IS THE PUBLIC FINANCE DEFICIT A RISK ON INFLATION IN TURKEY?

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Abstract

Price stability is the goal of economic policy. The policies implemented to achieve this goal can cause various problems such as financing the public deficit in economies. In this study, it is investigated whether public deficit financing has an impact on inflation in the period of 1975-2021 in Turkey. In the analysis, the financing of the public deficit is represented by the public sector borrowing requirement. Since the money to be released to the market due to the public sector borrowing requirement will affect the consumer price index, it has been chosen as the dependent variable. After the stationarity analysis of the series, the causality relationship between the series was investigated with the Toda-Yamamoto causality test. A relationship from inflation indicator to public deficit financing has been determined. The findings of the analysis for the period examined showed that, contrary to the widely accepted opinion in the literature, public deficit financing in Turkey did not cause an inflationary effect.

Keywords: *Inflation, Public Finance Debt, LM Unit Root Test, Toda-Yamamoto Causality Test*
JEL Classification: *E31, E62, C32*

TÜRKİYE'DE KAMU AÇIĞI FİNANSMANI ENFLASYON ÜZERİNDE RİSK MİDİR?

Öz

Fiyat istikrarı, ekonomi politikasının amacıdır. Bu amaca ulaşmak için uygulanan politikalar ekonomilerde kamu açığı finansmanı gibi çeşitli sorunlara yol açabilmektedir. Kamu açığının finansmanı GSYH'den yapıldığı için finansman değerinin GSYH'ya oranı önemlidir. Bu çalışmada Türkiye'de 1975-2021 döneminde kamu açığı finansmanının enflasyona etki edip etmediği araştırılmaktadır. Bu amaçla yapılacak analizde kamu açığının finansmanı kamu kesimi borçlanma gereği ile temsil edilmektedir ve GSYH içindeki payı ekonometrik değişken olarak kabul edilmektedir. Ayrıca kamu kesiminin borçlanma gereği nedeniyle piyasaya çıkacak paranın öncelikle tüketici fiyat endeksini etkileyeceği düşünülmüştür. Analizde bağımlı değişken olarak kabul edilen enflasyon göstergesi TÜFE ile temsil edilmektedir. Değişken serilerinin durağanlığı incelendikten sonra Toda-Yamamoto nedensellik testi ile seriler arasındaki nedensellik ilişkisi araştırılmıştır. Araştırma sonucunda enflasyon göstergesinden kamu açığı finansmanına doğru bir ilişki tespit edilmiştir. İncelenen döneme ilişkin analiz bulguları, literatürde yaygın olarak kabul edilen görüşün aksine Türkiye'de kamu açığı finansmanının enflasyonist bir etkiye yol açmadığını göstermiştir.

Anahtar Kelimeler: *Enflasyon, Kamu Açığı Finansmanı, ADF Birim Kök Testi, LM Birim Kök Testi, Toda-Yamamoto Nedensellik Testi*
JEL Sınıflandırması: *E31, E62, C32*

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1. Introduction

Market economies are economies of stability. There is not include in inflation in the logic of establishing this system at the end of the 18th century. This logic is based on a natural and unchanging order. In the 19th century, the Gold Money System built the free market system on a stable basis with the help of natural order and expanded its application area. In this period, thanks to the discipline of the Gold Money System and technological developments, it was possible for countries to get out of the poverty circle by increasing their GNP every year above their population growth rate.

On the other hand, the first encounter of the market system with inflation is at the beginning of the 20th century, when monetary policies began to be guided by banknot and nominal money systems instead of the Gold Money System. However, while the world economies were experiencing the problems caused by the new system and the effects of the Second World War, the market system, which tried to exist in inflation, started to move away from being a market system. In other words, the existence of inflation, even at the lowest rate, in an open market system turns into a potential source of accumulation that will cause problem. Inflation has now become a determinant of economic policy for economies. This situation has brought along especially wrong practices in economies. One of the consequences of malpractices is financing the public deficit.

In recent years, the share of public debt in the country's GDP has been well above the historical average in almost all economies. In particular, the COVID-19 pandemic, which emerged in the last months of 2019, has caused an unprecedented fiscal response. The high level of public debt, coupled with the necessity of fiscal interventions to reduce the negative impact of the pandemic on health and economic outcomes, has limited the scope of fiscal financing, increasing the need for further fiscal support. This raises concerns about debt sustainability in post-pandemic economies. On the other hand, Blanchard (2019) states that the welfare cost of high public debt can be reduced with low interest rates, and thus there is no need to reduce the amount of public debt rapidly.

Overall, high inflation was one of the few factors that helped to reverse public debt after 1945. With high economic growth and progress in fiscal consolidation, inflation remained low despite years of concerted monetary policies in many advanced economies, but has been a potential driver for reversing public debt in the current conjuncture. It should not be overlooked that the warnings made to observe high inflation (Rogoff, 2013; Sims, 2016) also raise the issue of how inflation will contribute to the reduction of public debt.

Another topic that started to be talked about in these periods is the financial pressure that contributes to the reversal of public debt. During periods of high inflation, nominal interest rates are kept low by policy regulatory or institutional factors. In this case, high inflation and low nominal interest rates create low real interest rates for government borrowing. While the term financial pressure was often used as a way to describe the emerging market financial system before widespread financial liberalization, it has re-emerged in many forms, including macroprudential adjustments, among advanced economies after the global financial crisis (Reinhart, 2012; Reinhart & Sbrancia, 2015).

Inflation is highly correlated with increases in Fiscal Deficit/GDP ratios. Fiscal deficits are generally pre-existing stocks, and downside rigidities in the country's maturity structure and interest rates tend to amplify this increase. On the other hand, variables such as wealth, nominal GDP and small amounts of spending also tend to increase automatically. This study investigates the effect of the increase in consumer prices on the public borrowing requirement in Turkey, using annual data for the period 1975-2021.

2. Literature Review

Oliveira (1967) and Tanzi (1977) found that double-digit inflation worsened fiscal deficits in real terms due to delays in tax collections. Aghevli & Kahn (1978) and Heller (1980) show that nominal fiscal situations are also affected if nominal expenditures are adjusted more slowly than nominal incomes.

Akçay, Alper & Özmucur (1996) used annual data and used annual data covering the period 1948-1994. In the study conducted with annual data, under the assumption of monetary neutrality in the long run, a strong relationship was obtained from the budget deficit to inflation. Özgün (2000) made a study for the 1950-1998 period using annual data on the budget deficit/GDP, the percentage change in money in circulation and the inflation rate. As a result of the cointegration test using annual data, it was concluded that there is a linear positive relationship between budget deficits and money in circulation and inflation in the long run, and that there is a bidirectional causality relationship between budget deficits and inflation.

Günaydın (2001) examined the causality between public sector deficits and inflation by applying Hsiao's Granger causality method to Turkey data for the period 1975-1998. A bi-directional causality has been determined between public sector deficits and inflation in Turkey. Catao & Terrones (2005) showed that there is a strong positive relationship between fiscal deficits and high inflation in developing country groups, using panel data of 107 countries between 1960 and 2001. However, such a relationship is not valid in developed economies with low inflation.

Demir & Sever (2008) examined the effect of public domestic borrowing on basic macroeconomic variables at the theoretical and empirical level. The long-term effects of Turkey's public domestic borrowing for the period 1987-2007 on macroeconomic variables were investigated with Johansen cointegration test and short-run dynamics using VEC models by impact response functions. The results showed that public domestic borrowing had a negative impact on interest rates, gross national product and inflation. Giannitsarou & Scott (2008) investigated the effects on inflation of increasing public debt based on the recognition of public debt.

Oktayer (2010) investigated the relationship between budget deficits, money supply increase and inflation in Turkey in the 1987-2009 period using cointegration techniques. In Turkey, budget deficits have a direct effect on inflation in the long run. Hall & Sargent (2011) and Abbas et al. (2011) calculate the contribution of inflation by decomposing the development of public debt and find that inflation was not a consistent source of public debt reduction, but was significant in the United States for certain periods up to the post-war 1960s. Aizenman & Marion (2011) used US debt maturity in 2009 to approximate the effects of sustained hyperinflation.

Sağlam & Uğurlu (2013) examined the short- and long-term relationship between the public budget deficit, money supply and inflation in Turkey with annual data for the 1983-2008 period. While it is determined that there is no long-term relationship between the variables, the change in KKBG has an increasing effect on inflation in the short run. Ulusoy & Erdem (2014) investigated the interaction between the share of domestic borrowing in the Gross Domestic Product and the inflation rate in Turkey in the 1998-2012 period with modern time series. It has been determined that there is a long-term relationship between domestic borrowing / GDP and inflation rate in Turkey. End et al. (2015) used a fiscal account dynamics model for the euro area to simulate the effects of persistent inflation/inflation shocks. Krause & Moyen (2016) simulated the effects of shocks on the inflation target using the New Keynesian dynamic general equilibrium model with an imperfectly observed inflation target.

Equiza-Goñi (2016) and Hilscher et al. (2020), detailed government bond data and Hilscher et al. (2020) simulated the effects of debt dynamics equation-based inflation on the public debt-to-GDP ratio, using option price data to estimate the distribution of inflation risks. Akitoby et al. (2017) simulated the effects of a persistent inflation shock that drove inflation to 6% for the next five years, using IMF's World Economic Outlook (WEO) data for the G7 countries.

Cherif & Hasanov (2018) estimates the VAR model with the debt dynamics equation using US data and estimated the effect of an inflation shock on the debt-to-GDP ratio. Çakmak & Gökçe (2018) analyzed the long-term relationship between inflation and public sector deficit in the Turkish economy for the period 1975-2016, and the macroeconomic dynamics that emerged as a result of this relationship, using Johansen cointegration and VECM-based Granger causality tests. As a result of the research, high and chronic inflation rates cause deterioration in public sector balance and basic macroeconomic variables.

Afonso & Jalles (2019) determined inflation shocks using the local projection method, historical data before the First World War, a deflationary dummy variable and multiple techniques. Fukunaga, Komatsuzaki & Matsuoka (2022), using simulation and estimation approaches, they examined the effects of inflation shocks on the public debt to GDP ratio in 19 developed economies. The simulations show that a 1 percent shock to the inflation rate can reduce the debt-to-GDP ratio by about 0.7 percent on average across countries, while the predicted impact responses are slightly larger and more persistent.

The main starting point of this article is the insufficiency of studies investigating the effects of increases in the public finance deficit/GDP ratio on inflation using Turkey's data, and the lack of studies examining a wide time period covering the years 1975-2021.

3. Data and Methodology

The public finance deficit/GDP rate and inflation data of the Turkish economy were used in our study. The public finance deficit value is considered as the total value used in public financing in the country. The share of this value in GDP is a variable used in the analysis. Inflation variable is represented by CPI.

The data of the variables were obtained from the Turkish Statistical Institute and the World Bank. It is an annual data set covering the period 1975-2021. Logarithm was applied to the series in order to reduce the difference between the values of the data and to bring the series closer to stationarity. The public finance deficit/GDP ratio has negative values. After making negative values positive, logarithm was applied.

3.1. Unit Root Tests

Unit root tests are very important in the econometric analysis of time series. In order for the regression analyzes to be interpreted correctly, the series should not have a unit root. The unit root is related to whether the mean and variance of the observation values of a variable are independent of time. If it is independent of time, the series is stationary. If it is time dependent, the series has a unit root.

One of the traditional unit root tests frequently used in time series is the ADF test. Augmented Dickey Fuller Test is used when there is a correlation problem. On the other hand, changes that start in any period and show the effect of a certain period of time in time series where macroeconomic variables are used are defined as structural breaks.

There are unit root tests in the literature that also investigate structural breaks. One of them is structural break unit root tests developed by Lee and Strazicich (2003, 2004). In these tests, the alternative to the null hypothesis should not be stationary with a structural break. If the alternative hypothesis is that there are structural breaks, then the series has a unit root with a structural break. That is, rejecting the null hypothesis does not mean rejecting the existence of the unit root, but rejecting the unit root without structural break.

3.2. Causality Test

Causality tests are tests that determine the direction of a possible relationship to be determined between variables. In other words, they reveal which of the dependent and/or independent variables affects the other variable. Among such tests is the Toda-Yamamoto

causality test. This test is based on the VAR model and allows estimating the model with the level values regardless of whether the series to be examined contain a unit root or not. In addition, it can conduct a causality research independent of the cointegration relationship between the variables (Mavrotas and Kelly, 2001:100).

The Toda-Yamamoto causality test is done in two stages. First, the lag length (m) is determined. Then the maximum degree of integration (dmax) for the variables is selected. Akaike Information Criteria (AIC), Schwarz Information Criteria (SC) and Hannan-Quinn (HQ) Information Criteria are taken into account to determine the degree of latency of the VAR model. The VAR model is estimated by the sum of the lag length and the degree of lag (p = (m + dmax)). Then the Standard Wald test is applied to the mVAR coefficient matrix to draw conclusions from the Granger causality test (Awokuse, 2003:130).

4. Findings

4.1. ADF Unit Root Test Findings

In the study, first of all, the ADF unit root test was applied to the variables for the stationarity test. The findings of the ADF unit root test are given in Table 1.

Table 1: **ADF Unit Root Test Findings**

Variables	Trend-Intercept Level Value	Trend-Intercept 1st Difference Value	Results
lnCPI	-1.314064 (0.8703)	-5.913939 (0.0001)	I (1)
lnKKBG	-2.690716 (0.2452)	-6.103131 (0.0000)	I (1)

lnCPI and lnKKBG variables according to Table 1; trend-intercept is stationary at the 1st difference value, i.e. I(1).

4.2. Lee - Strazicich Unit Root Test Findings with Structural Break

The findings of the endogenous single break LM unit root test for the lnCPI and lnKKBG variables are given in Table 2.

Table 2: **Single Break LM Unit Root Test Results**

	lnCPI Model A	lnKKBG Model A	lnCPI Model C	lnKKBG Model C
Test Statistics	-2.332733	-3.211588	-4.622349	-4.631082
Lag Length	7	3	2	3
Date of Breaking	1987	2009	2002	2002
Critical Values (%5)	-3.4870	-3.4870	-4.34942	-4.34942

The CPI rate of change break dates are 1987 for Model A, 2002 for Model C, and the public finance deficit breakage dates are 2009 for Model A and 2002 for Model C. When the test statistics of the variables are examined, Model A values of lnCPI and lnKKBG variables are less than the critical value and Model C values are greater than the critical value. At the 5% significance level, the break dates and structural break unit root fundamental hypothesis in both models are not accepted in Model A values of the two variables, but are accepted in Model C values. This means

that for Model A values for lnCPI and lnKKBG variables, the unit root without structural break isn't rejected, and for Model C values, the unit root without structural break is rejected. The variable series of the study are stationary with structural break in Model C. These results show that the variables are stationary at I(1), that is, at the first difference. The unit root is rejected without structural break.

<div align="center">Table 3: Two Break LM Unit Root Test Results</div>

	lnCPI Model AA	lnKKBG Model AA	lnCPI Model CC	lnKKBG Model CC
Test Statistics	-2.171688	-3.523498	-5.411975	-6.638320
Lag Length	6	3	2	5
Date of Breaking	1986-2010	1999-2009	2002-2012	1984-2005
Critical Values (%5)	-3.5630	-3.5630	-6.1660	-6.2880

Table 3 shows the results of the LM unit root test examining two structural breaks according to the null and alternative hypothesis. Except for the Model CC value of the lnKKBG variable, all calculated test statistics are less than the 5% critical value. In this case, the LM two-break unit root basis hypothesis is not rejected, except for the Model CC value of the lnKKBG variable. The other variable lnKKBG's Model CC calculated test statistic is greater than the 5% critical value. In this case, the unit root hypothesis with structural break is not accepted and the unit root without structural break is rejected. As a result of the LM unit root test, the lnCPI and lnKKBG variables are stationary at the first difference.

4.3. Toda-Yamamoto Causality Test Findings

The variables in our study were found to be stationary at the I(1) level as a result of the stationarity tests. At this stage, while traditional cointegration and causality tests should be applied, Toda-Yamamoto causality test was preferred in order to add innovation to the literature. This test investigates the causality relationship without considering the stationarity levels of the variables. For this reason, it is preferred.

For the Toda-Yamamoto analysis, firstly, the maximum lag length was determined. Table 4 shows the maximum lag length determined according to the information criteria. According to the criteria in this table, the ideal maximum lag length is 2.

<div align="center">Table 4: Determination of Maximum Lag Length Belong to lnCPI and lnKKBG Variables</div>

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-32.39765	NA	0.020005	1.763982	1.849293	1.794591
1	25.87224	107.5752	0.001238	-1.019089	-0.763157	-0.927263
2	33.38366	13.09683*	0.001036*	-1.199162*	-0.772608*	-1.046118*
3	35.67375	3.758103	0.001137	-1.111474	-0.514298	-0.897213
4	38.97527	5.079268	0.001189	-1.075655	-0.307857	-0.800176
5	44.95478	8.585958	0.001090	-1.177168	-0.238749	-0.840471
6	48.20010	4.327093	0.001158	-1.138467	-0.029426	-0.740552
7	48.95894	0.933957	0.001409	-0.972253	0.307409	-0.513121
8	52.35151	3.827517	0.001516	-0.941103	0.509181	-0.420754

After the maximum lag length, a standard VAR model was created by using the level values of the series.

$$lnCPI_t = \beta_0 + \beta_{lnKKBG} lnKKBG + \mu_i$$

∂$lnCPI_t$ / $lnKKBG$ > 0 ; the KKBG affects CPI,

∂$lnCPI_t$ / $lnKKBG$ < 0 ; the KKBG does not affect CPI.

Since the lag length is 2 when creating the VAR model for the CPI and KKBG variables, the lag length of the standard VAR model is also 2. Since CPI and KKBG are I(1), the degree of integration (dmax) is 1. By adding the degree of integration (dmax) to the standard VAR model, the lag length is determined as 3.

The new VAR model was estimated using the Seemingly Unrelated Regression (SUR) method. This method is preferred because it takes into account the heteroskedasticity in the error terms of the equations and the correlation (autocorrelation) between the error terms.

The findings of the Toda-Yamamoto causality test for CPI and KKBG variables are shown in Table 5.

Table 5: **Toda-Yamamoto Causality Analysis Findings of the lnCPI and lnKKBG Variables**

Dependent Variable	lnCPI	lnKKBG	Direction of Causation
lnCPI	-	5.898772 (0.1166)	lnKKBG ⟶ lnCPI
lnKKBG	19.53011 (0.002)	-	lnCPI ⟶ lnKKBG

The values in Table 5 shows that there is a relationship between variables public finance deficit/GDP ratio and inflation in Turkey. The direction of the relationship between the variables is from inflation to the public finance deficit/GDP ratio. In other words, the public finance deficit/GDP ratio in Turkey is affected by changes in inflation. While our findings support the results of Oliveira (1967), Tanzi (1977) and Günaydın (2001), it is not compatible with the findings of studies in the literature showing that the public finance deficit/GDP ratio will cause inflation.

5. Conclusion

The effect of public deficit financing on inflation in the Turkish economy has been quantitatively investigated using structural break unit root and Toda-Yamamoto causality test. The findings revealed that the public sector borrowing requirement did not affect inflation in Turkey. With this result, public sector borrowing requirement is not a factor that directly increases inflation in Turkey. On the other hand, our result is in line with the literature emphasizing that periods of high inflation have quite negative effects on the macroeconomic outcomes for public finance. The inflationary experience of the Turkish economy is also supported by the results we have reached.

Inflation is one of the constant structural problems in Turkey. Since 1971, an inflationary period has been experienced in which double-digit figures lasted for 34 years. In particular, political instability and security problems in the country have led to a decrease in the effectiveness of public administration and an increase in budget deficits. The financing of these public deficits from the central bank resources, the increase in the need for foreign currency due to the development of the import-based industry in the country, and the oil crises caused a serious increase in inflation. The Turkish economy faced the 1994 and 2001 crises in the 1980-2001 period. At the root of these two crises are unsustainable public savings deficits and current account deficits. Although inflation declined to single digits in the 2000s, it has once again become one of the serious problems as a result of the upward movement in the exchange rate since the end of 2010.

Inflation not only negatively affects public finance deficit/GDP ratios, but also negatively affects government revenues and expenditures, which are nominal budget variables. It is also difficult to direct fiscal policy in inflationary shocks. This may lead to an inflation spiral, especially in a developing country like Turkey. Inflationary outcomes are significantly stronger where fiscal dominance is high, that is, where the government pays less attention to debt stability and less independence of monetary policy. Inflation is both higher and more volatile. At high levels of inflation, large fiscal and monetary incentives by the authorities are not enough. It will also require policy makers to reaffirm their commitment to policy regimes that help low and stable inflation to restore and maintain price stability over the long term.

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