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Research Article

The validity of the Phillips curve in Türkiye: Evidence from the Cantile Fourier causality test and the wavelet transform consistency test

Türkiye'de Phillips eğrisinin geçerliliği: Kantil Fourier nedensellik testi ve dalgacık dönüşüm tutarlılığı testinden kanıtlar

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Abstract

The relationship between two important macroeconomic indicators, inflation and unemployment, has been extensively studied by economists. The inverse relationship between these two variables is often referred to as the Phillips curve. However, studies have shown that the inverse relationship between these two variables does not always hold. To this end, the validity of the Phillips curve is investigated using monthly inflation and unemployment data for the Türkiye's economy from January 2005 to August 2025. The relationship between these data is examined using current tests such as the Fourier-based Quantile Toda-Yamamoto causality test and wavelet transform consistency. The study's results generally show that the Phillips curve is invalid. However, evidence supporting the validity of the Phillips curve in the Türkiye's economy has been found for certain periods. These findings are limited to the relationship between the youth unemployment rate and the consumer price index.

Keywords: Phillips Curve, Türkiye, Cantile Fourier Causality Test, Wavelet Transform Consistency Test

Jel Codes: E24, E31, J10

Öz

Enflasyon ve işsizlik gibi iki önemli makroekonomik gösterge arasındaki ilişki iktisatçılar arasında yoğun olarak çalışılan bir alandır. Bu iki değişken arasındaki ters yönlü ilişki kısaca Phillips eğrisi olarak tanımlanmaktadır. Fakat yapılan çalışmalar bu iki değişken arasındaki zıt yönlü ilişkinin her zaman geçerli olmadığını ortaya koymaktadır. Bu amaçla Türkiye ekonomisi için Ocak/2005 ve Ağustos/2025 enflasyon ve işsizlik aylık verileri kullanılarak Phillips eğrisinin geçerliliği araştırılmaktadır. Bu veriler arasındaki ilişki ise Fourier tabanlı Kantil Toda-Yamamoto nedensellik testi ve dalgacık dönüşüm tutarlılığı gibi güncel testlerle araştırılmıştır. Çalışmanın sonucunda genellikle Phillips eğrisinin geçersiz olduğu kanıtlara ulaşılmıştır. Ancak Türkiye ekonomisinde bazı dönemlerde Phillips eğrisinin geçerliliğine dönük kanıtlarla karşılaşılmıştır. Bu bulgular sadece genç işsizlik oranı ile tüketici fiyat endeksi arasındadır.

Anahtar Kelimeler: Phillips Eğrisi, Türkiye, Kantil Fourier Nedensellik Test, Dalgacık Dönüşüm Tutarlılığı Testi

Jel Kodları: E24, E31, J10

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Introduction

The original Phillips curve is based on Phillips's (1958) work. This study examined the relationship between unemployment and the rate of change of money wages in the United Kingdom and found a negative association. Some studies have examined similar periods and claimed that the Phillips curve is unstable (Castle and Hendry, 2024). Some studies have also been conducted to prove that the original traditional Phillips curve is invalid (Do and Spanos, 2024). Therefore, the relationship between unemployment and the rate of change of money wages, which entered the literature in 1958 and has changed over time, or the current Phillips curve, the relationship between unemployment and inflation, continues to be frequently researched.

In the literature, some studies examine the validity of the New Keynesian Phillips Curve, which concerns the relationship between wage inflation and unemployment (Ozan and Bakırtaş, 2021). While the New Keynesian Phillips curve describes the inverse relationship between wage inflation and unemployment, the Post-Keynesian Phillips Curve suggests that the relationship between inflation and unemployment can sometimes be positive (Şeker, 2023). Therefore, the Phillips curve, which investigates the relationship between inflation or wages and unemployment, is constantly changing and subject to analysis.

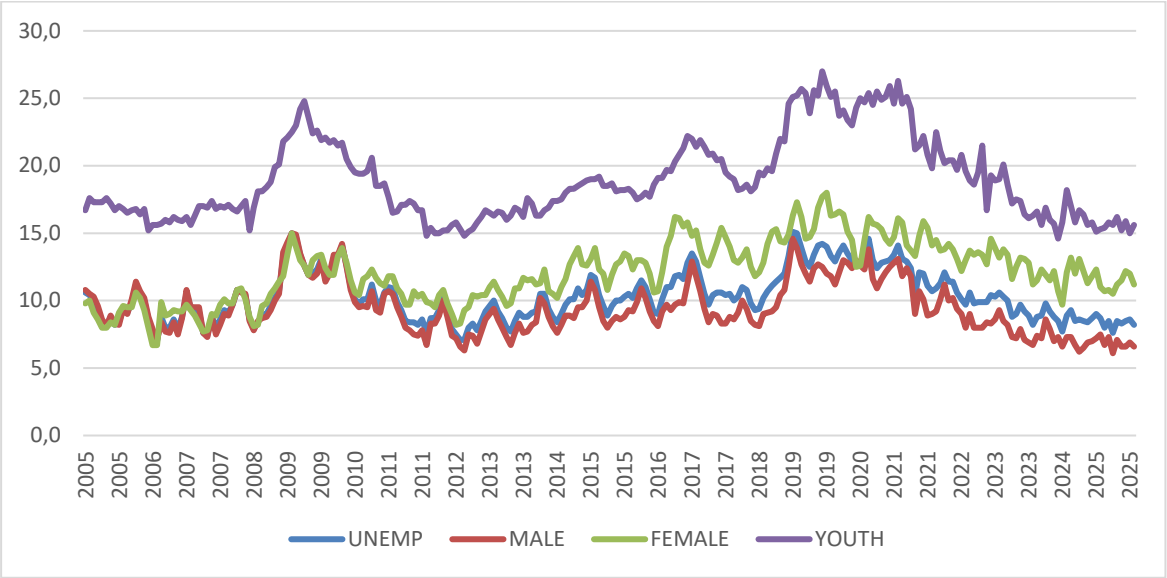

Figure 1: Unemployment Rates

The graph above shows Türkiye's unemployment data between 2005 and 2025. Looking at the graph, it can be seen that over the last 20 years, Türkiye has always had the highest youth unemployment rate. Looking at the unemployment rates for women and men, it is evident that, until 2010, the female and male unemployment rates followed a similar trend in Türkiye. However, since 2010, the unemployment rate for women has been higher than for men almost every year. When the data from the last 20 years is evaluated as a whole, the highest unemployment rate is the youth unemployment rate, followed by the female unemployment rate, the general unemployment rate, and the male unemployment rate.

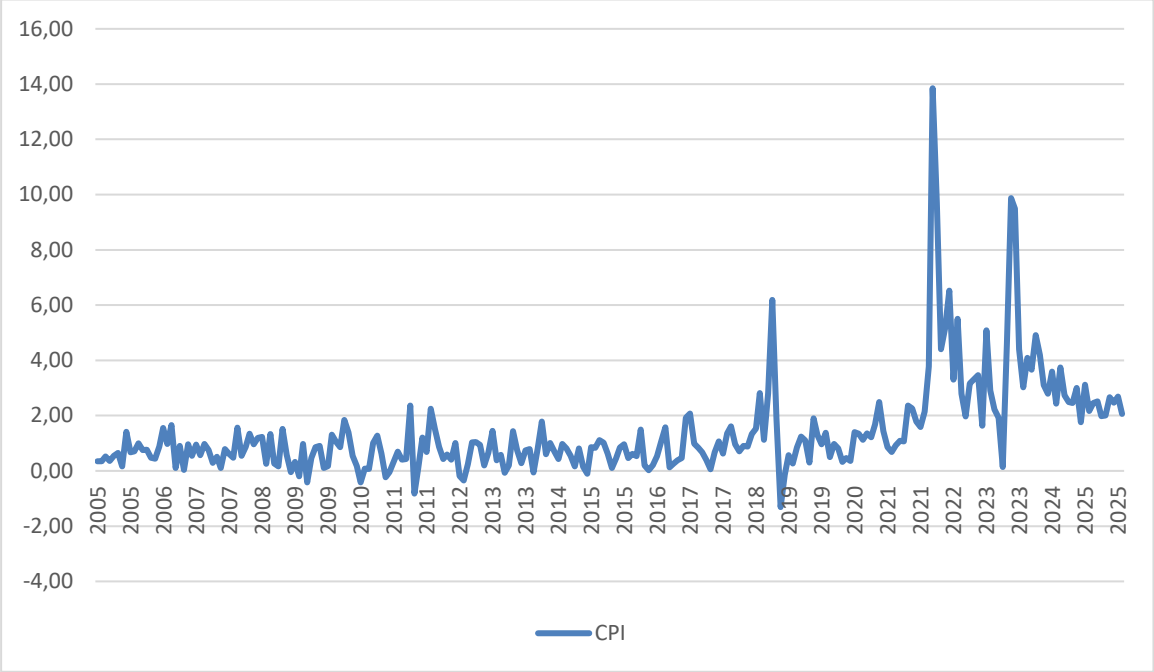

Figure 2: Consumer Price Index

Looking at consumer price inflation data, it can be seen that inflation was balanced during the period from 2005 to 2025. However, it is understood that more intense, sharp breaks marked the period after 2018. While the first sharp break occurred in 2018, the largest occurred in 2021 due to economic policies influenced by the COVID-19 pandemic. The last serious break occurred towards the end of 2023. The graph above shows that the effects of the implemented measures are seen over time.

A review of the literature reveals studies with different results measuring the validity or slope of the Phillips curve. For example, in the literature, Daşdemir (2024), Yağmur (2025a), Karagöl (2024), Buyrukoğlu and Mercan (2022), and Karataş (2024) have concluded that the Phillips curve is valid in Türkiye's economy. Kartal (2024), Ekinci, Güzel, and Kara (2023), Şengönül and Tekgün (2021), and Yıldırım and Sarı (2021) studies concluded that the Phillips curve is both valid and invalid. Olsson (2023) and Aydın (2025) concluded that the Phillips curve is invalid. One of the main reasons for these differing results is the method used (Guirguis, Cwik, DeMauro, and Suen, 2024). Therefore, conducting a study using current analytical techniques to measure the validity of the Phillips curve in Türkiye's economy will contribute to the literature. For this purpose, the Kantil Fourier Toda-Yamamoto Causality Test and the wavelet transform consistency test, which are current econometric methods, were used to analyse the validity of the Phillips curve. Studies examining the validity of the Phillips curve across different inflation regimes have appeared in the literature (Daşdemir, 2024). However, this study examines the validity of the Phillips curve across different unemployment groups using current econometric methods and data.

The study begins with an introductory section that provides general information and graphical representations of the data used. The introduction is followed by a literature review that examines the validity of the Phillips curve using panel and time-series data across various countries. After the literature review, the study investigates the validity of the Phillips curve over time using econometric analysis. Finally, in the results and interpretation section, the findings are evaluated from a scientific perspective and concluded with policy recommendations.

Literature review

The Phillips Curve, the inverse relationship between inflation and unemployment, was first described by Phillips (1958). The original study examined the inverse relationship between the rate of change of money wages and unemployment. This study evolved into its current form with the work of Samuelson and Solow (1960). Following this work, the Phillips Curve underwent further modification by Monetarist economists. In the perspectives developed by Phelps (1968) and Friedman (1968), the existence of two distinct wage rates in the market is discussed. According to these studies, economic expectations are also taken into account, and the effect of expected wages on real wages is emphasised. In this approach, wages in the market are determined by monetary wages, but the worker and employer sides of working life act according to real wages after the contract is signed. In the New Classical approach, adaptive expectations have been replaced by rational expectations (Ekinci et al., 2023).

According to rational expectations, economic actors will learn from their mistakes, and in the long run, the Phillips Curve will become parallel to the inflation axis. The New Classical approach is followed by the Post-Keynesian approach. The Post-Keynesian approach views the Phillips Curve in both symmetrical and asymmetrical terms. Therefore, according to the Post-Keynesian approach, the Phillips Curve can also contain a positive relationship between variables in certain periods and conditions (Şeker, 2023). The method used in this study allows the detection of both positive and negative relationships between variables, making it more feasible to analyse the Post-Keynesian perspective on the Phillips Curve.

In the literature, studies use panel and time-series data analyses to examine the validity of the Phillips curve. For example, some studies analyse country groups using panel data, such as Bozkaya (2023), which examines Brazil, Russia, India, China, and South Africa. The study finds a two-way causal relationship between inflation and unemployment in Russia, whereas in South Africa, it identifies a one-way causal relationship from inflation to unemployment. Similarly, in India and China, a unidirectional causality from unemployment to inflation is observed. Another study by (2021) examines the relationship between inflation and unemployment in a panel of Brazil, Russia, India, China, South Africa, and Türkiye, analysing the validity of the Phillips curve in these countries. The results indicate unidirectional causality from inflation to unemployment, suggesting that the Phillips curve is invalid in this context. Meanwhile, Yağmur (2025b) investigates whether the Phillips curve holds in OECD countries. The findings indicate that it is valid, showing a significant and negative relationship between inflation and unemployment. Specifically, a 1% rise in unemployment is associated with a 0.016% decrease in inflation, confirming an inverse relationship across OECD nations. Likewise, Ispir and Atılgan (2022) examine the Phillips curve across G8 countries and find a negative relationship between inflation and unemployment. Similarly, Alev et al. (2022) analyse a panel including Türkiye and G7 countries and find no evidence supporting the constancy of the Phillips curve in these nations.

In studies conducted across different countries, Kishaba and Okuda (2025) examine the validity and slope of the Phillips curve in Japan's service sector. The results support the hypothesis that the Phillips curve has flattened in Japan's service sector since the early 2000s. Additionally, they find that the Phillips curve in the service sector is flatter than in the goods sector. Benedictow, Larsen, and Sundelius (2025) analyse the validity of the Phillips curve in Norway, specifically in the housing market. Their study indicates that the Phillips curve is valid for housing in Oslo, Norway. Nie et al (2025) investigate the flattening of the Phillips curve in China. Their results show that the Phillips curve was positively sloped at the start of the analysis period. However, when actual costs were included, the curve became statistically insignificant. Furthermore, toward the end of the period, the slope turned negative, though only slightly. Haschka (2024) evaluates the Phillips curve in the United States. The findings suggest that the Phillips curve is valid there, but its effectiveness diminished due to the COVID-19 pandemic. Crump et al (2024) examine whether the increase in the natural unemployment rate after COVID-19 affected the inflation-unemployment relationship. Their results show that the Phillips curve became relatively flatter following the pandemic.

Some studies explore the Phillips curve from different perspectives. In these studies, Kocherlakota (2026) investigates the curvature properties of the Phillips curve. The results show that the short-term Phillips curve is globally concave when the elasticity of substitution for goods exceeds 2. Ashley and Verbrugge (2025) analyse the validity of the Phillips curve concerning whether inflation is persistent or transitory. Their findings suggest the Phillips curve holds when inflation remains stable and consistent. Seip and Zhang (2025) test the validity of the Taylor rule, Okun's law, and the Phillips curve. Their results indicate that during periods of stagnation, Okun's law and the Phillips curve deviate significantly from stationary values, and the roles of the variables change. Jørgensen and Lansing (2025) examine the evolving dynamics of the Phillips curve, including both the original and the renewed Phillips curve. They find that the New Keynesian Phillips curve shifts upward with the use of long-term expectations and remains constant in both its long- and short-term forms. Smith, Timmermann, and Wright (2025) analyse the slope of the Phillips curve using panel data. Their results reveal that the slope after 2004 is -0.14. In their panel data analysis, the slope is -0.48 in wealthy countries and -0.09 in poorer countries.

The literature also includes studies examining the validity of the Phillips curve in Türkiye's economy. These studies can be broadly divided into three groups. In the first group, the Phillips curve is considered valid, while the second group presents evidence that it is both valid and invalid. The third group finds the Phillips curve invalid for Türkiye's economy. In the first group, Daşdemir (2024) investigated the effect of rising general price levels on unemployment, exploring the status of the Phillips curve across various goods and services in Türkiye's economy. The study's results showed a

linear relationship between unemployment and price indices in the footwear and clothing, communications, and entertainment sectors, contrary to expectations. Therefore, it concluded that the Phillips curve varies across different goods and services. It is valid for the overall consumer price index and the food price index. Yağmur (2025a) reached a similar conclusion, examining the Phillips curve's validity in Türkiye's economy across different types of unemployment and inflation. The results suggest that the Phillips curve's validity may depend on the specific types of inflation and unemployment. Karagöl (2024) examined the validity of the Phillips curve in Türkiye's economy and found no causal relationship between inflation and unemployment in either the short- or long-term. However, they identified a one- way causal relationship from unemployment to inflation in the short term. These findings imply that the Phillips curve is only partially valid in Türkiye's economy. Buyrukoğlu and Mercan (2022) investigated the relationship between inflation and unemployment in the context of the validity of the Phillips curve. They found an inverse relationship: a 1% increase in inflation was associated with a 2% decrease in unemployment. Thus, they concluded that the Phillips curve is valid for Türkiye's economy. Karataş (2024) tested the validity of the curve for both the general unemployment rate and the youth unemployment rate, using producer price index data as a proxy for inflation. The results indicated that the Phillips curve is valid for both the general and youth unemployment rates. Tunçsiper and Yamaçlı (2024) examined whether the Phillips curve holds in Türkiye's economy. Their findings suggest that while the Phillips series is not valid for short-term analyses, in the long term, every 1% increase in unemployment causes a 0.8% decrease in consumer prices, leading to the conclusion that the Phillips curve is valid in Türkiye's economy over the long run.

In the second group of studies, Kartal (2024) examined the validity of the Phillips curve in Türkiye's economy. According to the study's findings, a 1% increase in the unemployment rate in the short term decreases the consumer price index by 0.49%, indicating that this relationship holds in the short term. Another finding is that no long-term relationship was found between inflation and unemployment variables in Türkiye's economy. Therefore, the Phillips curve is not valid in Türkiye in the long term. Similarly, the validity of the Phillips curve in Türkiye's economy was investigated. The results showed that, since no long-term causal relationship was found between inflation and unemployment variables in Türkiye, the Phillips curve is invalid. However, the study also found evidence supporting the validity of the Phillips curve, as a relationship between inflation and unemployment was observed in short-term analyses. Şengönül and Tekgün (2021) analysed the validity of the Phillips series across regions in Türkiye. Their results indicated a negative relationship between inflation and unemployment variables in 10 of Türkiye's 26 regions in the short term, while a significant relationship was observed in the remaining 16 regions. Thus, the study provided evidence that the Phillips curve is valid in the short term in ten of Türkiye's 26 regions. Yıldırım and Sarı (2021) examined the validity of the Phillips curve using data on inflation and unemployment in Türkiye's economy. Their results showed that, in the model where unemployment is the independent variable, a 1% increase in unemployment leads to a 1% increase in inflation. Conversely, in the model where inflation is the independent variable, a 1% rise in inflation leads to a 0.23% increase in unemployment. Therefore, the Phillips curve was deemed invalid in Türkiye's economy when inflation or unemployment is the dependent variable.

Finally, in the third group of studies, Olsson (2023) examined the relationship between inflation and unemployment variables in Türkiye's economy. The results indicated a linear, positive relationship between inflation and unemployment in Türkiye's economy. Therefore, the Phillips curve was found to be invalid in Türkiye's economy. Aydın (2025) also investigated the validity of the Phillips curve in Türkiye's economy. The study found no long-term relationship between inflation and unemployment in Türkiye's economy. Consequently, the Phillips curve was deemed invalid in Türkiye's economy.

According to the literature, the general unemployment rate is predominantly used in the analysis of the Phillips curve for the Türkiye's economy. However, some studies also utilise the youth unemployment rate. This study aims to evaluate different types of unemployment using a single model. In this way, it investigates how the heterogeneous structure of the labour market is reflected in the Phillips Curve model.

Data set and method

The methods described above are used to examine consumer price index, general unemployment rate, male unemployment rate, female unemployment rate, and youth unemployment rate data for the Türkiye's economy, based on 250 observations. Data on the variables were obtained from the Türkiye Statistical Institute and are seasonally adjusted. Descriptive statistics for these data are given in the table below. Descriptive statistics for these data are provided in the table below.

Table 1: Descriptive Statistics

	CPI	UNEMP	MALE UNEMP	FEMALE UNEMP	YOUTH UNEMP
Mean	1.387	10,296	9,443	12,094	18,928
Median	0.920	10,000	9,000	12,000	18,200
Maximum	13,850	15,100	15,000	18,000	27,000
Minimum	-1,310	7,000	6,100	6,700	14,600
Std. Dev.	1,718	1,840	1,954	2,279	3.047
Skewness	3.340	0.608	0.677	0.131	0.811
Kurtosis	19.157	2.598	2.806	2.479	2.658
Jarque-Bera	3,183.813	17,065	19,485	3,532	28,639
Probability	0.000	0.000	0.000	0.171	0.000
Sum	346,850	2,574,100	2,360,700	3,023,400	4732.100
Sum Sq. Dev.	734,910	843,447	950,412	1,292,990	2,312,368
Observations	250	250	250	250	250

Fractional Frequency Fourier Augmented Dickey Fuller Unit Root test equations used

$$\Delta Y_t = \delta_0 + \delta_1 \sin\left(\frac{2\pi kt}{T}\right) + \delta_2 \cos\left(\frac{2\pi kt}{T}\right) + \delta_3 Y_{t-1} + \sum_{i=1}^{P} ai\Delta Yt - i + v_t \quad (1)$$

$$Y^*_t = a_0 1^*_t + \beta_0 t^*_t + \lambda_1 \sin^*_{1,t} + \lambda_2 \cos^*_{1,t} + \mu_t \quad (2)$$

Equation (1) represents the Fourier Augmented Dickey Fuller unit root test, while equation (2) represents the equation that includes fractional frequencies in the analysis.

The Fourier quantile causality test is formulated by equation (3), which allows the analysis to observe soft breaks with d(t). In the model, "k" denotes the frequency of the Fourier function, and "T" denotes the number of observations (Nazlıoğlu et al., 2016).

$$d(t) = y_0 + y_1 \sin\left(\frac{2\pi kt}{T}\right) + y_2 \cos\left(\frac{2\pi kt}{T}\right) \quad (3)$$

$$Y_t = y_0 + y_1 \sin\left(\frac{2\pi kt}{T}\right) + y_2 \cos\left(\frac{2\pi kt}{T}\right) + \sum_{j=1}^{m} \cdot \sum_{i=1}^{l+n} Vj,_i X_{j,t-i} + \varepsilon_t \quad (4)$$

In Equation (4), Y represents the dependent variable, while X represents the independent variable. n denotes the highest degree of integration, and "l" denotes the delay length.

Equation (5) is estimated by selecting the optimal frequency and optimal delay values. The "Z" in the equation represents the matrix of all common variables.

$$Q_{Yt}(\tau \mid Z) = y_0(\tau) + y_1(\tau) \sin\left(\frac{2\pi k*t}{T}\right) + y_2(\tau) \cos\left(\frac{2\pi k*t}{T}\right) + \sum_{i=1}^{l*+n} \theta i(\tau)\, Yt - i \quad \sum_{i=1}^{l*+n} Vj, i(\tau) + X_{j,t-i} + \varepsilon_t \quad (5)$$

In this equation, Z represents the matrix of all common variables.

H_0: Causality exists between variables

H_1: No causal relationship exists between the variables

The Wald test used in the model is calculated as follows.

$$Wald = [T(Ej(\tau))/\ (\Omega(\tau))\text{-}1\ (Ej(\tau)))] / \tau(1-\tau) \quad (6)$$

In this equation, "Ej(τ)" is the vector coefficient estimate of the τ quantile, and the notation Ω(τ) represents the consistency of the estimator of the variance or covariance matrix of Ej(τ).

Four different models are analysed in this study.

$$\Delta CPI_t = \beta_0 + \beta_1 UNEMP + \varepsilon_t \quad (7)$$

$$\Delta CPI_t = \beta_0 + \beta_1 MALE + \varepsilon_t \quad (8)$$

$$\Delta CPI_t = \beta_0 + \beta_1 FEMALE + \varepsilon_t \quad (9)$$

$$\Delta CPI_t = \beta_0 + \beta_1 YOUTH + \varepsilon_t \quad (10)$$

Equation 7 examines the relationship between inflation and the overall unemployment rate, while equations 8, 9, and 10 examine the relationships between inflation and male, female, and youth unemployment, respectively.

Empirical findings

When examining the table above, the youth unemployment rate is the highest, followed by the female, general, and male unemployment rates.

The unit root inclusion or stationarity tests for these variables are provided in the table below.

Table 2: Results of the Fractional Frequency Fourier Augmented Dickey-Fuller Unit Root Test

Variable Name	Frequency	Min. KKT	F Constraint Test	Optimal lag length	FADF Test requirement:
CPI	1.3	328.9347	5.122539	2	-6.54514
UNEMP	2	127.2686	4.899112	15	-3.68719
MALE UNEMP	2	165.779	7.026018	14	-4.85183
FEMALE UNEMP	0.1	164.1259	3.756331	15	-3.20881
DFEMALE UNEMP	3.9	174.8284	2.218142	15	-5.02087
YOUTH UNEMP	2	175.81	5.449289	15	-1.84787
DYOUTH UNEMP	3.8	166.5438	6.135603	13	-6.90437

The table above shows the results of the fractional frequency Fourier Augmented Dickey Fuller unit root test. When the results in Table 2 are examined, it is concluded that the consumer price index, the general unemployment rate, and the male unemployment rate are stationary at their level values. However, it is concluded that the female and youth unemployment rates are stationary after taking first differences. The unit root tests indicate that the variables are stationary at different levels. For this reason, the Fourier-based quantile Toda-Yamamoto causality test will be applied to investigate the causality dimension of the relationship between the variables.

Table 3: CPI and UNEMP Quantile Fourier Toda-Yamamoto Causality Test Results

Quant.	**CPI→UNEMP**				**UNEMP→CPI**			
	Wald. Stat.	**Critical Value**			**Wald Stat.**	**Critical Value**		
		10	**5**	**1**		**10**	**5**	**1**
0.1	6,551	17,546	28,721	32,569	4,596	31,526	34,140	38,795
0.2	1,136	14,857	16,639	18,136	4,644	16,435	23,722	29,477
0.3	2,969	11,139	12,695	25,643	10,121	17,828	21,033	22,245
0.4	3,481	12,078	14,573	20,096	13,874	14,761	17,374	23,036
0.5	5,865	11,779	13,841	15,979	**18,121**	**15,958**	**18,037**	**23,830**
0.6	8,589	11,846	13,540	16,367	**18,166**	**16,773**	**19,488**	**21,220**
0.7	3,996	15,090	15,597	22,423	**35,885**	**21,421**	**26,073**	**31,689**
0.8	7,604	15,000	17,149	23,249	25,641	31,843	36,373	58,242
0.9	2,164	15,942	18,758	25,781	43,298	52,146	67,569	90,696

CPI and UNEMP Quantile Fourier Toda-Yamamoto. The causality test results showed no causality from the consumer price index to unemployment across any quantile. However, when testing for the causal relationship between unemployment and the consumer price index, causality was observed at the 5th,

6th, and 7th quantiles. Therefore, the conclusion that unemployment causes inflation was evident in only three of nine quantiles over the 250-observation period.

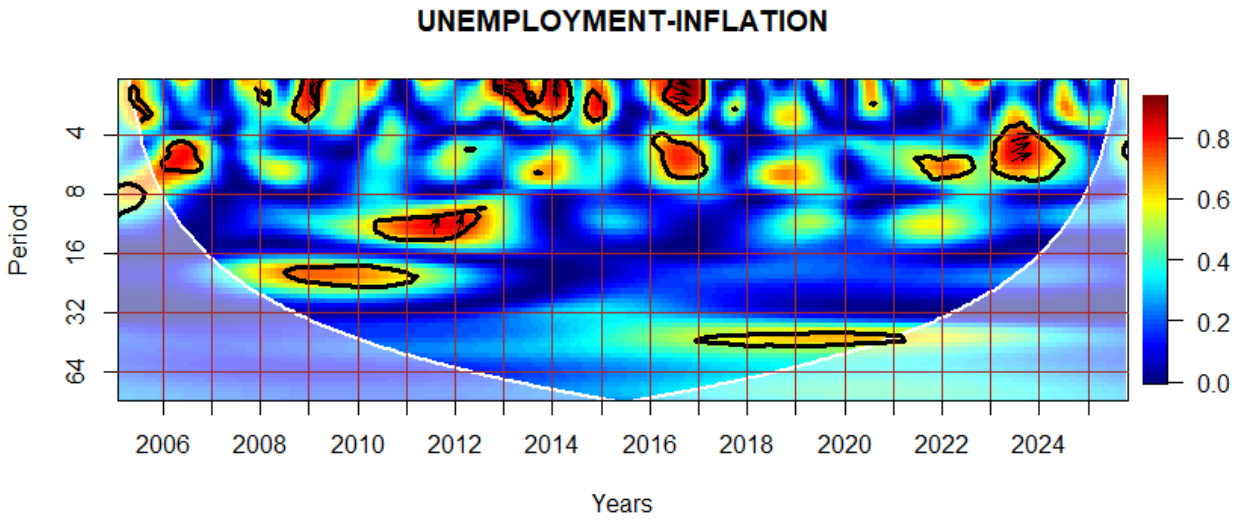

Figure 3: Unemployment-Inflation

According to the wavelet transform consistency analysis used to determine the direction of the relationship between unemployment and inflation, a positive relationship was observed at medium frequency in 2013 and 2014, and at low frequency between 2010 and 2013. Similarly, a positive relationship was observed at low to medium frequencies between 2023 and 2024. Therefore, according to the wavelet transform consistency results, a result supporting the Phillips curve, which claims a negative relationship between unemployment and inflation, was obtained.

The 2018 exchange rate shock and the monetary policy adjustments after 2021 mark important periods for Türkiye's economy. During these times, the link between unemployment and inflation became especially prominent. A possible outcome of this link is a persistent correlation between the two variables over the medium- and long-term. The simultaneous increases in inflation and unemployment after 2018 challenge the traditional Phillips curve approach and suggest the emergence of a structure akin to stagflation.

Table 4: CPI and MALE Quantile Fourier Toda-Yamamoto Causality Test Results

Quant.	CPI→MALE UNEMP				MALE UNEMP →CPI			
	Wald. Stat.	Critical Value			Wald Stat.	Critical Value		
		10	5	1		10	5	1
0.1	9,778	23,049	31,813	46,192	10,694	34,128	40,701	56,260
0.2	3,990	18,718	23,045	37,244	8,293	21,310	22,474	25,902
0.3	3,170	19,975	23,502	32,177	4,954	17,676	19,515	21,319
0.4	3,510	16,690	20,669	25,555	6,313	14,905	18,004	21,818
0.5	6,129	15,816	20,484	22,044	8,817	14,982	17,590	20,737
0.6	8,790	14,287	14,531	25,826	10,505	16,047	19,648	25,091
0.7	7,641	16,286	17,531	32,057	8,366	17,358	22,405	33,787
0.8	8,954	16,909	18,766	19,678	9,524	20,363	22,491	26,326
0.9	3,995	22,202	25,319	38,019	19,060	24,515	36,864	49,206

When examining the causality results between the consumer price index and the male unemployment rate, similar results were obtained to those from the causality test between the general unemployment rate and the consumer price index. According to Table 3, there was no causal relationship between the consumer price index and the general unemployment rate. According to Table 4, no causality was found in either direction between the consumer price index and the male unemployment rate, or between the male unemployment rate and the consumer price index.

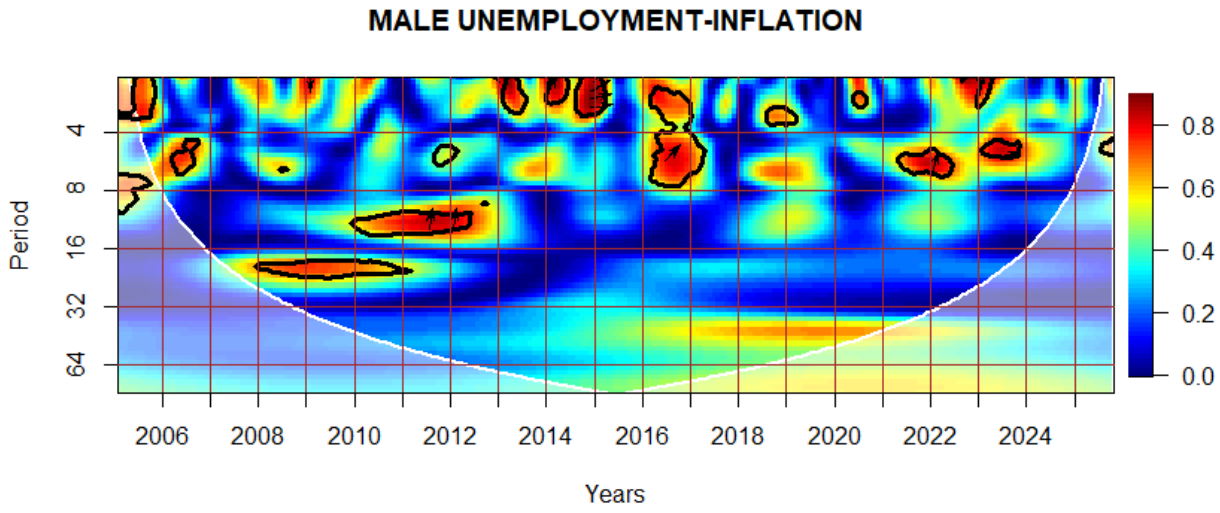

Figure 4: Male Unemployment-Inflation

According to the consistency analysis results of the wavelet transformation applied to determine the direction of the relationship between the male unemployment rate and inflation, a medium-frequency positive relationship was found from 2010 to 2013, a low-frequency positive relationship in 2015, a medium-low frequency positive relationship in 2016, and finally a medium-low frequency positive relationship in 2022. These results show that no conclusion can be drawn about the validity of the Phillips curve between the male unemployment rate and consumer price inflation.

Table 5: CPI and FEMALE Quantile Fourier Toda-Yamamoto Causality Test Results

Quant.	CPI→FEMALE UNEMP				FEMALE UNEMP →CPI			
	Wald. Stat.	Critical Value			Wald Stat.	Critical Value		
		10	5	1		10	5	1
0.1	12,026	20,773	24,423	36,769	26,326	28,035	34,304	53,674
0.2	8,516	28,843	32,009	42,255	17,001	20,973	23,330	42,168
0.3	7,479	27,622	28,803	31,001	10,473	18,178	20,766	28,975
0.4	2,394	29,648	31,622	40,414	6,614	11,177	13,363	24,382
0.5	4,795	24,294	30,146	46,753	5,067	10,600	15,996	22,417
0.6	6,543	21,855	30,996	45,163	5,380	12,019	14,623	28,286
0.7	6,614	23,596	26,582	32,201	3,994	16,290	18,216	25,090
0.8	8,997	30,221	32,300	39,590	9,386	24,017	25,277	26,961
0.9	3,084	37,635	45,949	72,683	6,837	30,951	38,929	43,193

CPI and FEMALE Quantile Fourier Toda-Yamamoto Causality Test Results when examining the causality results from the consumer price index to the female unemployment rate, no causality relationship was found in any quantile. Similarly, when examining the causal relationship between the female unemployment rate and the consumer price index, no significant causal relationship was found at any of the 9 quantiles. This indicates that evidence has been found that the Phillips curve is invalid between the female unemployment rate and the consumer price index.

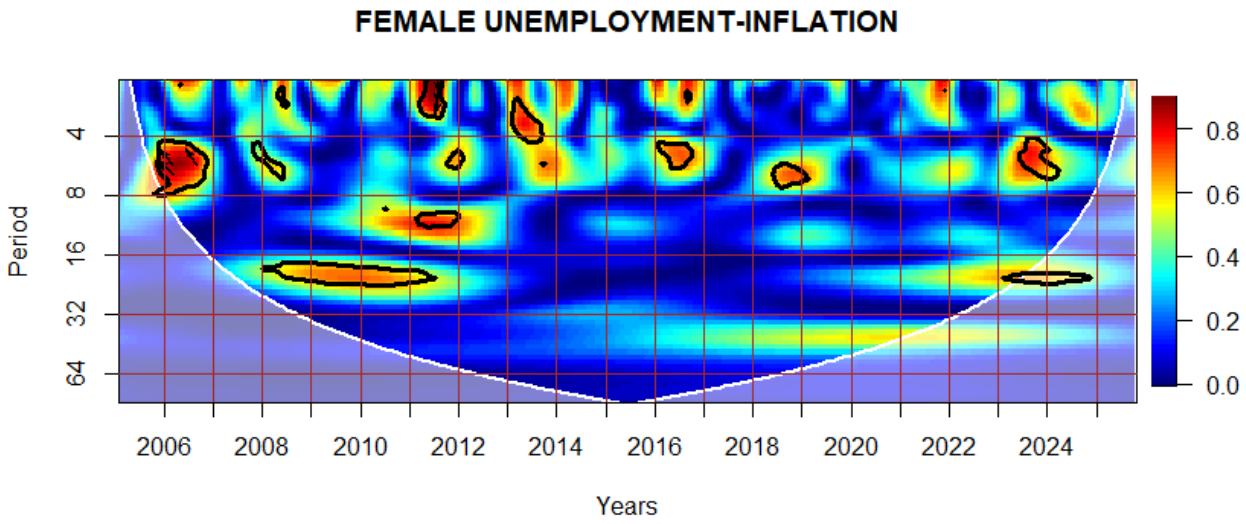

Figure 5: Female Unemployment-Inflation

When examining the wavelet-transformed results for the direction of the relationship between the female unemployment rate and the inflation rate, a significant relationship was observed only in 2006, when both positive and negative relationships were observed. This relationship is valid at medium and low frequencies. Furthermore, the figure above shows a positive relationship at low frequencies in 2011. Therefore, evidence indicates that the Phillips curve is invalid for the relationship between the female unemployment rate and inflation.

Table 6: CPI and YOUTH Quantile Fourier Toda-Yamamoto Causality Test Results

Quant.	CPI→YOUTH UNEMP				YOUTH UNEMP →CPI			
	Wald. Stat.	Critical Value			Wald. Stat.	Critical Value		
		10	5	1		10	5	1
0.1	15,691	23,290	28,167	36,179	1,551	18,919	28,808	53,758
0.2	8,875	18,114	21,217	34,709	0.487	12,978	19,809	28,686
0.3	4,787	15,462	21,265	24,966	1,271	8,528	10,227	18,303
0.4	3,543	14,408	20,690	21,835	3,281	8,932	11,088	16,354
0.5	2,579	16,664	18,045	20,454	4,342	8,935	9,453	13,202
0.6	4,202	15,808	17,666	27,998	2,448	9,016	10,283	12,831
0.7	3,591	18,554	22,050	31,662	7,743	8,025	8,489	12,192
0.8	8,977	21,773	24,021	29,534	11,209	13,533	15,818	18,904
0.9	**38,690**	**37,894**	**40,127**	**63,264**	**23,473**	**18,664**	**31,687**	**35,747**

CPI and YOUTH Quantile Fourier Toda-Yamamoto Causality Test results show that a causality relationship from the consumer price index to the youth unemployment rate was only found in the ninth quantile. Similarly, when examining the causal relationships between the youth unemployment rate and the consumer price index, a significant causal relationship was found only at the 9th quantile. In this case, a causal relationship between the consumer price index and youth unemployment was observed only at the ninth quantile, and results indicated that the Phillips curve may be valid.

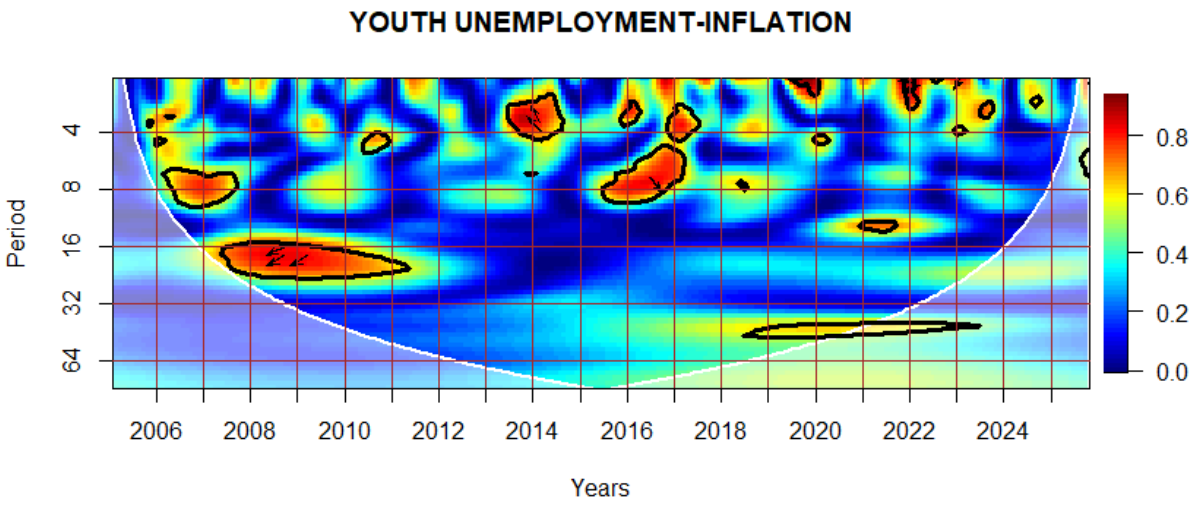

Figure 6: Youth Unemployment-Inflation

A wavelet consistency analysis was used to determine whether the relationship between the youth unemployment rate and the consumer price index was positive or negative. The analysis results showed a negative relationship at medium-frequency ranges between 2007 and 2012. It was also concluded that in 2014, both positive and negative relationships occurred at low frequencies, but between 2016 and 2017, a negative relationship was observed at medium-low frequencies. Therefore, these results suggest that the Phillips curve is valid between the youth unemployment rate and the consumer price index in some periods but is generally not valid.

Conclusion and interpretation

This study analysed monthly data from 2005 to 2025, including the consumer price index and various unemployment rates—overall, male, female, and youth. The findings indicate that the Phillips curve does not hold for the overall, male, or female unemployment rates. However, the relationship between youth unemployment and inflation suggests the Phillips curve is valid only during certain periods. For most of the study period, there was no significant link between youth unemployment and the consumer price index. Overall, these results imply that the Phillips curve does not apply in Türkiye. Comparing these findings with existing literature reveals some similarities. Kartal (2024), Ekinci, Güzel, and Kara (2023), and Şengönül and Tekgün (2021) found that the Phillips curve can be both valid and invalid. In this study, especially when examining the relationship between youth unemployment and the consumer price index, the Phillips curve appears both valid and invalid. Overall, findings were similar to those of Olsson (2023) and Aydın (2025). Therefore, no significant relationship was found between the consumer price index, which can guide economic policies in Türkiye, and different types of unemployment.

This study utilises wavelet transformation analysis, a dynamic method that examines periods separately, to analyse the relationship between inflation and unemployment rates. One of the most important features of this analysis technique is that it doesn't evaluate the entire time dimension from a single perspective, but reveals all correlations that change over time. The relationship between the general unemployment rate and inflation, shown in Figure 3, demonstrates a generally direct correlation between the two. This suggests that the post-Keynesian approach, which proposes a positive relationship between inflation and unemployment rates in some periods, is valid. Therefore, the post-Keynesian Phillips curve, indicated by the upward and rightward arrows, is valid for the relationship between the general unemployment rate and the inflation rate in Türkiye's economy in 2011-2014, 2016, and 2023. A similar situation is observed between the male unemployment rate and the inflation rate. A positive relationship between the inflation rate and the male unemployment rate was found between 2010 and 2015, in 2016, and finally in 2022. This confirms the post-Keynesian approach, which suggests a positive relationship between inflation and unemployment rates in some periods. Although very limited, a positive correlation was found between the female unemployment rate and the inflation rate in 2006 and 2011. These results show that the relationship between the female unemployment rate and the inflation rate supports the post-Keynesian approach.

The relationship between the youth unemployment rate and the inflation rate is examined in Figure 5. Specifically, the negative relationship between the variables from 2007 to 2012 became positive in 2014, but the trend reversed to negative between 2015 and 2017. Therefore, the post-Keynesian approach,

which suggests that there may be a direct correlation between the unemployment and inflation rates at times, is precisely confirmed in the relationship between the youth unemployment rate and the inflation rate.

Based on these findings and the 250-month observation results for Türkiye's economy, no clear correlation was identified between the inflation rate and the overall unemployment rate, the youth unemployment rate, the male unemployment rate, and the female unemployment rate. This contradicts existing studies that suggest an inverse relationship between inflation and unemployment. The results from this study, due to the timeliness and dynamic nature of the analysis methods employed, show a positive relationship between inflation and unemployment in some periods and a negative one in others between 2005 and 2025. However, one of the most notable findings is the failure to establish a consistent, highly significant relationship between the inflation rate and the youth unemployment, overall unemployment, female unemployment, and male unemployment rates. Therefore, it is possible to implement inflation and unemployment policies independently in Türkiye's economy from an economic policy standpoint. Additionally, the validity of the Post-Keynesian approach in Türkiye's economy appears more plausible than other approaches. For this reason, following other doctrines and theories from the Post-Keynesian school of thought when shaping inflation and unemployment policies is important for ensuring their effectiveness and efficiency.

The study demonstrates that, in addition to the relationship between inflation and unemployment, the unemployment rates for women, men, and youth fluctuate over time. The wavelet analysis results reveal that this relationship does not follow a fixed, linear pattern but varies over time in response to financial crises, changes in the financial system, and related factors. These findings suggest that the Phillips curve relationship for Türkiye's economy weakens at certain intervals and, in some cases, even reverses. They indicate that, rather than applying uniform policies, targeted strategies should be developed for specific groups.

Furthermore, since the relationship between price structure and employment may change over time, policy coordination needs to be strengthened. On the other hand, within the classical Phillips curve framework, youth unemployment is the most vulnerable form of unemployment. In the short and medium terms, young people are the first group affected by inflation in the labour market during the periods examined. Therefore, active labour market policies prioritising young people, such as supporting vocational training and entrepreneurship, are recommended for Türkiye's economy during periods of inflation.

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