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Growth and Inflation in Turkey

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Abstract

In this paper I investigate the empirical relationship between economic growth (as measured by growth in real GDP) and inflation in Turkey. We use a relatively large dataset spanning from 1960 to 2020. Our correlation analysis indicates that the nature of the relationship between inflation and unemployment in Turkey is substantially different before and after early 1980s.

Keywords: growth; inflation; Turkish economy

JEL Codes: E31; N10; O40

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1. Introduction

In this paper, we conduct an empirical investigation on the nature of the relationship between economic growth and inflation in Turkey. To this end, we analyze data series of both variables from 1960 to 2020. Our correlation analysis suggests that the relationship undergoes a structural change, particularly in the early 1980s. This, in turn, leads to a significant change in the relationship between inflation and economic growth.

There is a significant number of papers looking at the empirical relationship between inflation and growth both from a global perspective as well as for the Turkish economy. One such example is the paper by Asfuroglu and Elgin (2016), who investigate this relationship in a dynamic general equilibrium model. Here, a growth model including informal economy is used to visually support the article while using data sets and various graphs to contribute to the article empirically. The authors find out that the growth exhibits an inverted-U pattern with increasing inflation and the growth maximizing inflation rate depends on the size of the informal sector. Considering that the informal sector is substantial in Turkey (Elgin, 2020), it could be a relevant factor that should be included in the analysis here. Moreover, Cicek and Elgin (2011) also indicate a structural break in the Turkish economy, specifically around the late 1970s and early 1980s.

In a somewhat related IMF working paper, Leigh and Rossi (2002) investigate the predictive performance of economic indicators for inflation and real output growth in Turkey by constructing a forecast model. The aim is to see which indicators are more prominent than others at determining inflation and growth. On the forecast, it is seen that the series that forecast

inflation well for one horizon do worse than the AR benchmark at other horizons. It is also seen for current RGDP that some indicators are highly informative, meaning the forecast is a useful method. Next, Dibooglu and Kibritcioglu (2004) study the relationship between inflation and output in Turkey using a dynamic aggregate supply and aggregate demand model. Throughout the article, there are many usages of mathematical equations and statements. The article finds that the terms of trade shocks have a significant effect on inflation in the short-run. Ozpence (2016) investigates the causal relationship between inflation and economic growth in Turkey using the Vector Autoregressive Model (VAR) and Granger causality test. The aim is to find the answer to the question: "What is the nature of this causal relationship?". Various empirical data are used throughout the article, and the causes of economic crises are explained thoroughly. Karahan and Colak (2020) state the different approaches to the relationship between inflation and economic growth and debate which one is more useful. To bring up evidence, Turkey's economy is used in the article. Empirical data is used for both theories. The research considers the nonlinear ARDL approach, contrary to much other research done on this topic. As a result, it is found that the classical approach is a more desired method than the other.

Erbaykal and Okuyan (2008) discuss whether inflation depresses economic growth or not. Turkey is used to gather evidence for the topic. The relationship between the two in Turkey is analyzed using Bound Test. Many empirical tests are shown in order to support the claims. It is concluded that the importance of the macroeconomic policies which provide cost stability is evident for steady and sustainable growth.

Our paper is closely related to the existing literature as described above. However, it is distinct from its efforts to use the largest possible time-series data and identify several variables, such as the informal sector and trade openness, that interact with the relationship between inflation and economic growth.

The rest of the paper is organized as follows. In the next section, we present our data sources and describe the empirical methodology we will use in the paper. Then in Section 3, we present the results of our empirical analysis. Finally, in the last section, we provide some concluding remarks and a short discussion about the possible path of future studies.

2. Data and Methods

2.1 Data

Table 1. Descriptive Summary Statistics (1960-2020)

Variable	Mean	Median	Standard Deviation	Minimum	Maximum	Source
Annual Growth Rate (%)	4.37	4.50	3.83	-5.70	11.70	OECD Stats
Annual Inflation Rate (%)	31.65	17.5	28.76	1.10	105.20	OECD Stats
Informal Sector (ratio to GDP)	0.39	0.37	0.10	0.25	0.59	Elgin (2020)
Unemployment (%)	9.13	9.20	1.82	6.20	14.00	OECD Stats
Trade Openness (ratio to GDP)	0.16	0.12	0.12	0.04	0.40	PWT 10.0

We use several macroeconomic variables in our analysis. The two key variables are the annual GDP growth rate and inflation rate. Moreover, hypothesizing that the structure of the Turkish

economy exhibited a substantial change throughout the period of analysis (1960-2020), we also look at three different variables that manifest this change. These three variables are the informal sector (as a ratio to GDP), the unemployment rate (%), and trade openness, defined as the ratio of the sum of exports and imports to GDP. Table 1 presents descriptive summary statistics of all variables used in the empirical analysis. The source of each variable is indicated in the table.

2.2 Methods

Our empirical analysis calculates correlations and presents scatter plots and time-series graphs. As well known, a correlation coefficient between any two variables is in between -1 and 1. If two variables move in the same (opposite) direction, the correlation coefficient is calculated to be positive (negative). On the other hand, if the two variables do not exhibit any specific relationship, the correlation coefficient would not be significantly different from zero. We calculate and report the correlations; however, we visually complement this analysis by presenting scatter plots and time-series figures.

3. Results

Figure 1 illustrates the time-series behavior of the growth rate of GDP and inflation in Turkey between 1960 and 2020. It is not clearly visible from the figure, but the two variables have a positive correlation over this whole period. Nevertheless, we observe that the economy also exhibits a structural change at different time points, but a particular one in the late 1970s and early 1980s. This is not surprising considering that the Turkish economy has transitioned from an import-substitution-based industrialization policy to an export-led strategy in the early 1980s after the military coup d'état. In this regard, Table 2 shows some evidence towards this structural

change as manifested by the evolution of three variables. These are the informal sector (as a ratio to GDP), the unemployment rate, and the total trade to GDP ratio. Here, we report the averages of all these variables in three different time periods. These show the general look of the economy as of the rate of unemployment and the place of informal sector on GDP as well as the trade openness.

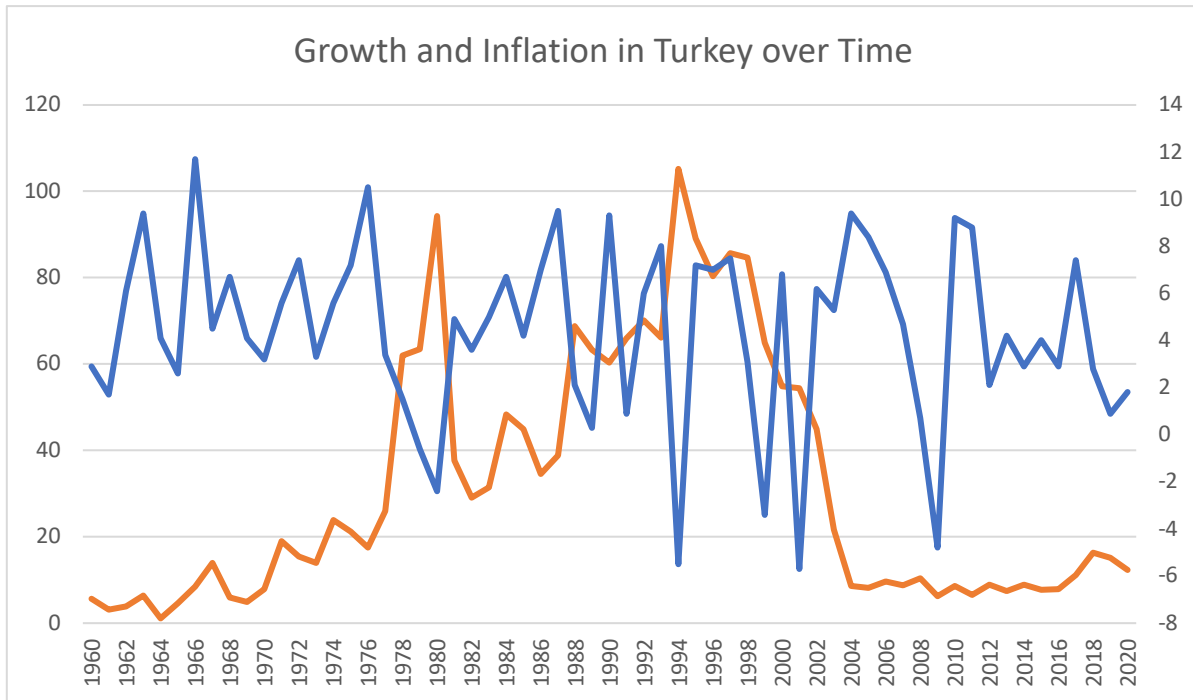


Figure 1. The Evolution of GDP Growth and Inflation (%) in Turkey (1960-2020)

Table 2. Averages of Three Macroeconomic Variables in Different Time Periods

	IS/GDP	Unemployment	Trade/GDP
1960-1983	0.4973	8.6750	0.0559
1984-2020	0.3207	9.4270	0.2324
1960-2020	0.3901	9.1311	0.1618

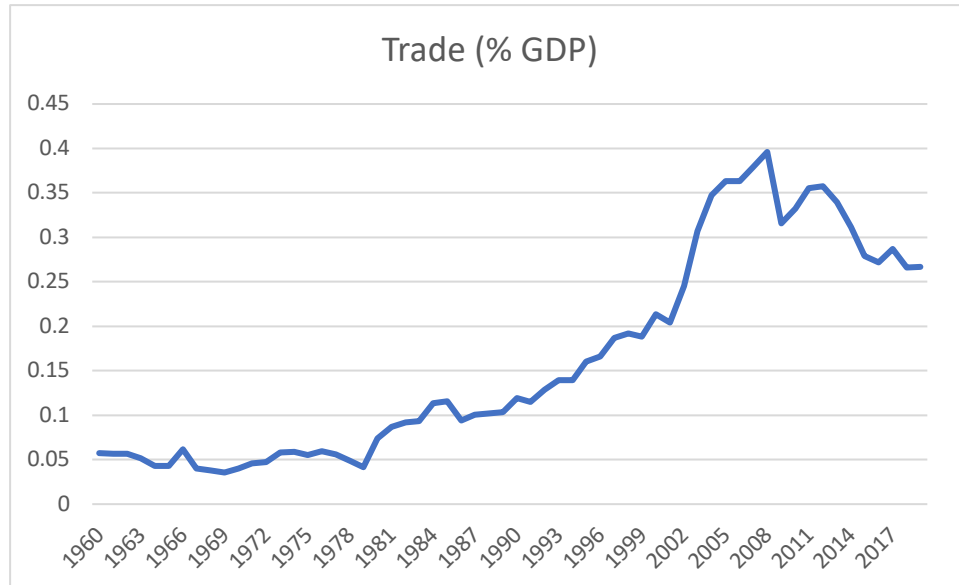


Figure 2. The Evolution of the Total Trade to GDP ratio in Turkey (1960-2020)

Figure 2 shows the structural change in international trade. Trade openness in the Turkish economy was under 10% until 1984, the first year that passed the 10% mark. This led to several changes in the Turkish economy. After its first breakthrough in the mid-'80s, trade openness continued to rise until peaking in the mid to late-'00s.

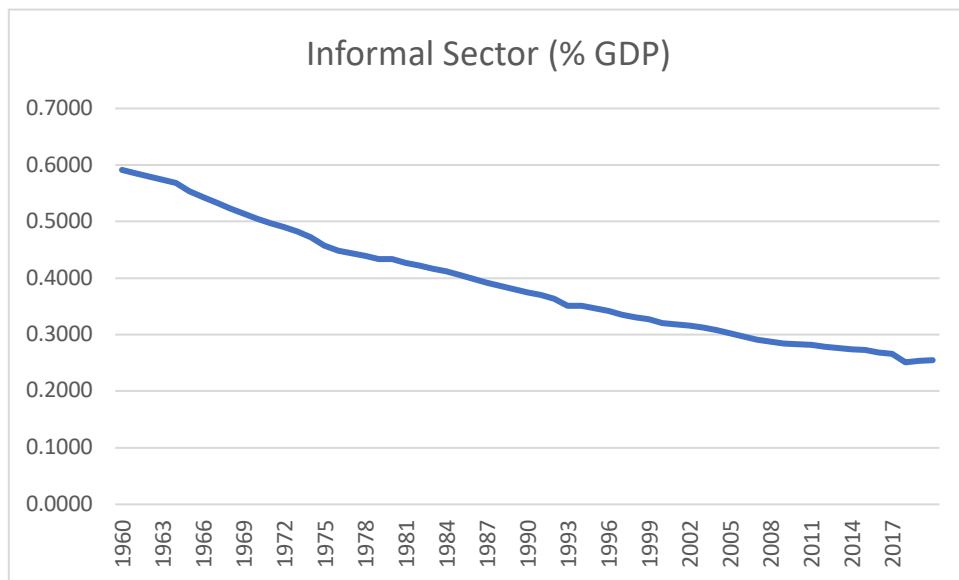


Figure 3. The Evolution of the Informal Sector (ratio to GDP) in Turkey (1960-2020)

Similarly, Figure 3 depicts the evolution of the informal sector in Turkey. Even though the overall trend is declining over the whole period again, the averages before and after the early 1980s are strikingly different, as shown in Table 2.

Table 3. Table of Correlations

	Inflation- Growth	Inflation - Unemployment
1960- 1983	-0.57	-0.22
1984- 2020	-0.13	-0.75
1960- 2020	-0.26	-0.51

Now, choosing 1983 as the year of the structural change, Table 3 shows the correlations between inflation and growth as well as inflation and unemployment in three different time periods, 1960-1983, 1984-2020, and 1960-2020, respectively. Evident from the table, these correlations are significantly different in the two subperiod of the whole period. When looking at the first period between the years 1960 and 1983, we observe that the correlation is much stronger between inflation and growth while being the weakest between inflation and unemployment. It is completely the opposite in terms of correlation in the second period. This shows how sharp was the change in the economy after the year 1983.

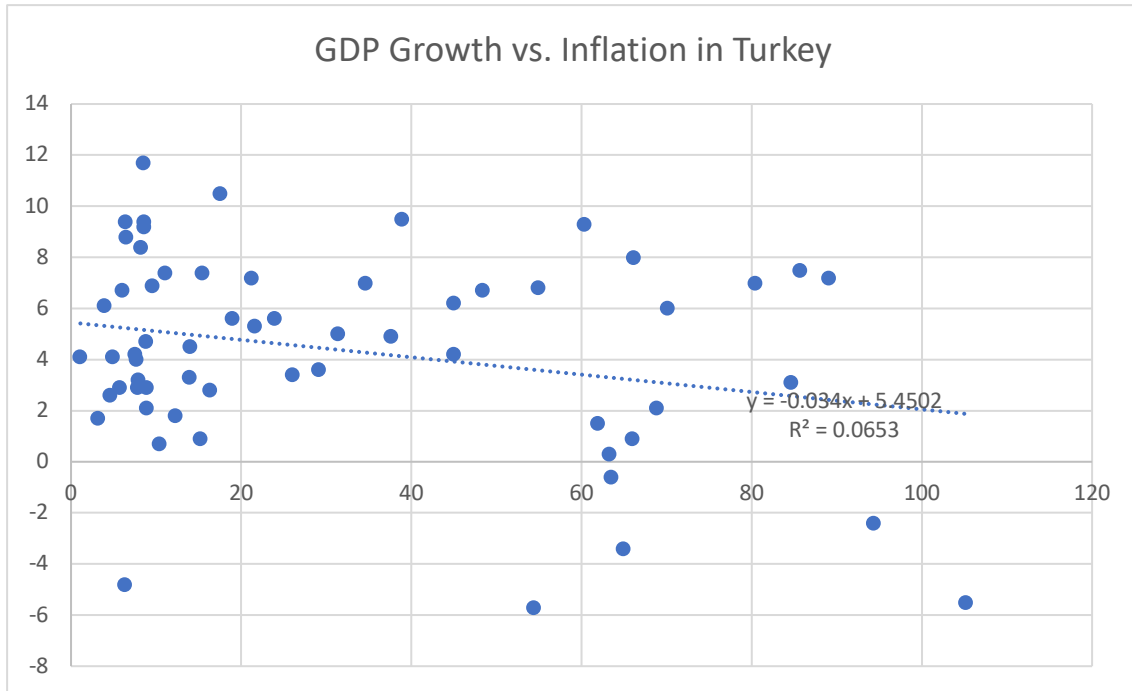


Figure 4. Scatterplot of GDP Growth vs. Inflation in Turkey (1960-2020)

Figure 4 is the scatter plot of GDP growth vs. inflation in Turkey over the years 1960-2020. It is calculated that these two data hold a value of -0.26 for their correlation. The line of best fit shows that the relationship has had a decreasing trend over the years. There are several outliers in the chart, and this could be caused by political developments taken in specific years.

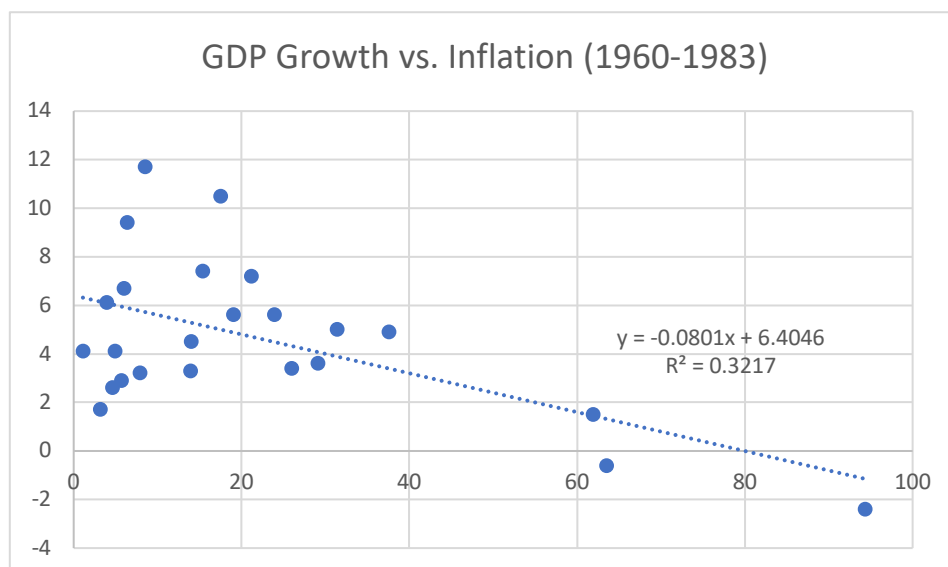


Figure 5. Scatterplot of GDP Growth vs. Inflation in Turkey (1960-1983)

In Figure 5, when we look at the same data in the years between 1960 and 1983, the slope is mathematically lower than the previous graph, and the decreasing trend is much more prominent. The value of correlation, -0.57 , also verifies this as its magnitude is larger than the previous data.

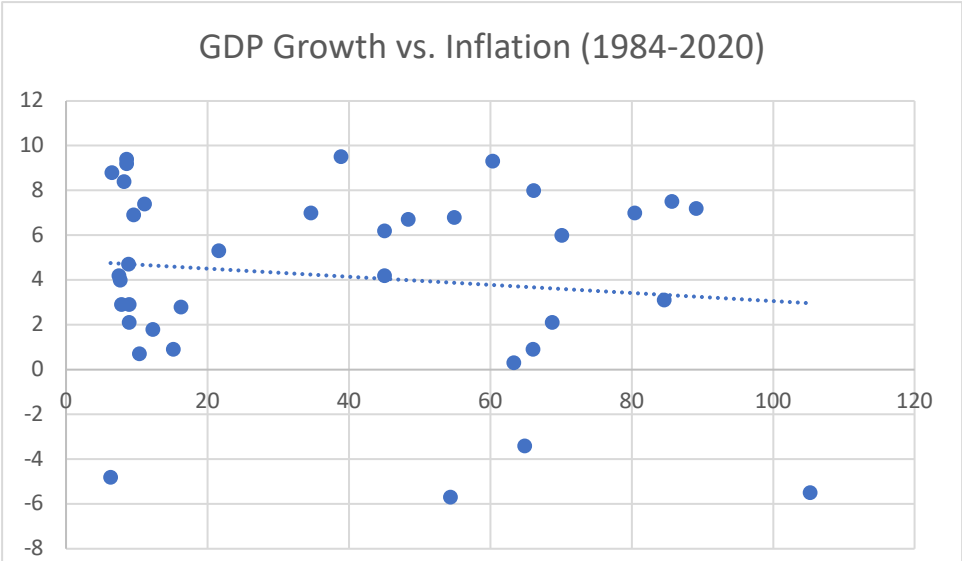


Figure 6. Scatterplot of GDP Growth vs. Inflation in Turkey (1984-2020)

In the second period, as depicted by Figure 6, the relationship between GDP growth and inflation decays compared to other time periods. The best fit line is almost flat, and the value of the correlation is -0.13 . These values also indicate no strong relation between them between the years 1984-2020. However, the year 1984 is chosen as a turning point as it was the year when the Turkish economy's trade openness became more prominent. This could be the reason behind the difference in correlation between these two data when analyzed in different time periods.

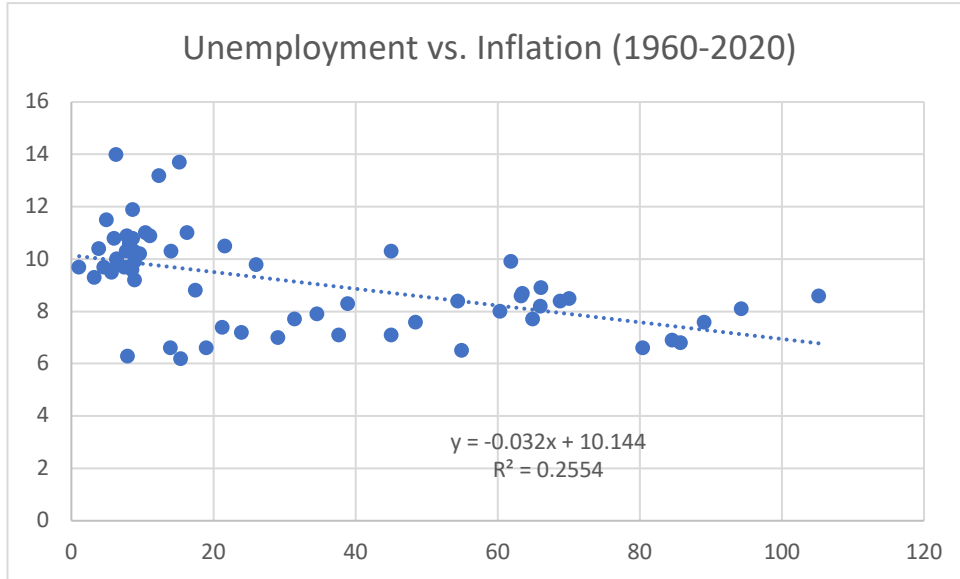


Figure 7. Scatterplot of Unemployment vs. Inflation in Turkey (1960-2020)

Figures 7, 8, and 9 illustrate the correlation between unemployment and inflation again in three different time periods in three different scatter plot diagrams. These figures illustrate the idea behind the Philips Curve, which suggests that unemployment and inflation are inversely related to each other. The best fit line shows that this is true for all periods. However, in line with Table 3, the negative correlation is much stronger for the latter period of 1984 to 2020.

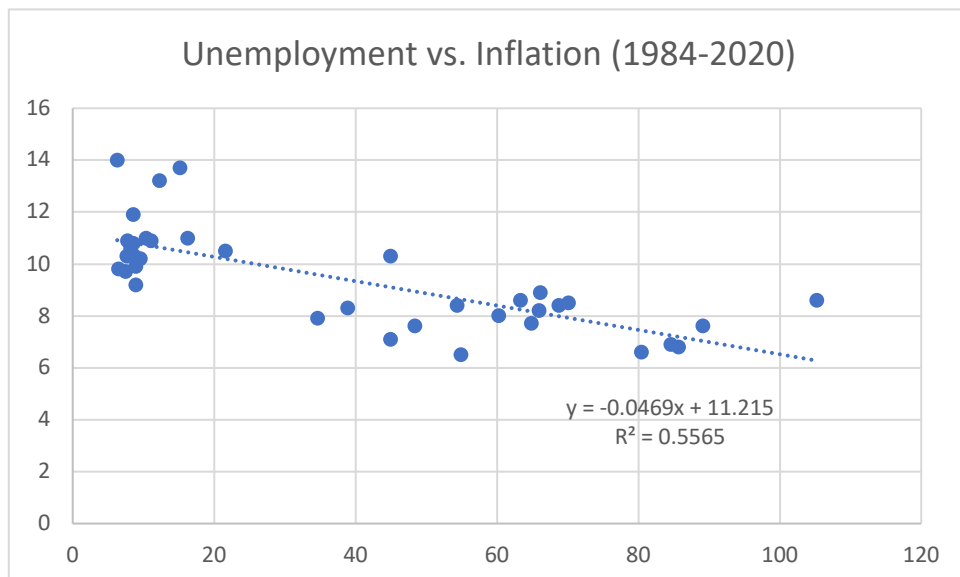


Figure 8. Scatterplot of Unemployment vs. Inflation in Turkey (1984-2020)

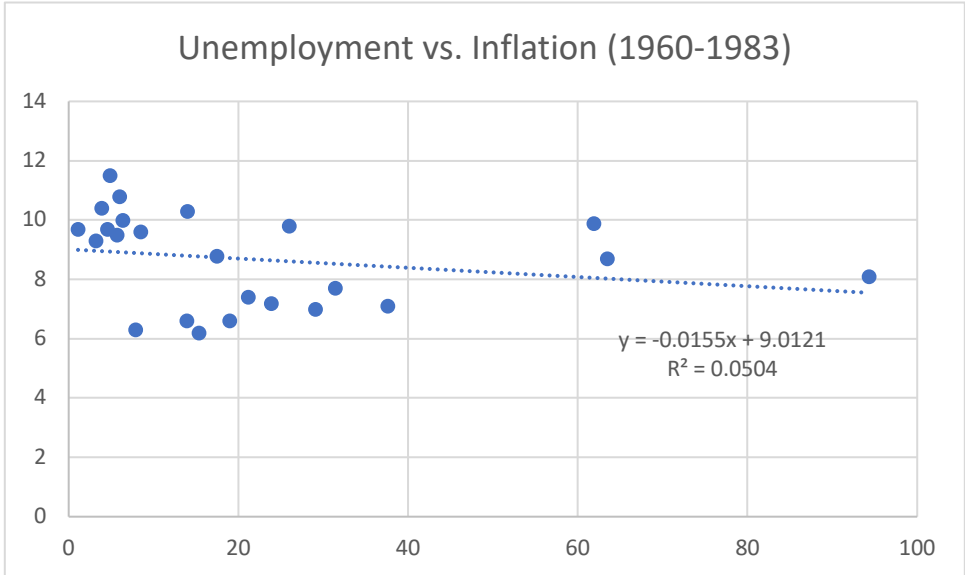


Figure 9. Scatterplot of Unemployment vs. Inflation in Turkey (1960-1983)

4. Conclusion

In this paper, we analyze the empirical relationship between economic growth (as measured by growth in real GDP) and inflation in Turkey. We use a relatively large dataset spanning from 1960 to 2020. Our correlation analysis indicates that the nature of the relationship between inflation and unemployment in Turkey is substantially different before and after 1980. We also identified trade openness and informal sector size as interaction variables that interact with this relationship.

Nevertheless, our paper has several limitations. First, the empirical analysis we use does not rest upon a deep econometric or economic-theoretical analysis. Second, there might also be factors other than informal sector size and trade openness that interact with the relationship between growth and inflation. Third, one can also further enlarge the dataset and go back as early as 1923,

the year the Turkish republic was founded. We leave the extension of the paper to address these issues to future studies.

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