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INFLATION, URBANIZATION, AND RURALIZATION IN TÜRKİYE: HOW THEY ARE RELATED IN THE LONG-RUN?

TÜRKİYE'DE ENFLASYON, KENTLEŞME VE KIRSALLAŞMA: UZUN DÖNEMDE NASIL BİR İLİŞKİ VAR?

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ÖZET

Bu çalışma, Türkiye'de enflasyon ile kentleşme ve kırsallaşma oranları arasındaki kısa ve uzun vadeli ilişkiyi 1960-2022 yıllarına ait bir veri seti ve ARDL tahmin yöntemini kullanarak incelemektedir. Durağanlık testi bulguları, kentleşme oranının birinci dereceden bütünleşik olduğunu, ekonomik büyüme, enflasyon ve kırsallaşma oranının ise sıfırıncı dereceden bütünleşik olduğunu ortaya koymaktadır. ARDL sınır testinden elde edilen eş bütünleşme testi bulguları, ekonomik büyüme, enflasyon, kırsallaşma oranı ve kentleşme oranı değişkenleri arasında eş bütünleşme ilişkisinin olduğuna işaret etmektedir. Uzun dönem katsayı tahminlerine bakıldığında kırsallaşma oranı ve ekonomik büyümenin birinci model için negatif ve istatistiksel olarak anlamlı katsayıları vardır. Yani kırsallaşma oranındaki yüzde birlik artış tüketici fiyat endeksinde yüzde 17,168 oranında düşüşe neden oluyor. Ayrıca ekonomik büyümedeki yüzde birlik artış, tüketici fiyat endeksinin yüzde 0,995 oranında düşmesine neden oluyor. İkinci model için kentleşme oranı için istatistiksel olarak anlamlı pozitif, ekonomik büyüme için ise negatif katsayı tahmini elde ettik. Daha spesifik olarak kentleşme oranı %1 artarsa tüketici fiyat endeksi %19.427 artarken, ekonomik büyümedeki %1 artış tüketici fiyat endeksini %0.947 azaltıyor.

ABSTRACT

This study examines the short-run and long-run relationship between inflation and urbanization and ruralization rates in Türkiye by using a data set for the years between 1960 and 2022 and estimation method of ARDL. Stationarity test findings disclose that urbanization rate is integrated order one while economic growth, inflation, and ruralization rate are integrated order zero. Co-integration test findings gathered from ARDL bound test hint that there is co-integrating relationship among variables of economic growth, inflation, ruralization rate, and urbanization rate. Considering to long-run coefficient estimations, ruralization rate and economic growth have negative and statistically significant coefficients for the first model. In other words, one percent increase in ruralization rate induces to a decrease in consumer price index by 17.168 percent. Also one percent rise in economic growth causes to a drop in consumer price index by 0.995 percent. For the second model, we obtained statistically significant positive coefficient estimation for urbanization rate and negative one for economic growth. More specifically, if urbanization rate goes up by %1 then consumer price index increases by %19.427 whereas %1 increase in economic growth lessens consumer price index by %0.947.

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Inflation can be defined as annual increases in goods and services. In other words, inflation is the continuous increase in the general level of prices as a result of total demand exceeding total supply. Inflation is not a desirable situation because it means disruption of price stability in the country (Tunca, 2005).

Urbanization refers to the process of economic, social and cultural transformation of rural areas as a result of industrialization and development. As a demographic term, urbanization refers to the redistribution of the population from rural to urban settlements. The main difference between urban and rural areas is that the urban population lives in larger, denser and more heterogeneous cities, while the rural population lives in smaller, sparser and less differentiated settlements (Peng et al. 2018).

The level of urbanization, expressed as the ratio of the urban population of a country to the total population of that country, is highly related to the income level of that country (Bloom et al., 2018). Much of the interest in the urbanization process stems from the fact that urbanization and economic growth are closely intertwined. Because economic development involves the transformation of a country from an agriculture-based rural economy to a service-based industrial economy, as well as the release of labor from agriculture as labor-saving technologies are implemented (Henderson, 2003).

The spatial-temporal urbanization process takes place in different ways depending on the country and city. Many historical, political, social and cultural factors explain increasing urbanization. Mass migration from rural areas and the development of an industrial and service-oriented society have made urban centers the main source of paid employment. The cultural and political appeal of cities, especially capitals, encourages the arrival of new residents despite chronic increases in rents and land prices. Political decisions regarding land use planning result in the development of existing cities or the creation of new cities from scratch.

There are various channels through which urbanization can affect economic growth. First, cities play a vital role in the economic and social fabric of both developed and developing countries. Urban settlements provide opportunities for education, employment and healthcare. Expanding education systems in urban areas is easier and cheaper than expanding in rural areas. Education and capital determine a nation's ability to develop new technologies and adopt existing technologies. Urban populations have more opportunities to access hospitals and care, and health services are also more developed. Health capital can directly influence economic activity through its productivity impact on the workforce. Firms and workers have higher productivity in urban areas than in rural areas. Additionally, urbanization is a key factor in entrepreneurship, leading to the concentration of labor and firms, economies of scale, which reduces production costs (Arouri et al., 2014).

Urbanization necessitates intersectoral labor transfer. Urban economic activities are in a process of continuous growth and development. During this process, the labor force needed in urban activities is transferred from the agricultural sector (Es & Ateş, 2010). In the process of economic growth, it is seen that people migrate from rural areas to urban areas where non-agricultural activities dominate. It creates new opportunities for people migrating from rural areas to urban areas in search of work and better living conditions. Especially in developing countries, migration flows from rural areas to urban settlements bring about higher unemployment rates in cities (Lee, 2008). Unemployment is seen as a serious problem encountered in the majority of countries in the world, regardless of their level of development, and brings with it many socio-economic problems. Developing countries are struggling more intensely with the unemployment problem due to insufficient domestic savings required for economic growth, increasing population, changes in technology and consumer demand, and increases in the demand for qualified labor in the employment market (Khrais & Al-Wadi, 2016).

The problem of rural depopulation and the need for rural communities to become more attractive places to live and work is of concern to both the rural population and policy makers. The decrease in the number of people to serve may threaten the development or preservation of services such as public transportation and health services. At the same time, infrastructure works prevent the economic sustainability of new services. Rural demographic structure is dominated by the elderly population rather than the young population. The age profile of farmers becomes an issue as they approach retirement. A social landscape lacking the vibrancy of cities and limited job and education opportunities make rural areas not only unattractive but also an unrealistic option for young people. A downward spiral of population decline is beginning to emerge. However, young people leaving rural areas creates a negative situation, but the desire to return usually only arises if there are jobs or employment opportunities necessary to make ends meet. Agriculture as an option for rural youth faces challenges. Being a farmer may not be attractive compared to other high-paying jobs that offer a better work-life balance. But even beyond these considerations, high farmland prices require a large capital investment to access it.

Fhang Lo (2010); Equating the causality relationship between urbanization and economic growth for 28 countries for the period 1950-2000. They tested this by integration and found that there was bidirectional causality. In addition, causal relationships between two variables. They found that the relationship depends on a country's economic development status.

Chen et al. (2014); Based on data from the last thirty years, global from this perspective, they investigated the relationship between economic growth and urbanization. For this purpose, cross-section, panel and geographic information systems (GIS) carried out the analysis using models. Emerging. According to the results, there is a strong relationship between economic growth and urbanization. However, no relationship was found between urbanization rate and economic growth. In other words, The economic benefit obtained by increasing the urbanization rate is the same not to the extent.

Singh et al (2014); urbanization to stimulate growth may play an instrumental role, negative externalities, urban potential growth impacts of congestion and inadequate infrastructure. They argued that it could severely undermine it. In this context, urbanization and development based on Pacific Island countries' economiesThey investigated the relationship between economic growth. According to the results of the study, urbanization has a negative impact on economic growth in underdeveloped economies, has an impact and in developed economies, urban density. It turns out that economic growth may increase further as has come out.

Sarker et al. (2016); They investigated the causal relationship between urban population and economic growth in Asia using a panel data analysis. Panel Pedroni cointegration test shows that there is a long-term relationship between variables. According to the analysis results, the growth of the urban population will significant impact on economic growth in South Asia in the long term, concluded that it may have an effect.

Değer and Emsen (2004), urbanization, which can be defined as the movement of the population in a country from rural areas to the city and the change of balance in favor of the city, is among the factors that are truly effective in economic growth. The export sector, is explained through the urban labor market. Urban labor market employment conditions in rural areas, It generally increases labor productivity and total employment positively compared to It has qualities that influence it.

Lewis (2014) analyzed economic growth with urbanization in Indonesia by using time series from 1960 to 2009 and panel data from various regions. Reports show that urbanization is related to economic growth in the same direction. However, the rate of urbanization change has a negative impact on economic growth.

There are several studies in the literature that examine rural areas from an economic perspective. One of them examined the Tunisian economy. In his study, Chabbi (2010) examined the consequences of economic growth and development variables in rural areas. In the study, it was seen that the rural sector played a major role in the Tunisian economy in the period 1961-2007.

Sönmez and Artukoglu (2021) in their study specifically for Izmir; It addressed savings in rural areas. Especially the production amount. It is an important factor in benefiting from advanced production technologies that are important in terms of quality and quality. The main purpose of this research is to determine the income and savings of the rural areas in İzmir.

1. DATA AND METHODOLOGY

This study investigates the short-run and long-run association between inflation and urbanization and ruralization rates in Turkey by using a time series data set covering years from 1960 to 2022 and ARDL method. We utilized consumer price index (2010 = 100) as the indicator of inflation (INFLATION). Urbanization (URBANRATE) rate and ruralization rate (RURALRATE) are given by urban population (% of total population) and rural population (% of total population) respectively. In addition to urbanization and ruralization rates we also employed GDP per capita growth (annual %) as the indicator of economic growth (GROWTH). All data come from WDI of the World Bank and their logarithmic forms were used in all analyses. Since urban life requires demanding and consuming a wider range of goods and services, it may have an increasing impact on inflation. On the other hand, unlike the urban life, rural life requires demanding and consuming a narrower range of goods and services and give chance to be self-sufficient by cultivating your own crops and producing your own diary goods, it may have a decreasing effect on inflation. Economic growth can lead to lower inflation by allowing more goods and services to be produced and thus allowing aggregate supply to exceed aggregate demand. Therefore we expect to have negative coefficient estimations for RURALRATE and GROWTH variables and positive one for URBANRATE variable.

Firstly we conducted co-integration analyses by employing ARDL bound test and for that reason we constructed and estimated Equation 1 and 2 given below:

$$\Delta \text{INFLATION}_t = \alpha_0 + \sum_{i=1}^{p} \delta_i \Delta \text{INFLATION}_{t-i} + \sum_{i=0}^{q} \phi_i \Delta \text{RURALRATE}_{t-i} + \sum_{i=0}^{r} \gamma_i \Delta \text{GROWTH}_{t-i} + \theta_0 \text{INFLATION}_{t-1} + \theta_1 \text{RURALRATE}_{t-1} + \theta_2 \text{GROWTH}_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta \text{INFLATION}_t = \alpha_0 + \sum_{i=1}^{p} \delta_i \Delta \text{INFLATION}_{t-i} + \sum_{i=0}^{q} \phi_i \Delta \text{URBANRATE}_{t-i} + \sum_{i=0}^{r} \gamma_i \Delta \text{GROWTH}_{t-i} + \theta_0 \text{INFLATION}_{t-1} + \theta_1 \text{URBANRATE}_{t-1} + \theta_2 \text{GROWTH}_{t-1} + \varepsilon_t \quad (2)$$

In the Equation 1 and 2 above; θ0, θ1, and θ2 notations show the long-term coefficients; δi, ϕi, and γi notations reflects the short-term coefficients; Δ represents the first degree difference operator; α_0 is intercept term and ε_t is white noise error term of the models.

The null hypothesis of ARDL bound test (i.e., H0: θ0=θ1=θ2=0) claims the absence of co-integrating relationship between relevant variables whereas the alternative hypothesis of ARDL bound test (i.e., θ0≠θ1≠θ2≠0) asserts the presence of co-integrating association between relevant variables. As long as the F-statistic value of ARDL bound test exceeds the critical value of upper limit at a given significance level, then we deduce that there is co-integrating relationship between relevant variables.

Moreover we constructed and estimated the models represented by Equation 3 and 4 in order to obtain short-run and long-run coefficients:

$$\text{INFLATION}_t = \beta_0 + \sum_{i=1}^{p} \alpha_i \Delta \text{INFLATION}_{t-i} + \sum_{i=0}^{q} \mu_i \Delta \text{RURALRATE}_{t-i} + \sum_{i=0}^{r} \pi_i \Delta \text{GROWTH}_{t-i} + \gamma ECM_{t-1} + \varepsilon_t \quad (3)$$

$$\text{INFLATION}_t = \beta_0 + \sum_{i=1}^{p} \alpha_i \Delta \text{INFLATION}_{t-i} + \sum_{i=0}^{q} \mu_i \Delta \text{URBANRATE}_{t-i} + \sum_{i=0}^{r} \pi_i \Delta \text{GROWTH}_{t-i} + \gamma ECM_{t-1} + \varepsilon_t \quad (4)$$

In the Equation 3 and 4 above; α_i, μ_i, and π_i symbols represent dynamic coefficients bringing the model back to the balance in the long run; ECM shows error correction term of the model; γ symbol reflects the speed of adjustment at which the model returns back to long run in response to a shock occurred in short-run. Meantime negative and statistically significant coefficient estimation for the speed of adjustment term must be obtained.

Table 1 reports summary statistics for RURALRATE, GROWTH, URBANRATE, and INFLATION variables.

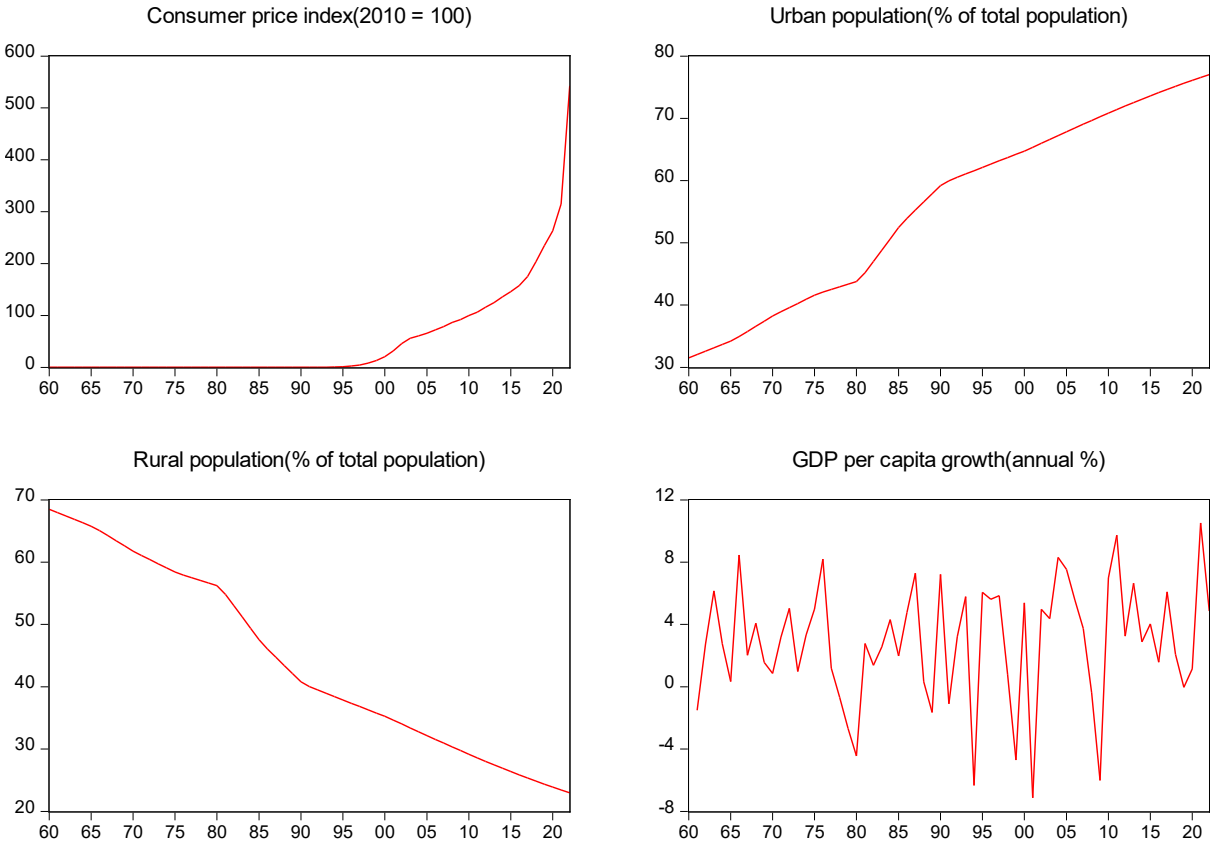
Table 1. *Descriptive Statistics*

	INFLATION	URBANRATE	RURALRATE	GROWTH
Mean	51.76628	55.87103	44.12897	2.885510
Median	0.118923	59.97600	40.02400	3.197341
Maximum	542.4388	77.02200	68.48500	10.51288
Minimum	5.40E-05	31.51500	22.97800	-7.138251
Std. Dev.	96.55566	14.76064	14.76064	3.876533
Skewness	2.809416	-0.212537	0.212537	-0.574546
Kurtosis	12.67469	1.592753	1.592753	3.166191
Jarque-Bera	328.5738	5.672706	5.672706	3.482420
Probability	0.000000	0.058639	0.058639	0.175308
Sum	3261.276	3519.875	2780.125	178.9016
Sum Sq. Dev.	578025.7	13508.34	13508.34	916.6782
Observations	63	63	63	62

In figure 1 below, we depicted the behavior of RURALRATE, GROWTH, URBANRATE, and INFLATION variables over the period of 1960-2022. INFLATION variable has a sharp increase after 1995; URBANRATE variable has a steep increase

and RURALRATE variable has a steep decrease between 1960 and 2022; and GROWTH variable fluctuates over the period of 1960-2022 with a weak upward trend.

Figure 1. *Time Trends of RURALRATE, GROWTH, URBANRATE, and INFLATION Variables*



1.1 Estimation Results

We implemented stationarity test by employing Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test where the null hypothesis of KPSS test claims the stationarity of relevant variable to find out the integration order of RURALRATE, GROWTH, URBANRATE, and INFLATION variables. We reported the results of KPSS stationarity test in Table 2 below. As seen from Table 2, RURALRATE, GROWTH, and INFLATION variables are stationary in levels while URBANRATE variable is stationary at first difference. Since integration order of our variables are not higher than one we are able to employ ARDL bound test for co-integration analysis, where ARDL bound test requires the series to be integrated order zero, one or mixed.

Table 2. KPSS Stationarity Test (Model: Constant&Linear Trend)

Variable: INFLATION/in level	LM-Stat.	
KPSS test statistic	0.131100	I(0)
Asymptotic critical value at 1% level	0.216000	
Variable: URBANRATE/in level	LM-Stat.	
KPSS test statistic	0.23714	-
Asymptotic critical value at 1% level	0.216000	
Variable: URBANRATE/in 1. diff.	LM-Stat.	
KPSS test statistic	0.091445	I(1)
Asymptotic critical value at 1% level	0.216000	
Variable: RURALRATE/in level	LM-Stat.	
KPSS test statistic	0.112941	I(0)
Asymptotic critical value at 1% level	0.216000	
Variable: GROWTH/in level	LM-Stat.	
KPSS test statistic	0.082865	I(0)
Asymptotic critical value at 1% level	0.216000	

AIC criterion was employed to identify the optimal lag lengths of ARD models given in Equation 1 and 2. As indicated by Figure 2 and 3 below, after evaluation of alternative 100 models, the best models in terms of optimal lag length are ARDL(4,2,0) for Equation 1 and ARDL(2,1,0) for Equation 2.

Figure 2. *Optimal Lag Length Selection for the Model given in Equation 1*

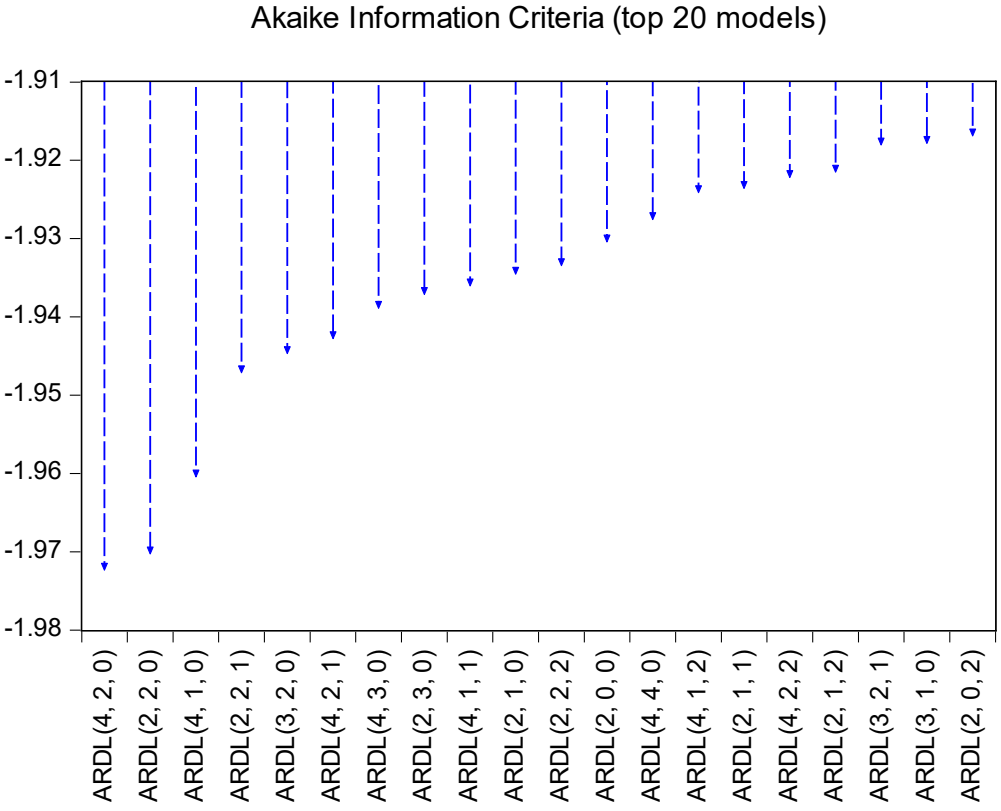
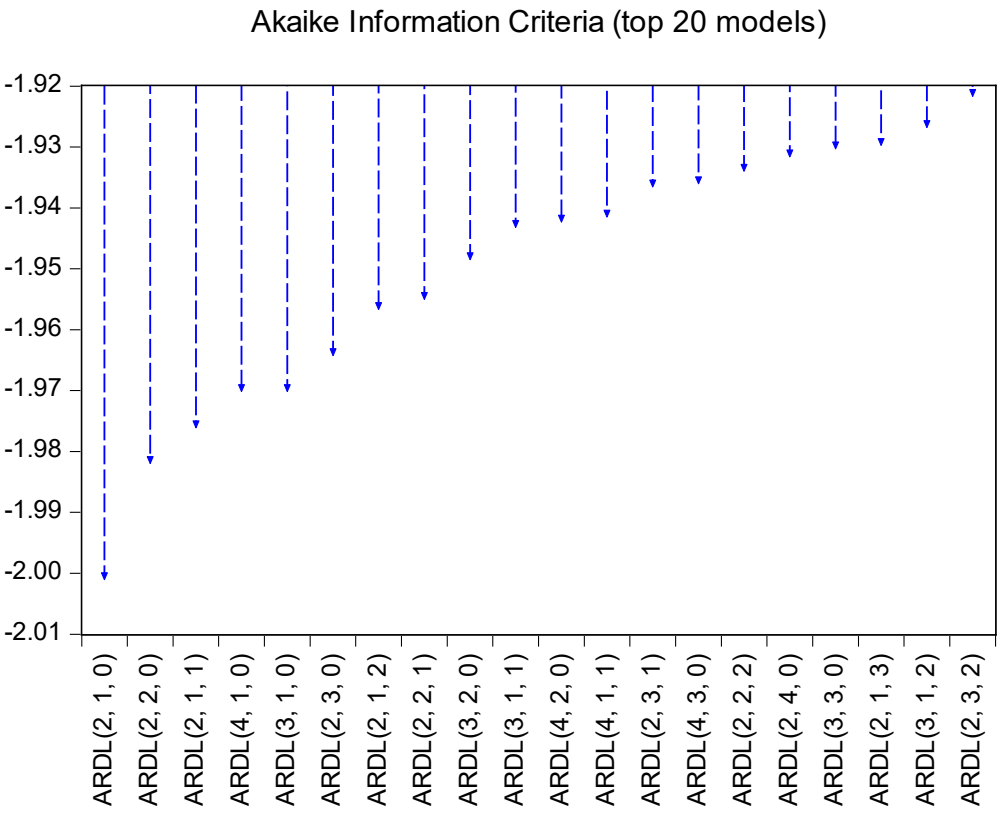


Figure 3. *Optimal Lag Length Selection for the Model given in Equation 2*



We displayed co-integration test results gathered from ARDL bound tests in Table 3 and 4. As F-statistic values of 5.048083 and 6.998767 are bigger than the upper limit critical values at all significance levels, we can conclude that there is co-integrating association among variables of consumer price index, urbanization rate, ruralization rate, and economic growth. More specifically, consumer price index, urbanization rate, ruralization rate, and economic growth series move together in the long-run in Turkey.

Table 3. *ARDL Bound Test for Model in Equation 1*

F-statistic:	5.048083	*Critical Values*
Significance	*Lower Limit*	*Upper Limit*
10%	2.63	3.35
5%	3.1	3.87
1%	4.13	5

Table 4. *ARDL Bound Test for Model in Equation 2*

F-statistic:	6.998767	*Critical Values*
Significance	*Lower Limit*	*Upper Limit*
10%	2.63	3.35
5%	3.1	3.87
1%	4.13	5

We reported long-run coefficient estimations of the models given in Equation 1 and 2 in Table 5 below. For the model given in Equation 1, ruralization rate and economic growth, in parallel to prior expectations, possess negative and statistically significant coefficient estimations at least at %5 significance level. One percent increase in ruralization rate leads to a decrease in consumer price index by 17.168 percent. Also one percent increase in economic growth causes to a drop in consumer price index by 0.995 percent.

For the model given in Equation 2, as anticipated, we obtained statistically significant positive coefficient estimation for urbanization rate and negative one for economic growth at least at %10 significance level. If urbanization rate goes up by %1 then consumer price index jumps by %19.427 whereas %1 rise in economic growth lessens consumer price index by %0.947.

Table 5. *Long-run Coefficient Estimations*

Model: Equation 1			
Variable	*Coefficient*	*t-statistic*	*Prob.*
RURALRATE	-17.1681	-23.0447	0.0000
GROWTH	-0.9951	-2.0747	0.0432
Constant	65.4892	20.7158	0.0000
Model: Equation 2			
Variable	*Coefficient*	*t-statistic*	*Prob.*
URBANRATE	19.4274	16.9815	0.0000
GROWTH	-0.9473	-1.8476	0.0700
Constant	-73.9931	-14.9067	0.0000

Table 6 reports the error correction estimation findings of the model shown Equation 1. Short-run coefficients of INFLATION variable are statistically significant and positive for just first and third lags while unexpectedly we got statistically significant positive coefficient for RURALRATE variable at the current period. The coefficient of error correction term is negative and statistically significant. Moreover, we implemented several diagnostic tests, namely Jerque-Bera normality test, Breusch-Godfrey serial correlation LM test for autocorrelation, Harvey test for heteroskedasticity, and Ramsey RESET test for model misspecification. Test results reveal that ARDL(4,2,0) model does not suffer from autocorrelation, heteroskedasticity, and model misspecification problems except non-normality problem.

Table 6. *Error Correction Estimation (ECM) Results of ARDL(4,2,0) Model*

	Coefficient	*t-Statistic*	*Prob.*
D(INFLATION(-1))	0.7876	5.9104	0.0000
D(INFLATION(-2))	-0.0841	-0.4927	0.6244
D(INFLATION(-3))	0.2554	1.8987	0.0634
D(RURALRATE)	7.2955	2.2016	0.0323
D(RURALRATE(-1))	-5.5317	-1.6178	0.1120
ECMt-1	-0.0474	-4.6264	0.0000
	*EC = INFLATION - (-17.1681*RURALRATE -0.9951*GROWTH + 65.4892)*		
Diagnostic Tests			Test Value / Prob.
Jerque-Bera Normality Test			17.35792 *(*0.00017*)*
Breusch-Godfrey Serial Correlation LM Test			0.956826 *(*0.3913*)*
Harvey Heteroskedasticity Test			0.816524 *(*0.5916*)*
Ramsey RESET Test			2.375527 *(*0.1297*)*

Table 7 depicts the error correction estimation results of the model represented by Equation 2. Short-run coefficient of INFLATION variable is positive and statistically significant whereas unexpectedly we obtained statistically significant negative coefficient for URBANRATE variable at the current period. By the way the coefficient of error correction term is negative and statistically significant in parallel to prior anticipation. Diagnostic test findings reveal that ARDL(2,1,0) model does not contain autocorrelation, heteroskedasticity, and model misspecification problems but non-normality problem.

Table 7. *Error Correction Estimation (ECM) Results of ARDL(2,1,0) Model*

	Coefficient	*t-Statistic*	*Prob.*
D(INFLATION(-1))	0.7247	11.7821	0.0000
D(URBANRATE)	-4.0877	-3.3780	0.0013
ECMt-1	-0.0422	-5.4334	0.0000

*EC =INFLATION- (19.4274*URBANRATE -0.9473GROWTH -73.9931)*

Diagnostic Tests	Test Value / Prob.
Jerque-Bera Normality Test	78.69320 *(*0.0000*)*
Breusch-Godfrey Serial Correlation LM Test	0.409129 *(*0.6663*)*
Harvey Heteroskedasticity Test	1.328027 *(*0.2660*)*
Ramsey RESET Test	0.000398 *(*0.9842*)*

Finally, we performed parameter stability test by utilizing CUSUM test. As seen from Figure 4 and 5 below, we fail to confirm parameter stability for ARDL(4,2,0) model but we confirm parameter stability for ARDL(2,1,0) model.

Figure 4. *CUSUM Test for Parameter Stability of the Model in Equation 1*

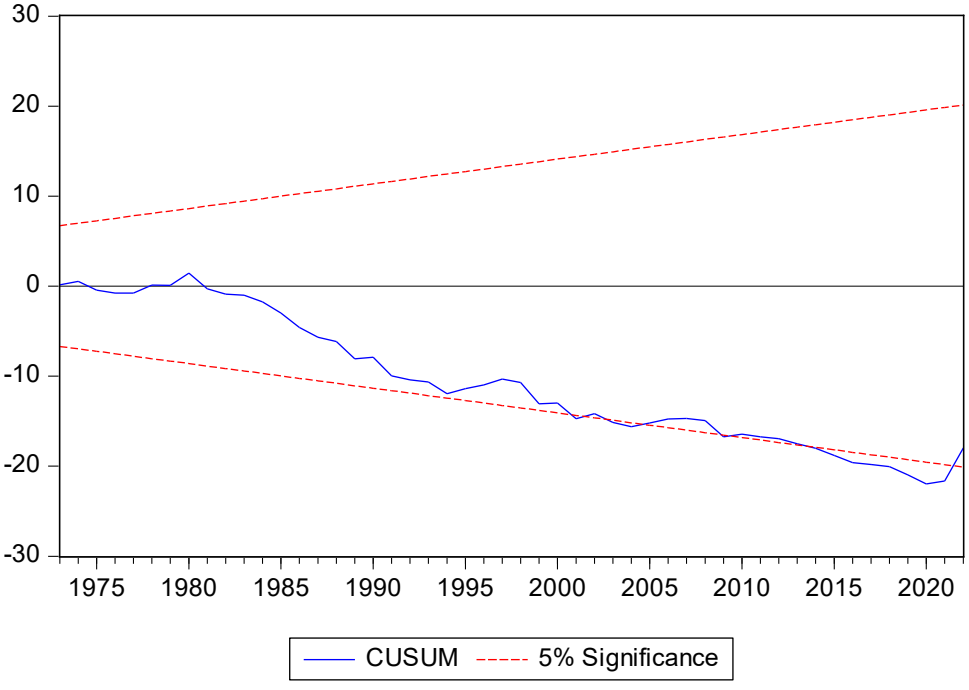
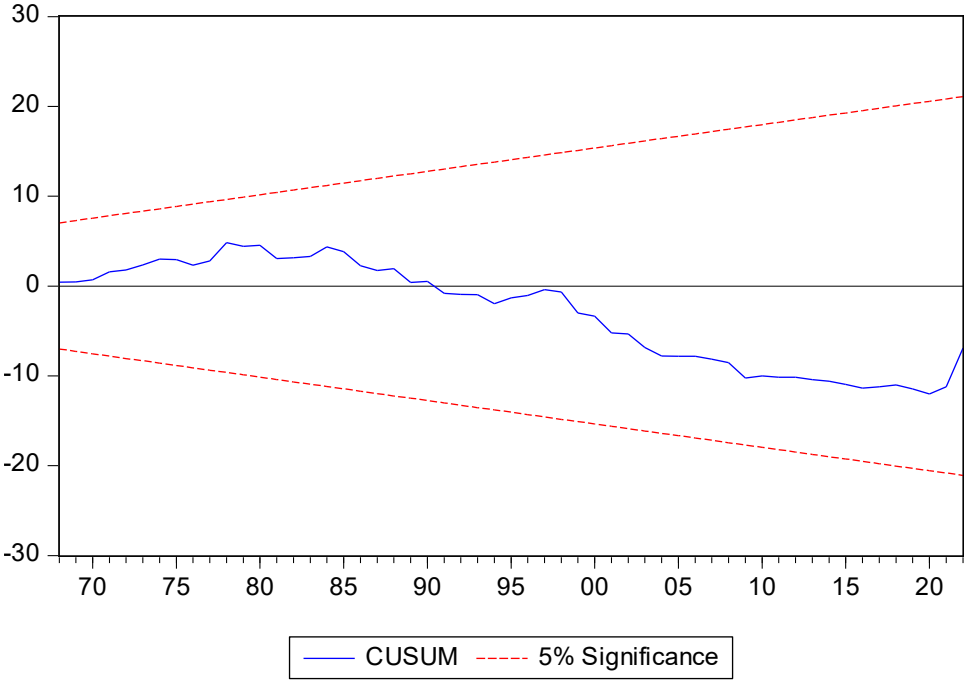


Figure 5. *CUSUM Test for Parameter Stability of the Model in Equation 2*



2. CONCLUSION

In this study we attempted to reveal the short-run and long-run relationship between inflation and urbanization and ruralization rates in Turkey by employing an annual data set for the years between 1960 and 2022 and estimation method of ARDL. KPSS stationarity test findings show that urbanization rate is integrated order one while economic growth, inflation, and ruralization rate are integrated order zero. Co-integration test results obtained from ARDL bound test imply that there is co-integrating association among variables of economic growth, inflation, ruralization rate, and urbanization rate. Put it differently, economic growth, inflation, ruralization rate, and urbanization rate move together in the long-run in Turkey.

Regarding to long-run coefficient estimations, ruralization rate and economic growth have negative and statistically significant coefficient estimations for the first model. More specifically one percent rise in ruralization rate causes to a drop in consumer price index by 17.168 percent. Also one percent jump in economic growth leads to a decrease in consumer price index by 0.995 percent. For the second model, we got statistically significant positive coefficient estimation for urbanization rate and negative one for economic growth. In other words, if urbanization rate increases by %1 then consumer price index goes up by %19.427 while %1 jump in economic growth drops consumer price index by %0.947.

Lastly we implemented several diagnostic tests. According to the diagnostic test findings, none of the models suffers from autocorrelation, heteroskedasticity, and model misspecification, but non-normality problem. Moreover, by utilizing CUSUM test, we confirmed the parameter stability for the second model but not for the first model.

AUTHOR DECLARATIONS

Declarations of Research and Publication Ethics: This study has been prepared in accordance with scientific research and publication ethics.

Ethics Committee Approval: Since this research does not include analyzes that require ethics committee approval, it does not require ethics committee approval.

Author Contributions: The authors have done all the work alone.

Conflict of Interest: There are no conflict of interest arising from the study for the authors or third parties.

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