Effects of Budget Deficits on Inflation, Economic Growth and Interest Rates: Applications of Turkey in 1980-2013 Period

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Abstract

The purpose of this study is to investigate the effects of budget deficits on inflation, economic growth and interest rates during the years 1980-2013 in Turkey. Long-term co-integration correlation between budget deficit and inflation, budget deficit and GDP, and budget deficit and interest rates were tested by using Johansen co-integration test. Acquired results didn't indicate any significant long-term co-integration correlation between budget deficits and inflation, GDP, and interest rate. Causality correlation was tested by Granger Causality Test. From the results of this test, a casual correlation was found between budget deficits and interest rates and the direction of such correlation was from interest rate toward budget deficits. Meaning, interest rates have significant effects on budget deficits

Keywords: Budget Deficit, Inflation, Economic Growth, Interest Rate, Turkey

1. Introduction

Described as the discrepancy between governmental inflows and outflows in a period of year, usually in favor of the outflows, budget deficits are seen as an economic and financial problem on various severity levels in both developed and developing countries. Budget deficits cause more severe problems in developing countries than in developed countries due to the structural issues encountered (Egeli, 1999).

Since external borrowing in developed countries are not in extreme levels this prevents the external borrowings from becoming a burden on budget.

Also, as opposed to developing countries, developed countries don't necessarily suffer from negative effects of budget deficits on macroeconomic balances due to reasons such as usually positive foreign trade balance, sufficiently high foreign exchange reserve, high level of capital stock, and low inflation rates they have (Peker&Acar,2010). In developing countries, however, budget deficits are likely to happen due to structural and economic factors such as high inflation rates, deficit in balance of payments, extreme level of expenditures against insufficient level of national income, as well as other political and military reasons (Şen et al., 2007).

Budget deficits getting chronicle could lead to deterioration in macroeconomic balances of a country and causes economic instability. Budget deficits have various effects in different levels on basic macroeconomic variables such as inflation rate, economic growth, balance of payments, investments, and labor.

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Budget deficits can affect a variable in positive way while it also can affect another variable in negative way at the same time. Also, while such deficits can affect a variable in positive way at the start, this effect can change to negative way in the long run, depending on the continuality and the amount of the deficit (Barışık & Kesikoğlu, 2006).

Budget deficits have become chronic in Turkey for long years. While monetarisation policies implemented since 1980s are taking a great part in the reasons for this, also failing to finance the expenditures with regular national incomes and/or increase in external borrowing in order to stabilize the macro instability that had occurred could be among those reasons (Çavdar, 2010). Identification of the correlation between budget deficits and inflation, economic growth, and interest rates which together comprise of some economic variables in Turkey is the purpose of this study. In this context, the study consists of four sections. Following the introduction section, second section addressed the empirical studies that reveal the correlation between budget deficits and inflation, economic growth, and interest rates. The third section consists of the data set used in the study, the model, and the analysis results. In the fourth and last section, results of the study and implications of them were summarized.

2. Literature

Theoretically, it's conventional wisdom that financing the budget deficits either by printing money or by borrowing causes inflation.

Financing the deficits by printing money through central bank leads to an increase in the money supply, and this in return causes inflation (Barışık & Kesikoğlu). Literature study showed that there isn't any consensus between the studies performed to test the correlation between budget deficits and inflation. Although some studies support the theory, still some of studies haven't found any correlation between budget deficits and inflation. For instance, in US, Darrat (1985) has found in his study on the correlation between federal budget deficits and inflation for post-1960s that monetary growth and federal deficits both have significant effects on inflation during 1960s and 1970s. Similarly, in his another study for Greece (2000) on the period of 1954-1993, he obtained some findings that indicated monetary growth and chronic budget deficits have significant and direct role in the inflationist process.

In his study on the correlation between budget deficits and inflation during the period of 1979:1 – 1994:4 in Portugal, Afonso (1993) predicted various models consisted of budget deficits and inflation, and budget deficits, inflation, and monetary growth variables.   Accordingly he found statistically significant positive correlation between budget deficits and inflation, and also between budget deficits and M2 monetary growth. Similarly, Alavirad and Athawale (2005) have found in their study for Iran on the period between 1963 and 1999 that there was a lon-term correlation between public budget deficits and inflation. In addition to these study that supported the theory, Aglavi and Khan (1978), Nachane and Nadkarne (1985), and Ramachandran (1983), although they accept the hypothesis that inflation is the cause of the monetary growth, have suggested that nothing conclusive can be said about whether budget deficits have direct and/or indirect effects on inflation or not.

In Turkey, although a relatively low-inflation environment has happened through inflation targeting policy that was applied implicitly after 2002 and explicitly as of 2006, the long-term existence of the high inflation has increased the significance of the studies designed to test the correlation between budget deficits and inflation. Some of such studies are summarized as follows:

Metin (1995), in his study on inflation and covered the period of 1950-1988 for Turkey, has found that monetary growth has significance role in determination of the inflation, and suggested that it's possible to reduce the inflation rapidly in Turkey by minimizing the budget deficits.

Egeli (1999), in his study across 23 developing countries with medium-level income, has analyzed the effects of inflation, public expenditures, interest rates, external debts, and income per capita on budget deficits through regression model, and except for income per capita and interest rate, coefficients of other independent variables were found statistically significant. Akçay, Alper, and Özmucur (2001) predicted the long-term correlation between budget deficits and inflation by using annual data sets of consolidated budget deficits, real economic growth, wholesale price index, and reserved money stock from 1970 through 2000. In the end, they found that in the long-term, budget deficits don't have a continuous effect on inflation, but in return, the changes in borrowing needs of public sector have a continuous effect on inflation.

Altıntas, Çetintas and Taban (2008) predicted the correlation between budget deficits, money supply, and inflation in Turkey for the periods of 1992:1 and 2006:12. According to obtained empirical results, monetary growth has positive and significant effect on inflation in short- and long-term while budget deficits have no significant correlation with inflation neither in short- nor in long-term. In another study performed by Aksoy (2010), whether budget deficits have any effects on inflation, growth, and interest rate in Turkey between 1980 and 2008 was investigated. Study didn't find any correlation between budget deficits and inflation neither in short- nor in long-term. While no correlation has been detected between budget deficits and money supply, a casual relation running from budget deficits toward interest rates in both, short-term and long-term was detected.

Another macroeconomic variable affected by budget deficits is economic growth. Budget deficits can affect the economic growth positively or negatively. If budget deficit was caused by an increase in public expenditures, then this may affect the economic growth positively. For example, necessary infrastructural investments done by public sector promote the private initiatives, increases the quality and quantity of the health and educational services as well as human capital, and increase the effectiveness of the labor and capital by taking legal and administrative decisions necessary for economical structure, thus enhances the economic growth (Barışık & Kesikoğlu, 2006). However, if the budget deficits are financed by internal borrowing, resulted crowding-out effect can lead in decrease in private investments, and accordingly in production level. And this causes a decrease in growth rate which reflects the annual growth of national income (Yılmaz, 2010).

 Some of the studies testing the correlation between budget deficits and economic growth are summarized in the preceding paragraphs. In addition to those studies, Barro (1991), in his study where he employed least squares method to analyze the cross-section data of 98 countries for the period between 1960 and 1985, has found a negative correlation between growth rate and public consumption expenditures. A similar study by Kelly (1997) was conducted across 73 countries for the period between 1970 and 1989. Study has found a correlation between economic growth and public investments. However, Kelly suggests that such findings shows weak support for such correlation. In his study, Arısoy (2005) has investigated the correlation between public expenditure, which is seen as one of the reasons for budget deficits, and economic growth for Turkey, using the annual data sets of 1950 – 2003. According to study results, except for total public expenditure, there was a unilateral causality relation in long-term that run from economic growth towards to public expenditure elements such as current expenditures, investment expenditures, transfer, and non-transfer expenditures as differentiated according to economic classification. In other words, he suggests that in long-term, economic growth would increase the public expenditure.

In this study, the last variable associated with budget deficits is interest rate. While in some studies investigating the correlation between budget deficits and interest rates, a positive-oriented correlation was found, again some of those studies have found no correlation: for example, Evans (1985) has conducted a study for US that covers different periods such as 1958-1970, 1912-1922, 1938-1950, and 1979-1984 and found no correlation between budget deficits and interest rates.

Another study conducted by Cebula (1998) which covers a period from 1973:02 to 1995:04 has found that US budget deficits has an elevator effect on long-term interest rates. Similarly, Barnes (2008) has investigated the existence of a correlation between budget deficits and long-term interest rates for US and nine European countries, using co-integration method. Using quarterly data sets for the period of 1970–2001, Barnes has found some findings that indicate a co-integration relation between budget deficits and interest rates for all countries in the study.

In Turkey, Aksu, Emsen and Başar (2001) investigated the correlation between budget deficits and interest rates for the period of 1985 – 2000 investigated the correlation and found a long-term significant correlation between real interests and budget deficits as well as between nominal interests and budget deficits. According to Granger causality test, budget deficits don't cause real and nominal interest rates but rather real and nominal interests cause budget deficits. Another study was conducted by Peker and Acar (2010). In their study, the analyzed the correlation between internal borrowing rate of interest and consolidated budget deficits by the help of co-integration method, using monthly data sets from 1992:1 – 2005:12. The study revealed a linear correlation in long-term between internal borrowing rate of interest and consolidated budget deficits. In short-term, correlation between interest rates and budget deficits was insignificant.

3. Data, Method and Analysis

Turkish economy has gone through an extensive economic change in 1980s. Import substitution policies were abandoned, export-based growth model implemented, and financial liberalization process has begun. Therefore, this study used annual data sets from 1980-2013. In this study by which the correlation between budget and inflation, economic growth, and interest rates: Budget Deficit/GDP rate was chosen as budget deficit variable; GDP was chosen as indicator of budget; and as indicator of inflation, TUFE (consumer price index); and finally as indicator of interest rate, average annual interest rate that used by the banks for deposit accounts were chosen. Data used in the study was obtained from Central Bank of Turkey, Secretariat of Treasury, and General Directorate of Budget and Fiscal Control.

Table 1: Defination of Variables

Variables		Explanation	Period
BUD	Refer to Budget Deficit	Budget Deficit/GDP	1980-2013
CPI	Refer to Inflation	Consumer Price Index	1980-2013
INT	Refer to Interest Rate	The average annual interest rate on deposits	1980-2013
GDP	Refer to Economic growth	Gross Domestic Product	1980-2013

A time series data is used to define a relationship between budget deficit and inflation,economic growth and interest rate. Many macroeconomic time series contain unit roots dominated by stochastic trends developed by Nelson and Plosser (1982). Unit roots are important in examining the stationary of a time series because a non-stationary regressor invalidates many standard empirical results (Dritsakis, 2008). If standard regression techniques are applied to non-stationary data, the end result could be a regression that looks good under standard measures (significant coefficient estimates and high R^2), but which is ultimately valueless. Such a model would be termed a "spurious regression" (Brooks, 2008).

The presence of a stochastic trend is determined by testing the presence of unit roots in time series data. In this study, Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root test are used for testing to the series' stationarity. According to the unit root tests results, we tried to find cointegration relations for the non-stationary series groups which are stationary after first difference.

The notion of cointegration was first introduced by Granger (1981) and Granger and Weiss (1983). It was further extended and formalised by Engle and Granger (1987). Cointegration describes the existence of an equilibrium or stationary relationship among two or more time series, each of which is individually non-stationary. The advantage of the co-integration approach is that it allows integration of the long-run and short-run relationships between variables within a unified framework (Narayan, 2003).

If the time series (variables) are non-stationary in their levels, they can be integrated with integration of order 1, when their first differences are stationary. These variables can be cointegrated as well, if there are one or more linear combinations among the variables that are stationary. If these variables are being cointegrated, then there is a constant long-run linear relationship among them (Dritsakis, 2008). We use Johansen's maximum eigenvalue and trace tests to defining cointegration relation between budget deficit and inflation, budget deficit and economic growth, budget deficit and interest for the integrated order one (I(1)) series. Johansen's procedure builds cointegrated variables directly on maximum likelihood estimation instead of relying on OLS estimation. This procedure relies heavily on the relationship between the rank of a matrix and its characteristic roots. Johansen derived the maximum likelihood estimation using sequential tests for determining the number of cointegrating vectors. We use this procedure to test for the existence of cointegrating relationships between bilateral series.

Cointegration analysis gives an account of whether there is a long-run relationship or not; however, it does not explain the direction of the relationship. Granger causality developed by Engle and Granger (1987), based on error correction model, enables us to explain the direction of the relationship. We used the Granger causality test for explaining the direct relationship between budget deficit and inflation,economic growth and interest rate.

First of all, it has been investigated the series stationary or not. ADF unit root test is used for testing series' stationarity.

The findings of the unit root tests can be found from Table 2. The series in Table 1 are checked based on intercept, intercept and trend, and the results vary according to the implications of these characteristics for the choice of intercept and intercept and trend in the unit root test regression. All series is not stationary at level, but for the model of the first difference, the series is stationary.

Table 2: Unit Root Tests Results

Variables	Level/First Difference	Augmented Dickey-Fuller (ADF) Test Statistic				Result
		Intercept	Prob	Trend and Intercept	Prob	
BUD	Level	-1.735288	0.4048	-1.576550	0.7806	**I(1)**
	First Difference	-5.265026	0.0001*	-5.305778	0.0008*	I(0)
CPI	Level	-2.390023	0.1521	-2.468828	0.3403	**I(1)**
	First Difference	-7.544559	0.0000*	-7.429764	0.0000*	I(0)
INT	Level	-1.113256	0.6987	-1.999989	0.5799	**I(1)**
	First Difference	-6.143130	0.0000*	-6.097183	0.0001*	I(0)
GDP	Level	-0.677792	0.8387	-3.090403	0.1251	**I(1)**
	First Difference	-6.390134	0.0000	-6.311940	0.0001	I(0)

*Significant at the 5% level.

If the time series are nonstationary in their levels, they can be integrated with integration of order one (I(1)), when their first differences are stationary. These variables can be cointegrated and there can be long-run linear relationship among them. Since it has been determined that the variables under examination are integrated of order one (I(1)), then the cointegration test is performed. The testing hypothesis is the null of non-cointegration against the alternative that is the existence of cointegration. Johansen cointegration test is used for testing series' cointegration relation.

Table 3: Johansen Cointegration Results

	Null Hypothesis	Trace Test	Prob.	Result	Null Hypothesis	Maximal Eigenvalue Test	Prob.	Result
BUD-INT	$r \leq 0$	11.31151	0.1930	Accepted H_0	$r = 0$	8.792343	0.3038	Accepted H_0
	$r \leq 1$	2.519171	0.1125	Accepted H_0	$r = 1$	2.519171	0.1125	Accepted H_0
BUD-GDP	$r \leq 0$	6.396358	0.6487	Accepted H_0	$r = 0$	4.243249	0.8328	Accepted H_0
	$r \leq 1$	2.153109	0.1423	Accepted H_0	$r = 1$	2.153109	0.1423	Accepted H_0
BUD-CPI	$r \leq 0$	15.17114	0.0559	Accepted H_0	$r = 0$	11.11425	0.1486	Accepted H_0
	$r \leq 1$	4.056891	0.0440	Accepted H_0	$r = 1$	4.056891	0.0440	Accepted H_0

Note: r is the number of the cointegrating vectors. Critical values vary based on trend, intercept. A lag of r=1 for VAR was selected before Johansen cointegration test.

According to Trace and Max-eigenvalue test indicates one cointegrating vector at the %5 level of significance. The finding of the cointegration test is cointegration not exists among Budget Deficit and interest rate, budget deficit and GDP, budget deficit and CPI. It means that there is no significant long-run relation between these variables.

Table 4: Granger Causility Test Results

		F-Sta.	Prob.	Result
H_0 Hypothesis	BUD does not Granger Cause INT	1.84574	0.1844	Accepted
Alternative Hypothesis	BUD does Granger Cause INT			Rejected
H_0 Hypothesis	**INT does not Granger Cause BUD**	**4.78417**	**0.0367**	**Rejected**
Alternative Hypothesis	INT does Granger Cause BUD			Accepted

* A lag of r=1 for VAR was selected before Granger Causility Test.

		F-Sta.	Prob.	Result
H_0 Hypothesis	BUD does not Granger Cause GDP	0.37963	0.5424	Accepted
Alternative Hypothesis	BUD does Granger Cause GDP			Rejected
H_0 Hypothesis	GDP does not Granger Cause BUD	0.04811	0.8279	Accepted
Alternative Hypothesis	GDP does Granger Cause BUD			Rejected

* A lag of r=1 for VAR was selected before Granger Causility Test.

		F-Sta.	Prob.	Result
H_0 Hypothesis	BUD does not Granger Cause CPI	0.03387	0.8552	Accepted
Alternative Hypothesis	BUD does Granger Cause CPI			Rejected
H_0 Hypothesis	CPI does not Granger Cause BUD	2.41052	0.1310	Accepted
Alternative Hypothesis	CPI does Granger Cause BUD			Rejected

* A lag of r=1 for VAR was selected before Granger Causility Test.

According to the Granger Causality tests results, H_0 Hypotheses are accepted for BUD-INT, BUD-GDP, GDP-BUD, BUD-CPI and CPI-BUD, H_0 Hypothesis is rejected for INT-BUD. It means that there is no causality relation from budget deficit to interest rate, from budget deficit to GDP, from GDP to budget deficit, from budget deficit to inflation and from inflation to budget deficit. But there is causality relation interest rate towards budget deficit.

4. Conclusion

Factors such as instability of the governmental income, pressure of extreme expenditure, defective source distribution, and insufficient private savings cause large and chronic budget deficits, particularly in developing countries. Continuous and large budget deficits encountered in Turkey affect many macroeconomic variables, particularly inflation, investment, employment, growth, etc. By this study, correlation between budget deficits and inflation, economic growth, and interest rates, and direction of such correlation were sought to identify.

In this study that covers the period between 1980-2013; long-term co-integration relations between budget deficits and inflation, budget deficit and GDP, budget deficit and interest rates were tested using Johansen co-integration test. According to test results, there was no significant long-term correlation between budget deficit and inflation, GDP, and interest rates. Causality relation was tested by Granger causality test. From the results of Granger causality test, it was found a causal relation between budget deficits and interest rates, and the direction of such relation was from interest rates towards to budget deficits. In other words, interest rates have a significant effect on budget deficits. According to these results, it's clear that one of the important factors affect the budget deficits in Turkey is interest rates. Due to economic program implemented in Turkey in the recent years, interest rates are usually floating high. Accordingly, cost of borrowing with high interest rates increases, and consequently budget deficit of the state also increases. In this case, in order to reduce the budget deficit occurred due to implemented policies, interest rates should be reduced.

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