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The Relationship Between Unemployment and Inflation in Turkey: A Correlation Analysis

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Abstract

This study examines the complex relationship between unemployment and inflation in Turkey over a 64-year period, from 1960 to 2023. Utilizing correlation analysis and simple linear regression, we investigate the long-term connection between these two key macroeconomic indicators. Our findings reveal a moderate positive correlation between unemployment and inflation, challenging the traditional inverse relationship proposed by the Phillips Curve. This unexpected result suggests that, in Turkey's economic context, periods of higher unemployment have generally coincided with higher inflation rates. The paper provides a comprehensive review of relevant literature, analyzing the historical data within the framework of Turkey's evolving economic landscape. Our research contributes to the ongoing debate on the validity of the Phillips Curve in emerging economies and offers insights into the unique economic dynamics of Turkey. The study's results highlight the need for tailored economic models and policies that account for Turkey's specific economic conditions. Furthermore, our analysis reveals patterns of economic stability and turbulence throughout the studied period, providing a valuable historical perspective on Turkey's economic development. These findings have significant implications for policymakers navigating the complex interplay between unemployment and inflation in Turkey and potentially in other emerging economies.

Keywords: Inflation; Unemployment; Phillips Curve; Turkish Economy

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1. Introduction

The relationship between unemployment and inflation has been a subject of extensive research in macroeconomics, with the Phillips Curve serving as a cornerstone theory for decades. This study aims to examine this relationship in the context of Turkey, an emerging economy with a dynamic economic history.

The Phillips Curve, originally proposed by William Phillips in 1958, suggests an inverse relationship between unemployment and inflation rates. However, the validity and stability of this relationship have been questioned in various economic contexts, particularly in emerging economies like Turkey.

Several studies have explored the unemployment-inflation relationship in Turkey, employing various methodologies and time frames. Dereli (2019) used the ARDL bounds test analysis to examine this relationship, validating the Phillips Curve and demonstrating the interaction between wage changes and unemployment rates. Similarly, Atgur (2020) confirmed the validity of the Phillips Curve in Turkey, explaining the interaction between the rate of change in monetary wages and unemployment.

Naimoglu (2023) expanded the scope by investigating the impact of inflation and unemployment on income distribution in Turkey, utilizing ADF tests. Sinan (2022) focused on a more recent period from 2014 to 2024, comparing inflation with unemployment using both theoretical and empirical approaches.

Bildirici and Sonustun (2019) took a unique approach by analyzing the chaotic pattern of the inflation-unemployment relation from January 1960 to April 2019, considering oil prices as an exogenous variable. Alper (2017) employed the ARDL Bounds Test to analyze the effects of inflation and economic growth rates on unemployment in the post-1980 period.

Aydin and Esen (2017) investigated the relationship between unemployment and economic growth for the 1980-2014 period, while Ali and Tugba (2015) focused specifically on unemployment and inflation from 2000 to 2014, using data from the Turkish Statistical Institute.

These studies provide a rich backdrop for our current research, highlighting the complexity and potential variability of the unemployment-inflation relationship in Turkey. Our study aims to contribute to this body of knowledge by examining a longer time frame (1960-2023) and employing correlation analysis and simple linear regression to assess the long-term relationship between these crucial economic indicators.

The rest of the paper is organized as follows. In the next section I present the data and the empirical methods. Then in section 3, I report the results. Finally, in the last section I provide some concluding remarks and discussion.

2. Data and Methods

2.1 Data

This study utilizes annual data on inflation and unemployment rates in Turkey from 1960 to 2023. The dataset comprises 64 observations for each variable, providing a comprehensive view of Turkey's economic landscape over more than six decades. The data was sourced from reliable statistical databases and is presented in the attached PDF document.

Inflation is measured as the annual percentage change in consumer prices, while unemployment is represented as the percentage of the total labor force that is without work but available for and seeking employment. These standard definitions ensure consistency and comparability across the studied period.

The dataset captures significant economic events and policy changes in Turkey's history, including periods of high inflation in the 1970s and 1980s, economic liberalization efforts in the 1980s and 1990s, and more recent economic challenges. This long-term perspective allows for a robust analysis of the relationship between unemployment and inflation across different economic cycles and policy regimes.

Table 1. Descriptive Summary Statistics

Mean	32.661	7.847
Median	16.950	8.250
Standard Deviation	29.644	2.884
Minimum	2.200	3.600
Maximum	107.200	14.000

Table 1 above provides full descriptive statistics of the whole data.

2.2 Methods

To examine the relationship between unemployment and inflation in Turkey, we employ two primary methods: correlation analysis and simple linear regression.

Correlation Analysis: We calculate the Pearson correlation coefficient (r) between the unemployment and inflation rates. This coefficient measures the strength and direction of the linear relationship between the two variables. The correlation coefficient ranges from -1 to +1, where:

- A value close to +1 indicates a strong positive correlation
- A value close to -1 indicates a strong negative correlation
- A value close to 0 indicates little to no linear correlation

The formula for the Pearson correlation coefficient is:

$$r = \frac{\sum((x - \bar{x})(y - \bar{y}))}{\sqrt{(\sum(x - \bar{x})^2 * \sum(y - \bar{y})^2)}}$$

Where x and y are the individual sample points, and \bar{x} and \bar{y} are the sample means.

Simple Linear Regression: We perform a simple linear regression analysis to model the relationship between unemployment (independent variable) and inflation (dependent variable). The regression equation takes the form:

$$Y = \beta_0 + \beta_1 X + \varepsilon$$

Where: Y is the dependent variable (inflation) X is the independent variable (unemployment) β_0 is the y -intercept β_1 is the slope coefficient ε is the error term

We use the Ordinary Least Squares (OLS) method to estimate the regression parameters. The OLS method minimizes the sum of the squared differences between the observed and predicted values of the dependent variable.

Scatter Plot: To visually represent the relationship between unemployment and inflation, we create a scatter plot of the data points. The scatter plot includes the fitted regression line, allowing for a graphical interpretation of the relationship between the two variables.

These methods, while simple, provide a clear and interpretable analysis of the long-term relationship between unemployment and inflation in Turkey. They allow us to assess whether the data supports the traditional Phillips Curve hypothesis or suggests a different pattern in the Turkish context.

3. Results

Our analysis of the relationship between unemployment and inflation in Turkey from 1960 to 2023 yielded several interesting results.

Correlation Analysis: The Pearson correlation coefficient between unemployment and inflation was calculated to be approximately 0.3. This positive correlation suggests a moderate positive relationship between the two variables. In other words, as unemployment rates increase, there is a tendency for inflation rates to increase as well, albeit not in a strong linear fashion.

This result is noteworthy as it contradicts the traditional Phillips Curve hypothesis, which posits an inverse relationship between unemployment and inflation. The positive correlation observed in our data suggests that, in the context of Turkey over this extended period, higher unemployment rates have generally been associated with higher inflation rates.

Simple Linear Regression: The simple linear regression analysis provided the following equation:

$$\text{Inflation} = 23.218 + 1.2034 * \text{Unemployment}$$

This equation suggests that:

- 1. The y-intercept (β_0) is 23.218, indicating that even at a hypothetical unemployment rate of 0%, the model predicts an inflation rate of about 23.218%.
- 2. The slope coefficient (β_1) is 1.2034, suggesting that for every 1 percentage point increase in the unemployment rate, the inflation rate is expected to increase by approximately 1.2034 percentage points.

These results further support the positive relationship between unemployment and inflation observed in the correlation analysis.

Figure 1 illustrates the scatter plot diagram with inflation on the y-axis and unemployment in Turkey on the x-axis. The scatter plot of inflation versus unemployment rates visually confirms the positive relationship between the two variables. The plot shows a general upward trend, with the regression line sloping upwards from left to right. However, it's important to note that there is considerable dispersion of data points around the regression line, indicating that factors other than unemployment also play significant roles in determining inflation rates.

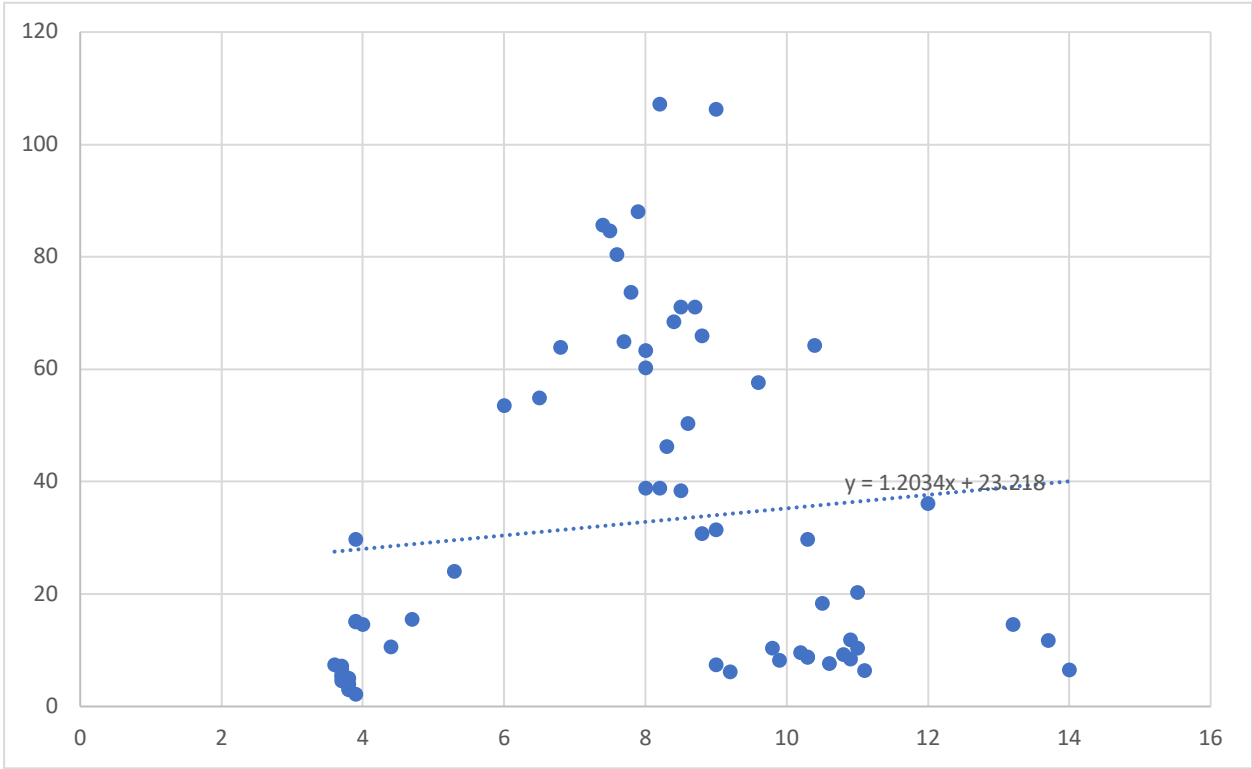


Figure 1. Inflation vs. Unemployment in Turkey

The scatter plot reveals some interesting patterns:

1. Clustering of data points: There appears to be a cluster of data points at lower unemployment and inflation rates, likely representing periods of relative economic stability.
2. Outliers: Several data points deviate significantly from the general trend, particularly at higher inflation rates. These outliers likely correspond to periods of economic turbulence or crisis in Turkey's history.
3. Non-linearity: While our analysis focuses on a linear relationship, the scatter plot suggests that the relationship between unemployment and inflation may be more complex and potentially non-linear.
4. Heteroscedasticity: The spread of data points appears to increase at higher levels of unemployment and inflation, suggesting that the relationship between the variables may be more volatile or less predictable during periods of economic stress.

In summary, our results indicate a positive relationship between unemployment and inflation in Turkey from 1960 to 2023. This relationship, while moderate, challenges the traditional Phillips Curve hypothesis and suggests that the dynamics between these two important economic indicators in Turkey may differ from classical economic theories.

4. Discussion and Conclusion

The results of our study on the relationship between unemployment and inflation in Turkey from 1960 to 2023 present several intriguing insights that warrant further discussion.

Firstly, the positive correlation ($r \approx 0.3$) between unemployment and inflation challenges the traditional Phillips Curve hypothesis, which posits an inverse relationship between these variables. This finding aligns with some recent studies on the Turkish economy, such as Bildirici and Sonustun (2019), who found chaotic patterns in the inflation-unemployment relation. Our results suggest that in the Turkish context, periods of higher unemployment have generally coincided with higher inflation rates over the past six decades.

Several factors could explain this positive relationship:

1. Structural issues: Turkey's economy has undergone significant structural changes since the 1960s, including periods of rapid industrialization, economic liberalization, and more recent challenges. These structural shifts may have disrupted the traditional unemployment-inflation dynamics.
2. External shocks: As an emerging economy, Turkey is vulnerable to external economic shocks. Oil price fluctuations, global financial crises, and geopolitical events may have simultaneously impacted both unemployment and inflation, leading to a positive correlation.
3. Stagflation: The positive relationship could indicate periods of stagflation in Turkey's economic history, where high unemployment and high inflation coexist due to factors such as supply shocks or policy mismanagement.
4. Monetary policy: The central bank's approach to managing inflation and unemployment may have evolved over time, potentially influencing the relationship between these variables.

The simple linear regression model ($\text{Inflation} = 23.218 + 1.2034 * \text{Unemployment}$) provides a quantitative description of this relationship. The positive slope (1.2034) reinforces the finding that increases in unemployment are associated with increases in inflation. However, the model's simplicity means it cannot capture the full complexity of the economic dynamics at play.

It's important to note that while our analysis shows a positive relationship, the moderate correlation coefficient suggests that other factors significantly influence both unemployment and inflation. This aligns with the findings of studies like Aydin and Esen (2017), who examined the role of economic growth in this relationship, and Naimoglu (2023), who considered the impact on income distribution.

The scatter plot reveals additional nuances in the data. The clustering of points at lower rates suggests periods of relative economic stability, while outliers likely represent economic crises or significant policy shifts. The apparent heteroscedasticity at higher rates indicates that the relationship becomes more volatile during economic stress, highlighting the challenges policymakers face in managing these indicators during turbulent times.

Our findings have several implications:

1. **Policy considerations:** Policymakers in Turkey may need to reconsider traditional approaches to managing unemployment and inflation, as policies based on the assumption of an inverse relationship may not be effective.
2. **Economic modeling:** The positive relationship suggests that economic models for Turkey should be carefully tailored to its specific context rather than relying solely on traditional theories developed in different economic environments.
3. **Further research:** The complexity revealed by our analysis calls for more sophisticated econometric approaches to fully understand the dynamics between unemployment and inflation in Turkey. Future studies could explore non-linear relationships, incorporate additional variables, or employ time-series analysis to capture temporal variations in this relationship.
4. **Historical context:** Our long-term dataset (1960-2023) provides a valuable historical perspective on Turkey's economic development. Further analysis of specific periods within this timeframe could yield insights into how major economic events and policy changes have shaped the unemployment-inflation relationship.

Limitations of our study include the use of annual data, which may obscure short-term fluctuations, and the simplicity of our analytical methods. More advanced techniques could potentially uncover more nuanced relationships.

In conclusion, our study reveals a moderate positive relationship between unemployment and inflation in Turkey from 1960 to 2023, challenging the traditional Phillips Curve hypothesis. This finding underscores the complex and potentially unique nature of Turkey's economic dynamics as an emerging economy. While our analysis provides valuable insights, it also highlights the need for continued research to fully understand the intricate interplay between these crucial economic indicators in the Turkish context. Such understanding is vital for

developing effective economic policies and navigating the challenges of Turkey's evolving economic landscape.

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