Analysis of the Phillips Curve: An Assessment of Turkey

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Abstract

This study analyzes the validity of the Phillips curve with regards to Turkey. The existence and direction of the causality relationship (reason-outcome relationship) between unemployment and inflation is investigated using inflation and unemployment data for the period 1980-2019. Unit root tests were utilized to evaluate the stationarity of the series. In line with the Zivot-Andrews unit root test, which was developed in response to the criticism of the failure of studies that presented macro-variables like inflation to consider traditional unit root tests, in this research, the Engle-Granger cointegration test was implemented to check whether the series could perform a joint action, and, finally, the Granger causality relationship was explored. According to the results of the analysis, over the relevant period there was a single directional causality relationship from inflation toward unemployment in Turkey. The importance of this relationship at the 10% significance level indicates the existence of many different factors that affect inflation and unemployment. Given the existence of a cointegration and causality relationship between inflation and unemployment, it can be said that, in Turkey, the Phillips curve is valid for the period 1980-2019 and that an increase of 1% in inflation will reduce the unemployment rate by 0.028%.

1. Introduction

Inflation and unemployment concepts continue to be a hot topic in the agenda of economies, and these concepts play a role in a vast array of domains ranging from molding government policies to voter behaviors. That being said, the American ethics of politics similarly emphasizes that, in state economies, the "two greatest" concepts are undoubtedly unemployment and inflation, so much so that those two magnitudes stand before us as the key determinants of the quality of life in a country (Nar & Nar, 2019). The causality relationship between inflation and unemployment has constituted the subject matter of many studies, and, in the studies conducted by New Zealander economist A.W. Phillips, the very same relation embraced a new dimension. Phillips argued that a reverse (negative) relationship between both variables is stable. The researcher structured his argument on the basis of 100 years of "wage inflation" and "unemployment" data obtained from England. This hypothesis that was based not on an analysis but simply an evaluation of the data was, in subsequent periods, reviewed by Robert Solow and Paul Samuelson who reinterpreted Phillips curve and reintroduced it to the agenda by conducting studies that merely focused on inflation and unemployment data.

By taking U.S data into account, Solow and Samuelson updated and modified the Phillips curve. The existence of the current relationship in US was proved. Thus, this analysis became a source of inspiration for governments that acted as decision-makers in Politics. Built upon a simple trade-off, this hypothesis gained so much attention that there has been an increase in dedicated attempts to prove and support the stable structure of the Phillips curve. In that way, the Phillips curve turned into an "option menu" that reduced macroeconomic problems from a fiscal policy perspective to a simple dilemma and presented to policy-makers different versions of the two dissimilar choices like inflation and unemployment, and, as another alternative, the curve became a "policy tool." As also suggested by Newman (1958), the

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dilemma of price level and employment has evolved into an almost-open arena.

This study, which examines the Phillips curve hypothesis in relation to the Turkish economy, aimed to investigate whether the same hypothesis is valid on the basis of the unemployment and inflation data of the 1980-2019 period. According to the results of this analysis, it was concluded that, for this period, a one-way causality relationship from inflation to unemployment prevailed in Turkey.

2. Theoretical Framework

In his 1958 article, Alban William Phillips examined the relationship between the growth ratio in nominal wages and unemployment ratios by harnessing around 100 years of data for the period of 1861-1957 in England. According to the result of this research, a reverse and stable relationship existed between wage inflation and unemployment. Phillips's original curve explained the link between nominal wages (W) and unemployment (U). Accordingly, the Phillips curve exhibits two main features:

(i) When the unemployment ratio is at the frictional unemployment level (5.5%), no change takes place in nominal wages.

(ii) When the unemployment ratio lowers, the climb in money wages is quicker whereas when unemployment ratio increases, the ratio of increase in money wages is slower.

In that case, a low unemployment ratio is reliant on the rise in nominal wages, and once nominal wages go down, the unemployment ratio moves up. Therefore, an original Phillips curve with a negative slope is produced. In Figure 1, the focus is on the reverse, or, in other words, the presence of a nonlinear relationship, and in Figure 1, it may be seen that the Phillips curve drawn on the basis of a zero inflation expectation possesses a stable structure (Bilgili, 2009; Frisch, 2010; Mustafa & Sivarajasingham, 2019).
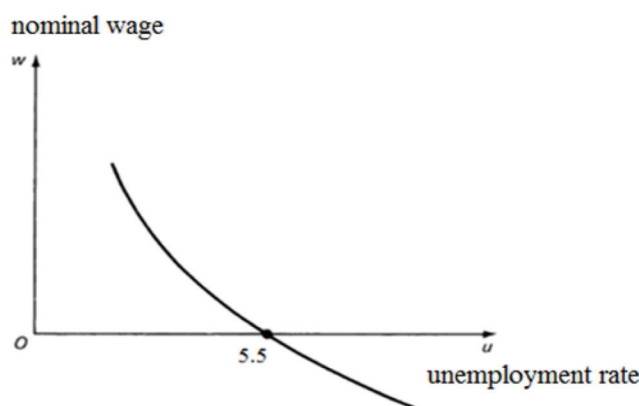

nominal wage

Figure 1: Original Phillips Curve

Source: (Frisch, 2010).

On the other hand, having reinterpreted the original Phillips curve, Robert Solow and Paul Samuelson analyzed the relationship between wage inflation and unemployment simply by depending on the links between "inflation and unemployment" and readjusted the relationship (modified Phillips curve or Keynesian Phillips curve). From this analysis that researchers presented in relation to pre-1960 data (1934-1958) from the U.S, it is possible to obtain the findings validating the existence of the Phillips curve. Figure 2 displays a modified Phillips curve. In the vertical axis, inflation ratio and in the horizontal axis, unemployment ratio is seen and there is a negative correlation between them. The exchange (trade-off) between inflation and unemployment is explained by a reciprocal trade-off between macroeconomic values. Agenor and Montiel (2015) argued that, since in subsequent periods, wage inflation triggered price inflation (wage-price spiral), it is safe to claim that no significant difference exists between the "original Phillips curve" and the "modified Phillips curve" (Colander & Gamber, 2006; Kaliyeva et al., 2018; Wulandari et al., 2019).

In Figure 2, high inflation ratios correspond to low unemployment levels whilst low inflation ratios correspond to high unemployment levels. To illustrate, when the unemployment ratio falls from eight percent to four percent, the inflation ratio moves up from three percent to seven percent (Point A). In other words, as inflation (overall level of prices) goes down, unemployment ratios escalate (Point B). Expansionary monetary (financial) policies adopted by governments to boost total demand lead to a total demand surge in economies. As a result of the rise in demand, the inflation ratio, that is, the overall level of prices, also skyrockets. While prices increase, employment with production climbs and unemployment lowers. Hence, as low unemployment becomes a reality in spite of high inflation, low inflation is realized at the expense of high unemployment. These explanations are also a summary of the studies conducted by Solow and Samuelson. In Figure 2, deciding what to choose between points A and B is a reflection of the public decision-making processes of governments.

This analysis based upon a simple trade-off gained such popularity that it began to be supported by dedicated studies aimed at proving the stable structure of the Phillips curve. At first, even Phillips himself avoided presenting the curve as a policy tool, but only two years later, Samuelson and Solow with their analyses turned Phillips curve into an "option menu" and "policy tool" that reduced macroeconomic problems to a simple dilemma from an economic policy perspective and presented different versions of two dissimilar choices to policy makers. In short, the Phillips curve played a critical role in the decision-making process that was related to macroeconomic policy. As also suggested by Newman (1958), the dilemma between price level and employment has evolved into an almost open arena (Furuoka, 2007; Schwarzer, 2013).
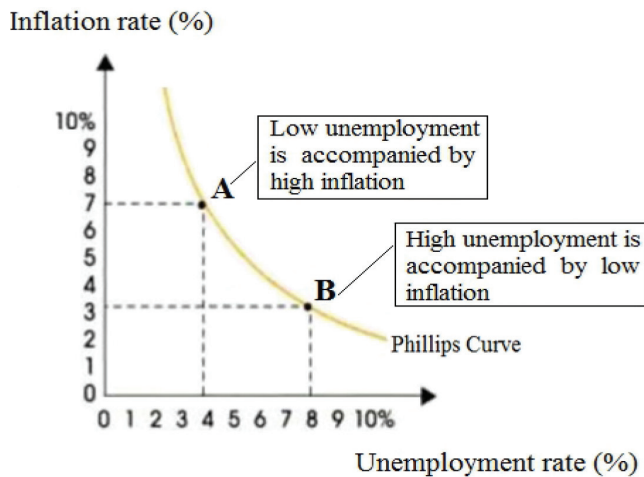
Figure 2: Modified Phillips Curve

Source: (Colander & Gamber, 2006).

The Phillips curve that was modified so that Keynesian economy models in that process became the main concept used to explain the ties between inflation and unemployment. The Keynesian approach took it one step further and concluded that the oppositional and stable relationship between unemployment and inflation could take place in the long term as well as in the short term. According to Keynesian policies, in an economy with missing employment (underemployment), expansionary financial and monetary policies towards enhancing total demand results in a rise in total demand. Once the overall level (inflation) of prices moves up, production and employment rise, and unemployment falls. Upon attaining a full employment level, expansionary policies towards boosting total demand can only elevate the overall level of prices. The Keynesian economic approach emphasizes the oppositional relationship between inflation and unemployment ratios on the basis of the Phillips curve and suggests that inflation and unemployment can in any economy. But it also underlines the presence of high unemployment at the expense of low inflation or high inflation at the expense of low unemployment. It is thus suggested that, at the expense of one, the other phenomenon occurs, but unemployment and inflation would never concurrently take place (Hetzel, 2007; Hughes & Perlman, 1984; Ngoc, 2020; Schwarzer, 2013).

In contrast to Keynesian policies, at the onset of the 1970s, the notion of stagflation where inflation and unemployment coexisted came onto the stage. That reality led to a questioning if the Phillips curve had suggested the presence of an oppositional relationship between unemployment and inflation. Friedman asserted that, unlike a traditional Phillips curve, the stagflation notion displayed a working structure, and, between inflation and unemployment

not an oppositional, but a positive relationship existed. Besides, higher inflation would eventually result in greater unemployment. This relationship was named slumpflation. This argument claiming that, despite existing in the short term, the Phillips curve would fail to be valid in the long term, provided an explanation for the topic using the concept of the natural unemployment ratio. According to Friedman, whatever the increase in inflation level in the long term may be, unemployment cannot fall under the "natural unemployment" ratio. The non-accelerating inflation rate of unemployment (NAIRU), which is a concept introduced by Franco Modigliani who argued that unemployment would exist at a natural ratio and could never be totally eradicated. Friedman developed Modigliani's insights to mold the natural ratio hypothesis and made use of this concept in interpreting the Philips curve. According to Friedman, "The natural ratio hypothesis notes that fiscal policies cannot leave a systematic effect on real variables. Therefore, in the long term, unemployment ratios would return back to their previous levels, meaning their natural ratio". The natural unemployment ratio consists of the sum of frictional unemployment (incidental-temporary) and structural unemployment, that is, job changes/location changes that led to temporary unemployment. whereas structural unemployment was due to the failure to hire the right personnel for the job. The natural unemployment ratio stems from market frictions when the labor force market stayed in balance. Wrong expectations, job changes, unemployment insurance, minimum wage policy, a higher ratio of women employed in professional life, geographical reasons, and a lower qualified labor force are among the factors behind natural unemployment. In addition to natural unemployment ratios, Friedman and Phelps included expectations in the analysis and attempted powerful explanations as to why a Phillips curve would fail to be valid in the long term despite being valid in the short term. Hence, it becomes feasible to explain stability in the short term and deviations observed in the long term on a more trustworthy basis (Hetzel, 2007; Hughes & Perlman, 1984; Öztürk, 2020).

Expectations are defined as projections that decision-makers expect to potentially take place under specific circumstances. According to Evans and Honkapohja (2001), "Since they offer intellectual causes in response to the widespread disillusionments of traditional finance, expectations hold a noteworthy value in the finance literature." Classical economy is a structure based upon stability; therefore analyses of expectations are grounded on simple arguments. In the Keynesian and Monetarist approaches, on the other hand, adaptive (conformist) expectations are directed toward taking future-oriented decisions into account. Expectations are formed by learning from the past (past experiences). In rational expectations, developed by John Muth, it is suggested that decision units

possess real-time information and manage to take swift future-oriented rational decisions. The theory of adaptive (conformist) expectations claims that price levels for the future are determined on the basis of previous periods. To illustrate; if the inflation ratio is 20% in the previous year, people expect that the current inflation ratio would equal 20%. Provided that, in the current year, the inflation ratio increases/decreases, people predict that, in the following year, the inflation ratio would also increase/decrease; thus, they adapt their behaviors accordingly. However, in rational expectations theory, people adopt rational expectations as opposed to conformist/adaptive ones. In consequence, they waste no time in taking an active stance against fiscal policy practices. This theory suggests that people are fully aware of fiscal policy practices and already expect the effects of such policies and they make no systematic mistakes. Since acting rationally allows people to predict the potential effects of fiscal policies, introduced political decisions also fail to create the expected impacts. Even in the short term, the state has no power to affect employment, price stability, production, and similar fiscal variables by utilizing tools such as taxes, public expenses, and money supply. For instance, when the government supply money to the market in order to raise total demand, decision making units—knowing that they would in the future turn into inflation—make no changes in their total demand level. Decision makers can thus stave off the impacts of fiscal policies; therefore, instead of active economy policies, governments should opt for stable economy policies (Aktan, 2010; Evans & Honkapohja, 2001; Hetzel, 2007; Holly & Hallett, 2010).
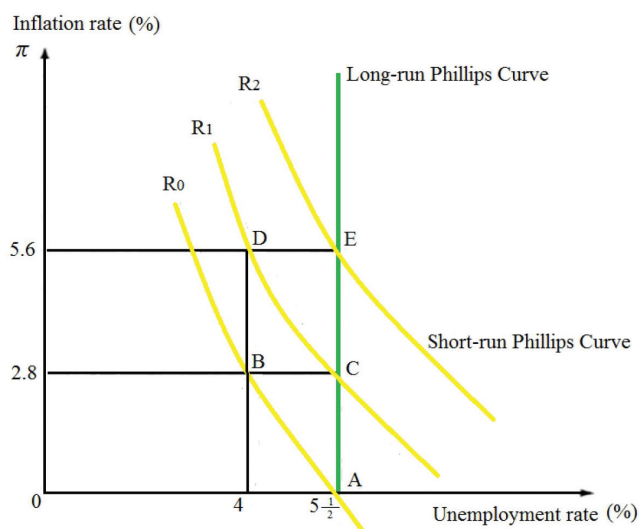

Figure 3: Monetarist Phillips Curve developed by adaptive expectations

Source: (Frisch, 2010).

In Figure 3, the short- and long-term Phillips curves are displayed in tandem. The yellow-colored Phillips curve, in the short term, transforms into a line, colored green, in the long term. This figure suggests that the natural unemployment ratio in the economy is around a five percent ratio (5.5%), and ,in terms of countries in general, the natural unemployment ratio is predicted to vary between three to five percent (Colander & Gamber, 2006). According to Friedman and Phelps, in the long term, no trade-off exists between unemployment and inflation. Growth in money supply determines the inflation ratio. In the long-term, no matter how much the inflation ratio is augmented, unemployment ratios can never be reduced below the natural unemployment ratio. It can thus be argued that, in the long-term, unemployment cannot be forced down by elevating inflation. In the natural unemployment ratio, expected and actualized inflation ratios are even.

Figure 3 exhibits the Monetarist Phillips curve developed by adaptive expectations. The way the long-term Phillips curve is attained has been explained. Through the "natural unemployment ratio" and "expectations," the movement of curve and deviations and deflections on the curve has been clarified. As emphasized earlier, in the fiscal approach of both Keynes and Monetarist, it is assumed that decision-makers act by adopting adaptive or conformist expectations, a proof of the equality between expected inflation and actualized inflation ratios. In Figure 3, the horizontal axis represents the current unemployment ratio (U), and some part of current unemployment takes place as a fixed ratio in the form of the natural unemployment ratio (Point A). In the long term, the natural unemployment ratio is a vertical line free from inflation, and in Figure 3, the R0 curve stands for the short-term Phillips curve. If the government seeks to lower unemployment to 5.5%, which is the natural unemployment ratio, actualized inflation must be bigger than expected inflation, and, to achieve that goal, as argued by Friedman and Phelps, growth in money supply and inflation ratio must be augmented. Growth in money supply boosts income, and increased income results in increased total demand and production. Increased production, in return, allows laborers to find higher wage jobs and the unemployed population to find jobs. As a result, unemployment goes below the natural ratio. Thus, economists report that the money supply needs to be increased if the aim is to lower the unemployment level below the natural ratio in the short term (nonetheless, in the long term, the increase in the money supply has no effect on real production and employment; to say it another way, money is neutral in the long term).

According to Figure 3, inflation rose from 0 % to 2.8 % as a result of the growing money supply. Wage increases due to inflation jump would, in the short term, lead some of the naturally unemployed people to be employed, and current (actual) unemployment ratio would then go down from 5.5% to four percent. Therefore, the new equilibrium shifts from Point A to Point B, and the Phillips curve emerges as a negative slope. Nevertheless, in subsequent stages, laborers

realize that, due to inflation, the value of wages starts to melt away. As they grasped that inflation had risen to 2.8%, their expectations regarding inflation increased. Laborers who are not satisfied with their current inflation-affected wage quit their job in an attempt to find new opportunities. Consequently, the unemployment ratio increases from four percent to 5.5% level; in other words, it returns to the previous natural ratio. As unemployment jumps to its initial natural ratio, the inflation ratio continues to stay at 2.8%. Under these conditions, the short-term Phillips curve moves in the right direction, and the Phillips curve takes its new form in the R1 position; hence, at Point C, a new equilibrium level occurs. At this point, the expected and actualized inflation ratios are even. At Point C, if the government, in another attempt to lower the unemployment below the natural ratio in the short term, chooses to refund the markets, inflation climbs to 5.6% whereas unemployment goes backwards to point D. However, once employees understand that the increase in their wages is nominal, not real (once they realize they are being deceived), unemployment returns back to natural levels in the long term. However, in the market, a constantly growing and non-sterilized fiscal expansion would make the rise in inflation continuous (Point E). As a result, through a vertical summation of Points A, C, and E that correspond to the natural unemployment ratios in Figure 3, the long-term Phillips curve would be obtained.

In Figure 4, there is a discussion of the meaning of the positive relationship that emerged between inflation and unemployment in the long term. As reflected in the long term as opposed to short term, a linear relationship exists between inflation and unemployment, and higher inflation resulted in higher unemployment. In an economy moving from Point A to Point B, high inflation brings high unemployment, and Friedman defined this concept as slumpflation, and, in that case, regardless of increasing inflation as much as desired in the long term, natural unemployment ratio could not be eradicated. Although, in the short term, unemployment is inclined to go down to the natural ratio, it returns back to the natural ratio in the long term and so manifested a "steady state," or, to say it another way, a stable equilibrium condition. Because of all these reasons, the Phillips curve disappeared in the long term. Decision-makers leading economic policies choose the kind of policies that would carry the economy to Point A or B and implement low or high inflation in the long term according to political preferences.

3. Literature Review

Phillips' analysis specific to England obtained identical results to those that Samuelson and Solow obtained particularly with respect to U.S data, and it was seen that the Phillips hypothesis holds true. Later, Monetarists explained the Phillips curve on the basis of "natural unemployment ratio" and "expectations" and argued that the same hypothesis became invalid in the long term. Neo-classical theorists, on the other hand, claimed that, in the short and long term, the Phillips curve gained a vertical line shape, thus arguing that the hypothesis lacked any validity. New Keynesians asserted that, in the short term, the Phillips curve would form a negative image whereas, in the long term, it would form a vertical line image. Studies of the Phillips curve that lost its value in the 1980s and regained value in the 1990s still continue to be significant.
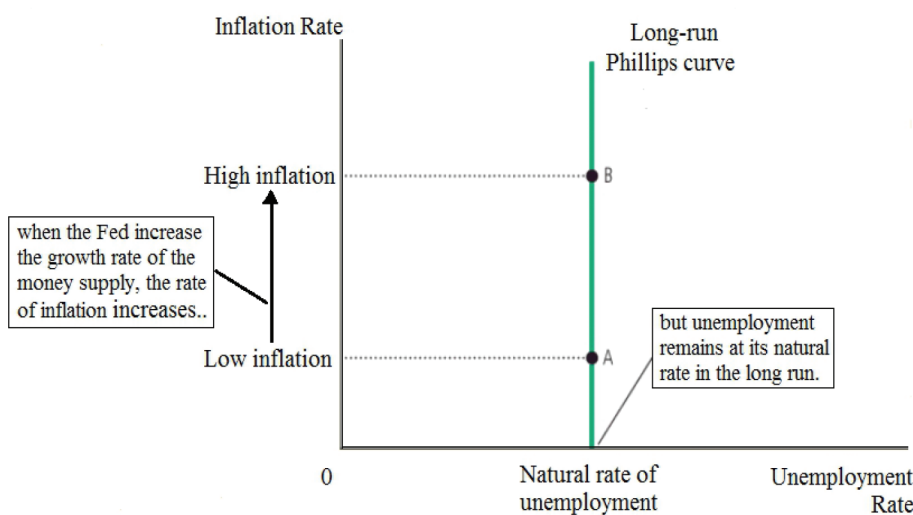

Figure 4: Long term Phillips Curve and Slumpflation

Source: (Mankiw, 2014).

Different approaches from countries in managing macro-economic problems resulted in divergences in inflation and unemployment levels as well as periodical fractions. Consequently, conducted analyses differed from one another and obtained sophisticated results. In that context, below are some of the international as well as Turkey-wide studies.

Alogoskoufis and Smith (1991), in a study conducted by utilizing post-war macroeconomic data from the U.S, rejected the trade-off between inflation and unemployment, and Lucas explained that empirical evidence in favor of his argument could be attained. Turner and Seghezza (1999) examined the Phillips curve in 21 OECD states from the onset of the 1970s until 1997. Findings indicate that, in 21 OECD countries, the Phillips hypothesis strongly prevailed. Hogan (1998) analyzed the 1960-1993 period based on macroeconomic data from the U.S, and findings of this study showed that a significant and negative relationship existed between unemployment and inflation. In their analysis, Vredin and Varne (2000) concluded that the hypothesis of the Phillips curve was rejected for the US. By employing annual data from 1980 to 2010, Dritsaki and Dritsaki (2013) investigated the Phillips curve approach for Greece. These findings indicate that in the indicated period, a long-term and causal relationship existed between inflation and unemployment. In the analysis by Daly and Hobijn (2013), findings that support the presence of the Phillips hypothesis in the short and long term were attained. Bulligan and Viviano (2017) in their Euro zone focused research after the global financial crisis noted that they failed to find strong evidence for a clear relationship between wage inflation and unemployment (Bulligan & Viviano, 2017; Daly & Hobijn, 2013; Dritsaki & Dritsaki, 2013; Furuoka, 2007; Vredin & Warne, 2000).

On the other hand, in the relevant literature, some of the studies on Turkey suggested that that the Phillips curve relationship truly existed between inflation and unemployment ratios. Yet, other studies concluded that this curve had no validity for Turkey. Studies of the Phillips hypothesis that associated unemployment ratio with inflation ratio can be assessed as "a search for a reliable tool in inflation prediction" and "an outcome of implementing monetary policy." Although a negative relationship between the change ratio in monetary variable and unemployment is unproven, it is still quite important for forming Phillips curve policy. A great number of studies so far are indicative of this significance. For example, Uysal and Erdoğan (2003) detected a positive relationship for the 1980-1990 period and a negative causality relationship for the 1990-2002 period. Kuştepeli (2005), on the other hand, stated that the Phillips curve for 1980-2003 period was invalid for Turkey. For Turkey, finding a quick settlement for its inflation problem rather than unemployment ratios is a must, particularly for the inefficiency that unraveled in the current period. According to Hepsağ (2009), although no relationship was visible in the short term, a trade-off existed between two variables such as inflation and unemployment in

the long term. Mangır and Erdoğan (2012) detected that, in the analyzed period (1990-2011) in Turkey, the Philips curve did not support theoretical hypotheses in the short term. Şentürk and Akbaş (2014) referred to the bidirectional causality relationship between inflation ratio and unemployment ratio. Öztürk and Emek (2016) determined that, between 1997-2006 in Turkey, the Phillips curve between inflation and unemployment proved to be a valid finding. Petek and Aysu (2017) at the end of their analysis concluded that in the Turkish economy, no causality relationship prevailed between unemployment and inflation; in other words, unemployment is not the cause of inflation, and inflation likewise is not the cause of unemployment (Hepsağ, 2009; Kuştepeli, 2005; Petek & Aysu; 2017; Uysal & Erdoğan, 2003).

4. Research Methodology

4.1. Research Objective

1980 was almost a turning point for Turkey. After the January 24 Resolutions, the economic system was transformed, and, as an effect of military intervention, radical changes were experienced in political life, which triggered a painful transition painful period for Turkey. A period of chronic high inflation period started after 1973 oil crises occurred in 1994, 2000, and 2001. Additionally, Turkey was significantly affected by the global financial crisis of 2008. The financial crises that have lasted to the present day shook both the financial and social dimensions of Turkey, and, consequently, inflation and unemployment literally exploded. In this study, the aim was to examine the Phillips curve hypothesis that suggested the presence of a trade-off with respect to Turkey between unemployment and inflation.

4.2. Data Set

This study utilized the unemployment and inflation data from Turkey for the 1980-2019 period. As unemployment data, the unemployment ratio of the 15+ age group was used, and, for inflation, the CPI (consumer price index)was the resource used (Table 1). The data were retrieved from the IMF database.

4.3. Research Method

In this study, firstly, unit root tests were utilized to evaluate the stationarity of the series. In line with the Zivot-Andrews unit root test, which was developed in response to the criticism of the failure of studies that presented macro-variables like inflation to consider traditional unit root tests, in this research, the Engle-Granger cointegration test was implemented to check whether the series could perform a joint action, and, finally, the Granger causality relationship was explored.

Table 1: Variables Used in the Study

Variable	Symbol	Explanation
Inflation	LnINF	Natural logarithm of (CPI- consumer price index)
Unemployment	LnUNEMP	Unemployment ratio natural logarithm for the age group 15+

For unemployment data, please see: https://www.imf.org/external/datamapper/LUR@WEO/NOR.
For inflation data, please see: https://www.imf.org/external/datamapper/PCPIPCH@WEO/TUR.

5. Findings

In this paper, the annual inflation and unemployment data pertaining to the 1980-2019 period were harnessed. As mandated in a time series, the stationarity of data must be examined in the first stage. Among the variables, significant relationships regarding econometrics come to the surface if the series are stationary. In an attempt to examine the stationarity of the series used in the study, at first the ADF unit root test was employed in which it became evident that the LnINF and LnUNEMP variables were unstable at the level value (I(0)). Despite that, once the difference of the series was taken (I(1)), it was seen that stationarity condition could be provided (Table 2).

On the other hand, while examining the stationarity of the series in the studies, which utilized macro variables, it was also necessary to also analyze potential structural fractions in the series. Within that context, the fraction Zivot-Andrews unit root test, which hypothesizes the uncertainty of its time and suggests the potential emergence of fractions in any given time period, was also employed in the research. Table 3 shows the results of the Zivot-Andrews unit root test.

As can be seen in Table 3, even after taking the structural fractions into account, the LnINF and LnUNEMP series failed to stay at a stationary level ($p<0.05$). This is a finding indicative of the fact that the structural fractions in the series did not significantly affect the results of a traditional unit root test. The fraction periods of the variables were 2003 for LnINF and 1994 for LnUNEMP. 1994 was a year that marked one of the most tumultuous financial crises for Turkey; yet 2003 gathers attention as a year when strict monetary and financial policies led by Kemal Derviş could trigger a swift decrease in inflation.

Upon demonstrating that via traditional unit root tests, the series could become stationary, not on the level, but when their first differences were taken, and via the Zivot Andrews unit root test, which showed that structural fractions did not significantly change the traditional unit root test's result, it was decided to administer cointegration tests so as to discover whether unemployment and inflation acted together in the long term. Because the study provided only two variables, there was no need to employ the Johansen cointegration test, and instead, the Engle Granger cointegration test that enabled the examination of the cointegration relationship of the two variables that were stationary at the same level was administered.

To ensure that two variables can be cointegrated at the end of the Engle-Granger cointegration test, it is required to administer least squares regression at the level where the series are stationary, to designate an error term at the end of regression, and to ensure that the series obtained from this error term stayed stationary in the level (I(0)). Equation of the conducted least squares regression was formed as seen below:

$$D(LnUNEMP) = -0,0281252777635 * D(LnINF) + 0,0150640176143$$

Table 4 depicts the unit root test of the error term obtained from this regression equation.

As shown in Table 4, the error term obtained from the least squares regression in which the dependent variable referred to LnUNEMP and the independent variable to LnINF was stationary in the level; therefore, among the examined variables, there existed a cointegration relationship, which enabled a designation of the direction of the causality relationship between the variables.

As shown in Table 5, inflation is the Granger cause of unemployment by a 10% significance level; thus, there is a one-way causality relationship from inflation to unemployment.

10% of the significance value of this relationship could be attributed to the presence of a wide range of factors impinging upon inflation and unemployment. On the other hand, there exists no causality relationship directed from unemployment to inflation. Unemployment is not the Granger cause of inflation.

Based on the existence of a cointegration relation and a causality relationship from inflation to unemployment, it can reasonably be argued that, in Turkey, the Phillips curve held valid for the 1980-2019 period (Figure 5), and an increase by one percent in inflation could diminish the unemployment ratio by 0.028%. This finding supports the fact that the Phillips curve is still a field worthy of study.

Table 2: Unit Root Tests

		Stationarity		Stationarity & Trend		Non-stationarity & Non-Trend	
		PP	ADF	PP	ADF	PP	ADF
LnINFLATION	t	-1,5228	-1,5228	-1,5284	-1,5284	-1,263	-1,3005
	p	0,5117	0,5117	0,8023	0,8023	0,1866	0,1753
		(0)	(0)	(0)	(0)	(2)	(0)
d(LnINF)	t	-6,3951	-6,3911	-6,245	-6,2367	-6,4913	-6,4791
	p	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
		(2)	(0)	(2)	(0)	(1)	(0)
LnUNEMPLOYMENT	t	-0,9002	-1,0585	-2,1731	-2,2369	1,8299	0,8399
	p	0,7776	0,7223	0,4906	0,4569	0,9821	0,8883
		(8)	(0)	(6)	(0)	(18)	(0)
d(LnUNEMP)	t	-5,2917	-5,1082	-7,0514	-5,1016	-4,9125	-5,065
	p	0,0001	0,0002	0,0000	0,0010	0,0000	0,0000
		(23)	(0)	(31)	(0)	(16)	(0)

*: Parenthetical values illustrate the lag length automatically determined based on SIC value.
**: Parenthetical values illustrate the band length determined based on Bartlett Kernel.

Table 3: Results of Zivot-Andrews Unit Root Test

	t	p	Fraction
LnINF	-5,331631	0,000123	2003
%1 Critical Value	-5,34		
%5 Critical Value	-4,93		
%10 Critical Value	-4,58		
LnUNEMP	-3,934545	0,022457	1994
%1 Critical Value	-5,34		
%5 Critical Value	-4,93		
%10 Critical Value	-4,58		

Table 4: Unit Root Test of the Error Term

Regression		ADF		PP	
Dependent V	Independent V.	t	p	t	p
D(LnUNEMP)	D(LnINF)	-5,169920	0,0000(1)	-5,906935 (32)	0,0000

Table 5: Granger Causality

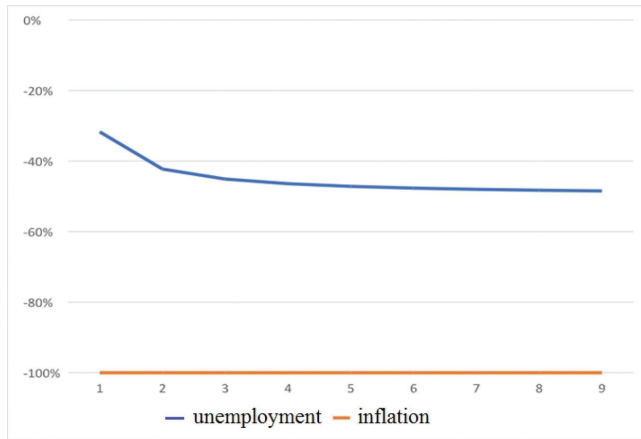| Hypothesis	F	p
LnINF is not the Granger cause of LnUNEMP.	2,91435	0,0683
LnUNEMP is not the Granger cause of LnINF.	0,54394	0,5856

Figure 5: Phillips Curve View for Turkey

D(LnUNEMPLOYMENT) = -0,0281252777635
* D(LnINFLATION) + 0,0150640176143

6. Conclusion

Recognized as the "two main magnitudes" in economies, the causality relationship between the concepts of inflation and unemployment has constituted a research topic for many studies to date. In this study, the relationship between inflation and unemployment was examined by employing a Phillips curve analysis, and obtained findings on the final results are as listed (Elliot, 2015; Nar, 2017; Nar, 2020). In economies, inflation lowers expendable income levels, and, because resources are basically channeled towards producing the kind of goods and services mostly demanded by high income individuals, resource distribution consequently becomes disrupted. Inflation undermines personal and corporate savings, and assets are widely shifted towards speculative investments. The segments of society most critically harmed by price increases are fixed income, salaried professionals, retired people, and low-income citizens; thus, income and wealth distribution that would be to their advantage is destroyed, and nation-wide social restlessness gains an increasing impetus. In Turkey, inflation problem is essentially a structural problem. Since 2006 when Turkey effectuated inflation targeting to the present date, it experienced a series of shocks stemming from global conjunctures. These shocks mostly derived from factors other than monetary policy auditing and likely to prove long lasting are determinant players in the rise of inflation. Most importantly, a shift in the terms of global liquidity in favor of developed countries, shocks directed at fiscal supply, increased food prices due to climate conditions have immeasurably augmented the inflation ratio. As price increases have gradually became a constant, rising oil and energy prices have blockaded the fall in inflation. In the

same vein, a weakening in the appetite for global risk has caused instability in financial markets to noticeably heighten and intensify capital outflows from developing countries. In parallel with the global trend, Turkey's risk premium as a country similarly escalated. The climb in Turkey's country risk premium (CRP) acted as a determinant factor in inflation.

Unemployment, on the other hand, is one of the greatest problems that people all over the world have to deal with. Unemployment first causes production loss and second a loss of freedom and social ostracization. Thirdly, a loss of skilled workers and long-term damage emerge, and crime ratios jump. Fourthly, psychological harm occurs due to unemployment. Intense depression triggers mental agony, and its potential outcome is an increased number of suicides. Fifthly, it poses not just a problem of a lowered income but also drives the person to lose his/her self-respect and feel that they are an unwanted, useless, and unproductive individual. Sixthly, the despair born out of unemployment, discouragement, and disappointment results in lost motivation. Seventhly, human connections weaken, and family life, domestic agreement, and attachment tear apart, gender inequality comes to the surface, and social values disappear. Because of all of this, governments should take radical measures against structural problems such as inflation and unemployment in order to propose applicable solutions. In a given economy, efficiency levels are grounded on production, specifically the production of producing high value-added goods and services. Despite that reality, Turkish the economy basically reflects an artificial state of growth depending upon imports. As a result, it has turned into a production model unable to provide employment but rather contributing to unemployment for many years. In addition, the low labor force productivity level in the agriculture sector and the inadequacy of employment policies aimed at industrial production have also limited growth.

The econometric analysis conducted at the end of this study appeared to confirm the above-mentioned conclusions since this analysis showed that a long term relationship has long existed between the variables. Accordingly, for the same period, a one-way causality relationship persisted from inflation to unemployment in Turkey. A 10% level of significance of the said relationship indicates that there is a wide range of factors impinging upon inflation and unemployment, and the attained findings in the research demonstrates that the relationship between inflation and unemployment is negative. Nonetheless, expected ratios are low. This finding underlines the fact that, in relation to Turkey, inflation should be searched for, not in fiscal expansion but rather in different factors such as fiscal shocks and energy prices. On the other hand, in Turkey, unemployment is an ineffective factor in inflation because a rise in employment is not causal factor for the inflation stemming from wage increases because the volume of the

labor force and young unemployed is the highest in Turkey among all European Union states, and a long waiting time in the job search as well as negations due to frictions in the labor force markets play a determinant role at this point. That being the case, monetary policies aimed at affecting inflation fail to create the kind of trade-off or stability to be formed between inflation and unemployment, and no equilibrium can thus be structured yet.

As regards finding a solution for the detected problems, measures directed at promoting exports and improving investment means are of first importance. Producing technological goods with a higher added-value, embracing local production rather than a production dependent on imported goods, implementing efficient manufacturing and agriculture policies, supporting a real sector, and enriching the export basket are the primary methods utilized by the countries undergoing similar problems. In the fight against high inflation and unemployment, promoting local production, training a qualified labor force and offering quality education and health services, and directing public expenses to needy sites to enhance skills are of utmost importance. In that way, while employment rises as an effect of a growing production ratio, inflation goes down and lowered prices would, subsequent to lower inflation, result in decreased interest rates. By means of an interest channel classified as the traditional transfer channel and the Keynesian transfer mechanism, investment decisions of producers can also be easily affected. Secondly, by means of the expectations channel, it could also be viable to control price fluctuations by offering a safe environment in the future to financial units. Further to that, the regulating of indirect taxes such as VAT and SCT (special consumption tax) towards the importation of luxury goods and certain items and furnishing taxation systems with a modernist and production-promoting character are the main solutions for winning the fight against unemployment and inflation.

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