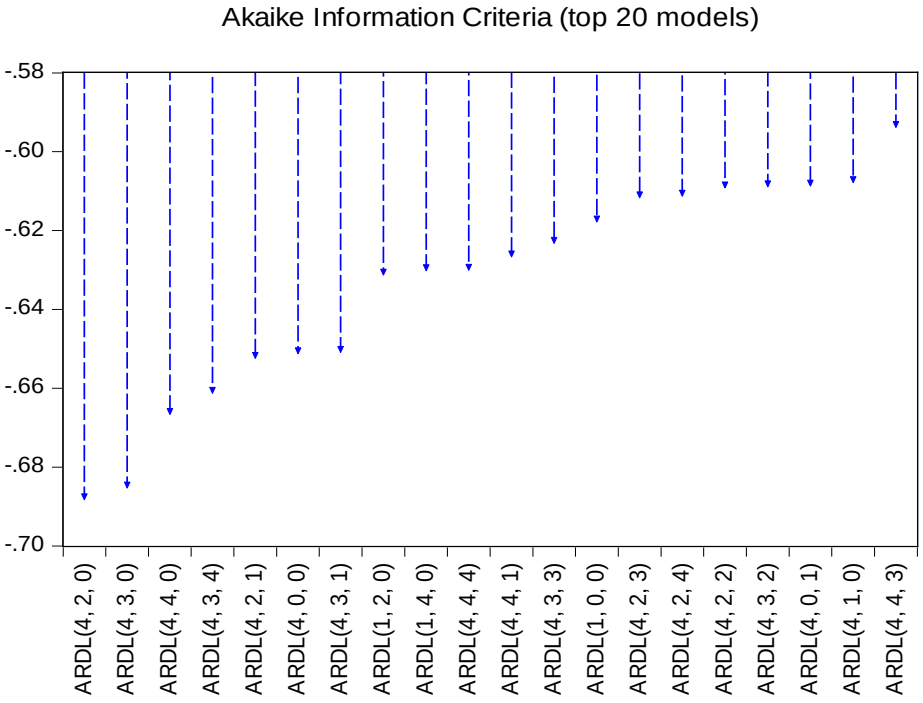
Table 2: Unit Root Test

Null Hypothesis: SAVING has a unit root			
Model: Constant&Linear Trend		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-2.680816	0.2487
Test critical values:	1% level	-4.156734	
	5% level	-3.50433	
	10% level	-3.181826	
Null Hypothesis: D(SAVING) has a unit root			
Model: Constant&Linear Trend		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-8.822321	0.0000

Test critical values:	1% level	-4.161144	
	5% level	-3.506374	
	10% level	-3.183002	
Null Hypothesis: INFLATION has a unit root			
Model: Constant&Linear Trend		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-1.98403	0.5985
Test critical values:	1% level	-4.11044	
	5% level	-3.482763	
	10% level	-3.169372	
Null Hypothesis: D(INFLATION) has a unit root			
Model: Constant&Linear Trend		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-8.698862	0.0000
Test critical values:	1% level	-4.113017	
	5% level	-3.48397	
	10% level	-3.170071	
Null Hypothesis: GROWTH has a unit root			
Model: Constant&Linear Trend		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-8.228791	0.0000
Test critical values:	1% level	-4.113017	
	5% level	-3.48397	
	10% level	-3.170071	

AIC criterion was employed to find out the best ARDL model in terms of optimal lag length. As indicated by Figure 1, after evaluation of 100 different ARDL models, AIC criterion chose the ARDL(4,2,0) model as the optimal model. Therefore I utilized ARDL(4,2,0) model in all analyses.

Figure 1: Selection ofOptimal Lag Length



By using ARDL(4,2,0) model and ARDL bounds test, I conducted cointegration test and the results of ARDL bounds test are given in Table 3. As can be deduced from the findings in Table 3, there is cointegration relationship among the variables of gross savings, inflation, and economic growth and hence it can be stated they move together in the long run during the estimation period.

Table 3: ARDL Bounds Test

	Signif.	Lower Limit	Upper Limit
		Asymptotic: n=1000	
F-statistic: 8.805130	10%	3.38	4.02
k: 2	5%	3.88	4.61
	2.5%	4.37	5.16
	1%	4.99	5.85
Actual Sample Size: 46		Finite Sample: n=50	
	10%	3.573	4.288
	5%	4.225	5.03
	1%	5.805	6.79
		Finite Sample: n=45	
	10%	3.625	4.33
	5%	4.335	5.078
	1%	5.878	6.87

I displayed the long run coefficient estimation results in Table 4. As expected, a negative statistically significant coefficient estimation for inflation variable was obtained and a positive statistically significant coefficient estimation for economic growth variable was obtained. In other words, if consumer price inflation increases by 1% then gross savings decrease by 0.2437% and if economic growth goes up by 1% then gross savings go up by 0.0980%

Table 4: Long-run Coefficient Estimations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATION	-0.2437	0.0609	-4.0055	0.0003
GROWTH	0.0980	0.0444	2.2087	0.0336
TREND	0.0584	0.0039	15.0752	0.0000

I reported short run coefficient estimation findings in Table 5. Short run coefficient estimations of SAVING variable are positive and statistically significant for second and third lags while short run coefficient estimations of INFLATION variable are negative for current period and positive for first lag. The coefficient of ECM term is statistically significant and negative as anticipated

Table 5: Short-run Coefficient Estimations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSTANT	14.7376	2.3739	6.2082	0.0000
D(SAVING(-1))	0.1367	0.1304	1.0479	0.3017
D(SAVING(-2))	0.2070	0.1209	1.7123	0.0954
D(SAVING(-3))	0.3430	0.1242	2.7629	0.0090
D(INFLATION)	-0.1172	0.0565	-2.0746	0.0452
D(INFLATION(-1))	0.1594	0.0597	2.6695	0.0113
ECMt-1	-0.6346	0.1027	-6.1770	0.0000

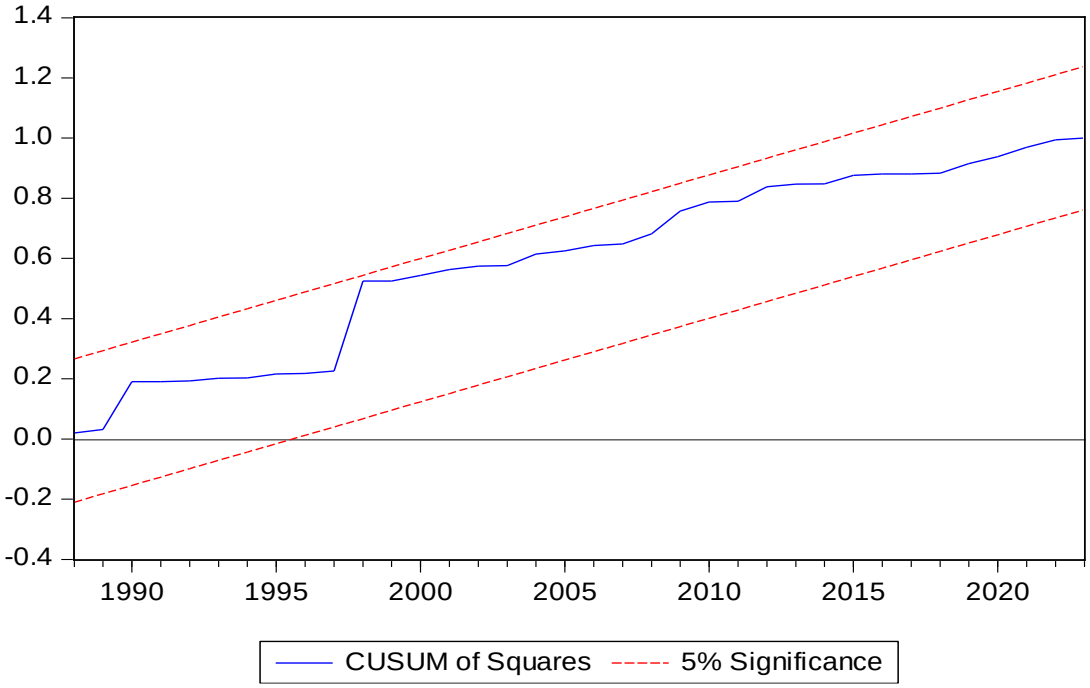
Table 6 below provides the diagnostic test results for normality, autocorrelation, heteroscedasticity, and model specification error. As can be concluded from the Table 6, ARDL(4,2,0) model is not exposed to non-normality, autocorrelation, heteroscedasticity, and model misspecification problems. Put it differently, ARDL(4,2,0) model is free from non-normality, autocorrelation, heteroscedasticity, and model misspecification problems.

Table 6: Diagnostic Test Results

Tests	Test Value / (Prob.)
Jerque-Bera Normality Test	4.171370 *(0.124222)*
Breusch-Godfrey Serial Correlation LM Test	0.410024 *(0.6669)*
ARCH Heteroskedasticity Test	0.99862 *(0.3232)*
Ramsey RESET Test	0.792440 *(0.3794)*

I also conducted parameter stability test by using CUSUM-Square test. CUSUM-Square parameter stability test results in Figure 2point out that the parameters of ARDL(4,2,0) model are stable.

Figure 2: CUSUM-Square Parameter Stability Test



4. CONCLUSION

This study investigates the long run effect of inflation on gross savings in Turkiye for a sample covering years between 1974 and 2023. ARDL estimation technique was employed for all analyses. ADF unit root test findings indicated that variables of gross savings and consumer price inflation are stationary at first differences while economic growth variable is stationary at level. ARDL bounds test implemented for cointegration analysis reveal the existence of cointegration relationship among the variables of gross savings, consumer price inflation, and economic growth.

Regarding to the long run coefficient estimations, negative statistically significant coefficient estimation for inflation variable and positive statistically significant coefficient estimation for economic growth variable were obtained. More specifically, if consumer price inflation jumps by 1% then gross savings drop by 0.2437% and if economic growth increases by 1% then gross savings augment by 0.0980%.

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