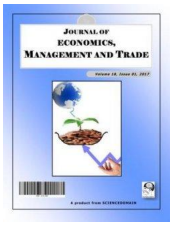


Journal of Economics, Management and Trade

21(11): 1-12, 2018; Article no.JEMT.30169
ISSN: 2456-9216
(Past name: British Journal of Economics, Management & Trade, Past ISSN: 2278-098X)

Inflation and the Determinants of Growth in Turkey

Ilhan Eroğlu[1*]

[1]Department of Economics, Faculty of Economics and Administrative Sciences, Gaziosmanpasa University, Tasliciftlik Campus, Tokat, Turkey.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/JEMT/2018/30169
Editor(s):
(1) Dr. Chiang-Ming Chen, Department of Economics, National Chi Nan University, Taiwan.
Reviewers:
(1) Rodica Pripoaie, "Danubius" University Galati, Romania.
(2) António Bento Caleiro, Universidade de Évora, Portugal.
Complete Peer review History: http://www.sciencedomain.org/review-history/27018

Original Research Article

Received 19 September 2016
Accepted 06 December 2016
Published 03 November 2018

ABSTRACT

Whether there is a relationship between price stability and sustainable growth has always been a matter of debate. Thus, a potential relation between the provision of price stability and sustainable growth will direct monetary and financial policies in reaching the economic targets. In this paper, we will discuss the determinants of growth and the inflation-economic growth relationship for the 1998:1-2011:4 quarterly periods in Turkey. The data for these periods have been tested by the Co-integration and Granger causality tests. The findings show that there is a causal relationship from inflation toward economic growth and inflation has a negative effect on growth in the long term. Furthermore, error correction model has been applied based on the presence of cointegration. The analyses have showed the basic determinants-(political stability (PS), gross capital formation (GCF), net export (XN) and Consumer Price Index (CPI)- are in a significant relationship with growth.

Keywords: Inflation; economic growth; co-integration; Granger.

JEL classification: E 50, E 52, E 58.

1. INTRODUCTION

Economic policy makers aim either to prevent the instabilities in economic activity or to convey economic welfare to a better degree than the present state. Economic growth and price stability are the primary objectives of fiscal policies. The main aim of economic policies is

**Corresponding author: E-mail: ieroglu71@hotmail.com, ieroglu@gop.edu.tr;*

generally focused on price stability and economic growth. Thus, fiscal policy is a determinant of price stability. In inflationist pressures, the fiscal policy instruments are for increasing tax rates and decreasing public expenditures. Thus, the detection of the relationship between inflation rate and growth is of prime importance in presenting the effectiveness of the economic policies in use. The relationship between inflation and economic growth is always a popular study item in economic literature. The findings obtained from the interaction between these variables have sometimes been different from one another and the results have showed that the existing conjuncture of the world economy is the basic determinant. In this sense, the studies agree that inflation affected the economic growth positively until the 1980s. However, the process has reversed for the last 30 years. The discussions over this issue have neither come to an end nor gained partiality. This is basically due to the fact that the issue is relatively devoid of theoretical frame and generally based on experimental studies [1]. Thus, the issue has, in theoretical context, been discussed through the Phillips curve analysis only and it is centered on the opposite relationship between inflation and unemployment rather than the inflation-growth relationship. Low unemployment rate against high inflation rate is presumably the primary determinant of growth [2]. In the literature, this fact is supported empirically by Okun's law. Okun (1962) proves empirically that there is an inverse relationship between rate of unemployment and potential GDP [3]. The Keynesian approach placed no emphasis on economic growth and inflation relationship because both the increase and decrease in the general levels of price were unnoticeable until the outbreak of the Second World War. However, the war balance sheets injected inflation into the priorities of economics in the post-war process [4]. During the 1950s and 1960s, the experimental studies suggested either mild inflation had a positive effect on growth or there was no explainable correlation between them [5]. The post-war Keynesian policies that were implemented until the 1970s were regarded as valid policies since the increase in production coincided with inflation rise [6].

Due to the stagflation crises that emerged in many countries in the 1970s, high inflation and low rate of growth caused Keynesian policies to fall out of favor and changed the perception of positive relationship [7]. The studies in the 1970s and 1980s suggested that there was a negative relationship between inflation and growth [5]. The later studies carried out in the 1980s also support these results [8]. However, the studies in the second half of the 1990s focused on the detection of the non-linear relationship between inflation and growth [9].

This study aims to narrow the ongoing discussion over the inflation-growth relationship to Turkey and to present the determinants of growth with an econometric analysis. In this sense, first, the subject in the literature will be discussed. Second, the applied econometric method and data are given. Third we will present the empirical findings that point to the relationship between inflation and growth and the determinants of growth in Turkey. Finally, the final part will be included.

2. LITERATURE

Numerous empirical studies on the effects of inflation on growth have come to various conclusions. However, recent studies have concentrated on negative relationship between inflation and growth [7]. The widespread assumption was that inflation had a positive effect on economic growth since inflation was never regarded as a serious problem until the early 1970s. The assumption is justified by William Phillips' analysis. The low unemployment-high inflation phenomenon lost validity after the outbreak of a stagflation phenomenon with high unemployment and high inflation in the 1970s. Later, inflation rates showed rapid increases and many empirical findings suggested the increasing inflation rates had negative effects on growth rates. The post-1980s studies placed emphasis on the assertion that inflation would negatively affect growth and investments, and, stabilized growth could not be assured with simultaneous inflation. Furthermore, several studies found no relationship between inflation and growth.

As mentioned above, Keynesian analyses supported the assumption that inflation would affect growth positively because it had never been considered as a serious problem until the 1970s. These inferences are based on the Phillips Curve analysis. There is an interchange (trade-off) relationship between inflation and unemployment. In other words, low unemployment-high growth rates across inflation are the focus points in question. Some economists from Keynesian and monetarist schools summarized the point as follows [10]: Economic units, in one hand, try to increase

saving levels and revive the investments through the reduction of interests in order to lower the effect of inflation on the level of wealth; on the other hand, funds tend to gravitate from financial sector to real sector in an inflationary environment and the rise of capital intensity will affect economic growth positively. This relationship, also known as the Mundell-Tobin effect, points to the fact that inflation increases the cost of money-saving. Those that intend to avoid this must make portfolio decisions in favor of capital and, thus, economic growth will be accelerated depending on the reduced interest rates. In the pre-1970 period, Organization for Economic Cooperation and Development (OECD) attained high levels of growth despite high inflation rates of many Asian and South American countries [11].

Several studies on the analysis of inflation and economic growth relation have found a positive relationship between inflation and economic growth. Lucas [12] has analyzed the annual data of 18 countries between 1951 and 1967 by the method of least squares. Lucas suggests that there will be a positive relationship between inflation and economic growth in the countries with price stability whereas such a relationship will be out of question in the countries with instable prices. Christina [13] has applied the method of least squares for the 1884-1994 period, excluding 1941-1951, in USA and concluded that 0,10% increase in inflation raised economic growth up to %1. Mallik and Chowdhury [14] has analyzed the economies of Bangladesh (1974-1997), India (1961-1997), Pakistan (1957-1997) and Sri Lanka (1966-1997) in various periods and detected a positive relationship between inflation and economic growth. Thirlwall and Barton [15] have conducted a study on both developed and developing countries for the 1958-1967 period and found that inflation has positive effect on growth in the developed countries with <8% inflation rate and negative effect in the developing countries with >10% inflation rate. Tun Wai [16] has analyzed 31 developing countries for the 1938-1954 period and come to the conclusion that inflation rate affects economic growth positively only if it is below the 13% threshold value.

However, the findings that inflation affects growth negatively date back to the early 1970s. Friedman's opinions on the Phillips Curve form the basis of these findings. Friedman, stating that Phillips curve is valid in the short term but is also invalid in the long term, suggests that if the growth of money supply surpasses economic growth, a high inflationary environment will occur and this will affect investments and exportation negatively [17]. With cross-sectional analysis, Gylfason and Herbertsson [18] have found a strong negative relationship between inflation and economic growth in 170 developed and developing countries for the 1960-1992 period. Furthermore, Edward [19]'s study with the method of least squares on Brazil (1952-1974) and Chile (1952-1970), Fischer [20]'s study with-least square method on 53 developed and developing countries during the 1961-1973 and 1973-1982 periods, Kormendi and Meguire [21]'s cross-sectional study on 47 developing countries and Jung and Peyton [22]'s study with the causality test on 16 developed and developing countries have indicated that inflation will affect economic growth negatively. Artan [4], has conducted a cross-sectional study with the panel data analysis on 23 developed and 40 developing countries during the 1980:1-1995:7 period and detected the presence of a negative relationship between inflation and economic growth. Gomme [23] has conducted a correlation analysis on 82 developed and developing countries for the 1949-1989 period and found the existence of a negative relationship between inflation and growth. Fountas, Karanasos and Kim [24] have examined the Japanese economy using the monthly data of the 1961-1999 period. The authors state that inflation and the inflation-led uncertainty affect growth negatively. Furthermore, Judson and Orphanides [25] have carried out a study on the economies of 69 sample countries for the 1959-1992 period and Apergis [26] has conducted a research with a panel data analysis. The findings of the two studies show inflation and inflation uncertainty affect growth adversely. Marhubi [27] has used different inflation uncertainty criteria for 78 sample countries and found that inflation and inflation uncertainty have unfavorable effects on growth and the efficiency of investments.

Haslag [28] has examined the relationship between real gross domestic product per capita and inflation in 82 countries for the 1965-1990 period and concluded that the relationship between the two variables is negative in the countries with 10% and higher inflation rates whereas it is insignificant when inflation is below 10%. Andrés and Hermando [29] 's study with cross-sectional causality tests on 20 OECD countries' annual data of the 1960-1992 period has supported the claim that there is a negative relationship between inflation and economic

growth. Frenkel and Mehrez [30] has conducted a panel data analysis by using the 1961–1992 period's annual data on 17 countries with high inflation rates and found inflation has affected growth negatively. Kim and Willett [31] have applied panel data analysis to the annual data of 23 developed OECD countries and 27 developing nations for the 1963–1992 period and claimed there is a negative association between inflation and economic growth. Furthermore, De Gregori [32], Robert and Alexander [33], Motley [34], Caporin and Maria [35], Valdovinos [36], Gillman and Nakov [37], Hodge [38] and some other researchers have supported the claim that inflation affects economic growth negatively. There are several studies that have found no relationship between inflation and economic growth. Vaona and Schiavo [39], Ericsson, Irons and Tyron [40], Hineline [41] and Chowdhury [42] have found no significant relationship between inflation and growth. Furthermore, Barro [43] has found there is a negative but statistically significant relationship between inflation uncertainty and growth.

The studies on the relationship between inflation and economic growth in Turkey have generally found a negative association. Aşirim [44] has detected a negative relationship between inflation and growth for the 1968–1994 period. Kirmanoglu [45] has used unrestricted VAR model for the 1996–2002 period and pointed to the presence of a negative relationship between inflation, growth and private sector investments. Karaca [46] has used the method of least squares for the 1987-2002 period and suggested that there is a causal relationship between inflation and growth and 1% increase in inflation will lead to 0,37 decrease in economic growth. In parallel with Karaca's suggestion, Berber and Artan [10] have used the method of least squares for the 1987:1-2002:3 periods and found a one-way causal relationship from inflation toward growth by the Granger causality test. The authors have concluded 10% increase in inflation will affect growth negatively up to 1,9%. Furthermore, Çetin [47] has conducted a study with the causality test for the 1985:1-2003:11 periods and found a negative relationship between high inflation and economic growth. Terzi and Oltulular [48] have used the causality test for the 1923-2003 period and found a negative causal relationship from inflation toward economic growth. Artan [1] has carried out a GARCH analysis for the 1987:1-2003:3 periods and suggested that inflation and inflation uncertainty have a negative effect on growth in Turkish economy. Sarac [49], in his study with the bounds test, has presented the presence of a negative relationship between inflation and economic growth in both short and long terms for the 1988:1-2007:4 periods. Yapraklı [6] has applied cointegration and causality test to the inflation-economic growth relationship for the 1987:1-2007-1 periods and concluded that inflation will prevent economic growth in the long term. The author has also found a one-way negative relationship from inflation toward growth. Erbaykal and Okuyan [50], Uysal, Mucuk and Alptekin [51] and Taban [52] have obtained similar results.

Saatcioglu and Karaca [53] have remarked Turkey implemented two types of growth policies in the 1950-2000 period: One was import substitution growth policy between 1950 and 1980, the other being export-oriented policies as from 1980 to 2000. Considering the 1950-2000 period as a whole, the researchers have found a causal relationship from economic growth toward export. Furthermore, they have also obtained a result pointing to the presence of causality from export toward economic growth in the 1980-2000 period [53].

Several studies have concentrated on the relationship between political stability and economic growth. Alesina and Perotti [54] have carried out a research on 71 countries for the 1960-1985 period and found political instability leads to adverse effects on growth. Berthelemy et al. [55], De Haan and Siermann [56], Barro [43], and Chen and Fengs [57] have obtained similar results. Arslan [58] has examined the correlation between political instability and gross domestic product (gdp) for Turkey's 1987-2007 period by using the Johansen cointegration and error correction model. The findings of the research show there is a long-run relationship between political instability and gdp, pointing to the existence of one-way causality from gdp toward political instability.

In the literature, fixed capital investments draw the attention as the determinants of growth. Barro and Lee [59], and Jones [60] have obtained positive findings for the existence of a relationship between fixed capital investments and economic growth. Sahbaz [61] has used the panel causality analysis in the study including the 1991-2011 period for Turkey and 27 EU member countries. The results of the study indicate there are causal relationships from fixed capital investments and employment toward growth in

the long term and from fixed capital investments toward economic growth in the short term.

3. DATA SET AND LIMITATIONS

In this study, the basic factors determining growth are explained as follows:

$$GDP_{t-i} = \alpha_0 + \alpha_1 CPI_{t-i} + \alpha_2 PS_{t-i} + \alpha_3 GCF_{t-i} + \alpha_4 XN_{t-i} + \varepsilon_t \quad (1)$$

The data set used in the study has been collected from Electronic Data Distribution System (EDDS) of Central Bank of Turkey (CBT) and Turkish Statistical Institute (TSI). The data comprises the 1998:1-2011:4 quarterly periods. Here, the model includes no background observations of some variables. Thus, we have used the quarterly data of all variables instead of the yearly observations. Furthermore, the quarterly data increases the number of observations, contributing to the efficiency of the estimations. The variables that form the data set of the study are GDP, consisting of quarterly data set of real Gross Domestic Product (GDP) and CPI, representing consumer price index and containing the percentages of annual price-rise on three-month basis for the given periods. PS includes the three-month mean values of the exchange/rate over Cental Bank's buying rate for USD and is regarded as an indication of political stability [62]. XN represents export value and contains the spread of export and import through the three-month data between the relevant periods. GCF, consisting of three-month data, represents gross capital formation that is composed of public and private sector investments. The obtained series are analyzed without seasonal effects. The variables included in the model are based on the literature and the variables obtained for the predetermined period.

3.1 Descriptive Statistics

Before testing the inflation-economic growth relationship in Turkey, the basic statistical indicators of the variables are examined and the findings are summarized in Table 1.

The Jargue-Bera values that show whether the series is normally distributed indicate the GDP, GCF and XN series are normally distributed whereas the series of CPI and PS are not.

Table 1. Descriptive statistics

Variables	Mean	S.Deviation	Skewness	Kurtosis	Jarque-Berra	Prob.
Gross Domestic Product (GDP)	22096713	3875703	0.092333	1.675967	3.872189*	0.144266
Consumer Price Index (CPI) %	24.18192	22.71837	0.974666	2.320737	9.232794	0.009888
Gross Capital Formation (GCF)	4930596	1463620	0.097463	1.857883	2.908594*	0.233565
Net Export (XN)	1785796	748358.3	0.208372	3.019339	0.377108*	0.828156
Political Stability (PS)	1.29043	0.370996	-1.31354	3.693217	15.99445	0.000336

Note: *Jargue-Bera gives the results of normal distribution test. Null hypothesis gives the normal distribution of the obtained series. * shows that the series are normally distributed*

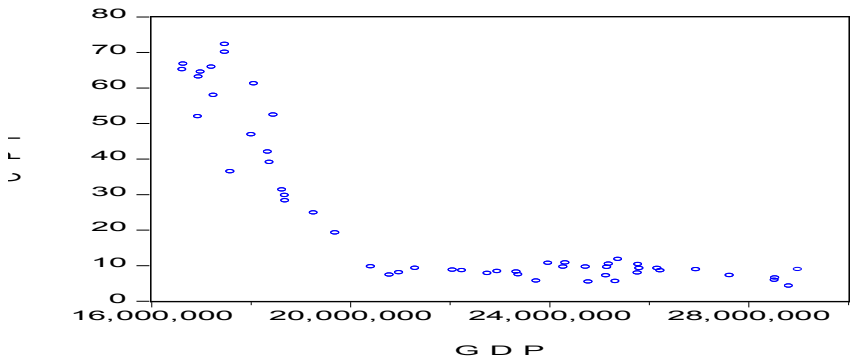


Chart 1. Dispersion diagram

The dispersion diagram showing the relationship between inflation and the variables of growth provides preliminary information about what sort of a relationship exists between the given variables. Flat regression line is negative-curved in the dispersion diagram. These findings point to a negative association between inflation and economic growth. Moreover, it is also important to present the causal relationship between the two variables. Thus, firstly, the series have been cleared of seasonality by Census X13 to examine the features of time series and, following the stationarity tests on the series, causality test that will present the causal relationship between inflation and economic growth has later been conducted to correctly set the regression equation.

4. ECONOMETRIC METHOD AND FINDINGS

4.1 Unit Root Test

In time series analysis, it will be wrong to instantly analyze the model regardless of the stationarity or non-stationarity of the series [63]. The series are accepted as stationary in the econometric implementations including time series. If the time series are both non-stationary and there is no significant relationship between them, an extremely high value of R^2 will be attained when the regression has been set, which is known as spurious regression [64]. There are various methods for testing stationarity. The most common method is unit root test. The examination of the presence of unit roots in time series determines whether the series is stationary or not. If the time series contains no unit roots, it is stationary and if it has unit roots, it is non-stationary. There are various types of unit root tests, the most common of which is the Augmented Dickey-Fuller (ADF) test. This test was developed by Dickey and Fuller [65,66]. The regression equation used in the ADF test is written as follows:

$$\Delta Y_t = \mu + \beta\, t + \delta\, Y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta Y_{t-i} + u_t \qquad (2)$$

In Equation 2, ΔY_t represents the first difference of the variable that has been tested for stationarity, $(Y_t - Y_{t-1})\ t$ is trend variable and ΔY_{t-i} is delayed difference. Delayed difference terms are attached to the equation for preventing the auto-correlation problem (sequential dependency) in the error term. There must be no auto-correlation problem in the predicted model so that the ADF test can give healthy results [67]. In the equation, k represents lags and is generally determined by the Akaike information criterion (AIC) or Schwarz information criterion (SIC). u_t represents a stochastic error term. Unit root test is applied for determining if the Y_{t-1} variable parameter (δ) is equal to zero. $\delta=0$ means that the series contains unit roots and it is non-stationary. $\delta \neq 0$ (i.e. $\delta < 0$) shows that the series contains no unit roots and it is stationary [63].

The Phillips-Perron test is another technique used in stationary tests. In this technique, statistics are transformed for converting the effect of auto-correlation on the asymptotic distribution of test statistics [68].

$$Z_t = \left(\sum_{t=2}^{T} Y_{t-1}^2\right)^{1/2} \frac{(\hat{\phi}_1 - 1)}{s_{T\ell}} - (1/2)\frac{(s_{T\ell}^2 - s_\varepsilon^2)}{\left[s_{T\ell}^2 \left(T^{-2}\sum_{t=2}^{T} Y_{t-1}^2\right)^{1/2}\right]} \qquad (3)$$

The critical values for the Phillips-Perron test are the same as those for the Dickey-Fuller test. In the two tests, if the t-statistic exceeds the critical value, it points to the presence of unit root and time series is non-stationary. According to the results of the ADF and PP tests, D GDP_SA series are stationary at 10% and 1% levels, respectively, whereas other series are non-stationary. Thus, based on the first differences of the series, the ADF and PP tests have been re-performed for providing stationarity for all the series.

In unit root test, we first determine the structure of the model and the number of lags that will be added to the model. Unit root test is performed consecutively for selecting the most proper structure out of the models with drift and trend, with drift and without trend, and without drift and trend. First, the model with drift and trend, which is the most common model, is estimated for testing the significance of the trend parameter. However, we use the critical values simulated for the Dickey Fuller [65] conditional hypothesis testing since there is no standard dispersion. Second, the model with drift and without trend is estimated when the trend parameter is insignificant. The significance of the trend parameter is tested with the Dickey Fuller [65] conditional hypothesis testing. Third, the model without drift and trend is used if the trend parameter is still insignificant after the first two steps.

In any of the three models, the appropriate lag lengths are determined with the Akaike information criterion (AIC) and/or the Schwarz information criterion (SIC). The models are estimated by using alternative lags. The appropriate lag lengths are determined with the least AIC or SIC value in any of the three models. Thus, the drift and trend that will be included in both the lag structure and model are co-evaluated for performing a unit root test. Table 2 shows the unit root test results of the series.

In the two tests, the t-statistic exceeding the critical value points to the presence of unit root and to the non-stationarity of time series. The ADF and PP results indicate no series is stationary. Thus, the ADF and PP tests have been re-performed with the first differences of the series for assuring the stationarity of all series.

4.2 Co-integration Analysis

After the stationarity of the series has been set, a co-integration analysis is conducted for determining the presence of a long-term relationship between the series. In this study, the presence of cointegration between the variables has been examined with the Johansen test.

Johansen and Juselius [69] developed maximum likelihood estimation and likelihood ratio for testing the cointegration hypothesis. The ECM (error correction model) form of the first differences in the Johansen test is written as follows:

$$\Delta X_1 = \Gamma_t \Delta X_{t-1} + \ldots + \Gamma_{k+1} \Delta X_{t-k} + \Pi X_{t-k} + \mu + \varepsilon_t \text{ ve } \varepsilon_t \sim N(0, \Lambda)\ t = 1, \ldots, T. \quad (4)$$

In Equation 4, Π, (nXn) matrix, Γ_t, . . . and Γ_{k+1} are the matrices of the parameters; Xt (nXn) is unit root vector, μ (nX1) is vector fixed value, ε_t is error term and error vector, and Λ (nXn) is covariance matrix. The right hand side can be stationary only when ΠX_{t-k} is stationary since ΔX_1 I is zero (0) in the equation. The Johansen approach in cointegration test is based on the likelihood ratio and it is tested according to the alternative hypothesis of n-r-1 unit root across n-r unit root hypothesis. Two different tests, Trace and max statistic, are used.

$$\Lambda_{max} = -T \Sigma_{i=r+1} \ln(1-\Lambda_i),\ r = 0, \ldots, n-1. \quad (5)$$

Here, Λ_i is the highest eigen value. Max statistic test is as $\Lambda_{max} = -T \ln(1-\Lambda_i)$.

According to the results of the two tests (trace and maximum eigen value), Table 3 shows that there is a strong cointegration relationship between the variables in the model. This result points to the presence of a long-run relation between the variables in the model and necessitates the use of error correction model (ECM) for the series with cointegration relationships.

Table 2. Unit root test results

Variable	Form of model	ADF		PP	
		Level	First difference	Level	First difference
GDP	Drift and Trend	-1.8280	-5.3694***	-2.0490	-5.3776***
CPI	Drift	-1.8585	-2.8995*	-1.7189	-4.8377***
PS	Drift	-2.1316	-5.3755***	-2.1261	-5.3659***
GCF	Drift and Trend	-2.8668	-3.7518**	-2.1082	-3.8654**
XN	Without Drift and Trend	-1.1951	-6.4704***	-1.2001	-6.4650***

Note: *Appropriate lag lengths have been determined by the AIC. *, ** and *** show 10%, 5% and 1% significance levels, respectively*

Table 3. Cointegration analysis results

Null hypothesis	Trace test	Null hypothesis	Maximum eigen value
r ≤ 0	116.8595*	r = 0	47.98924*
r ≤ 1	68.87023*	r = 1	28.61886*
r ≤ 2	40.25137	r = 2	23.92025
r ≤ 3	16.33112	r = 3	10.86320
r ≤ 4	5.467913	r = 4	5.467913

Note*: r represents the vector number of cointegration. (*) shows that null hypothesis is rejected at 5% significance level (there is no cointegretion among the series). The used critical values differ by the assumptions (e.g. linear trend, fixed value). The VAR lag was taken as 2 before the Johansen test*

The cointegration graph shows the 2001 and 2009 crises have adverse effect on cointegration but this effect has been removed in the subsequent periods.

4.3 Error Correction Model and Granger Causality Test

After finding a long-run relationship between the variables, an error correction model (ECM) has been estimated for determining if the long-run relationship will continue and how to adjust the imbalances that may emerge in the short term. Table 4 shows the obtained estimation results.

Table 4. Error correction model estimation results

	Model 1: ΔGDP_t	**Model 2:** ΔCPI_t
ECT_{t-1}	-0.479673	3.73E-06
	(0.14392)	(1.4E-06)
	[-3.33298]	[2.59563]
ΔGDP_{t-1}	0.107285	-2.14E-09
	(0.19978)	(2.0E-06)
	[0.53702]	[-0.00108]
ΔCPI_{t-1}	18204.18	0.199390
	(12643.7)	(0.12619)
	[1.43979]	[1.58007]
ΔXN_{t-1}	-0.290318	1.59E-06
	(0.23859)	(2.4E-06)
	[-1.21683]	[0.66925]
ΔGCF_{t-1}	0.532521	-6.98E-06
	(0.37513)	(3.7E-06)
	[1.41955]	[-1.86456]
ΔPS_{t-1}	-1475314.	10.91634
	(846581.0)	(8.44934)
	[-1.74267]	[1.29197]
Constant	226620.6	-0.553015
	(86499.8)	(0.86332)
	[2.61990]	[-0.64057]
R^2	0.371663	0.367953
$\overline{R}^2$	0.283988	0.279760
F-stat.	4.239095	4.172150

Note: The values in round brackets show standard errors and those in square brackets show test statistics

ECT_{t-1} is the error correction parameter for stabilizing the model dynamics and approximating the variables to the long-run balanced values. The ECT_{t-1} parameter is expected to be negative and statistically significant in the application. Thus, the variables are expected to move toward the long-run balanced values. Short-run deviations from the balance can be corrected depending on the size of the error correction parameter. The obtained results indicate that the error correction parameter is negative at 1% significance level, as expected. This result clearly shows short-run deviations can be corrected depending on the size of the error correction parameter.

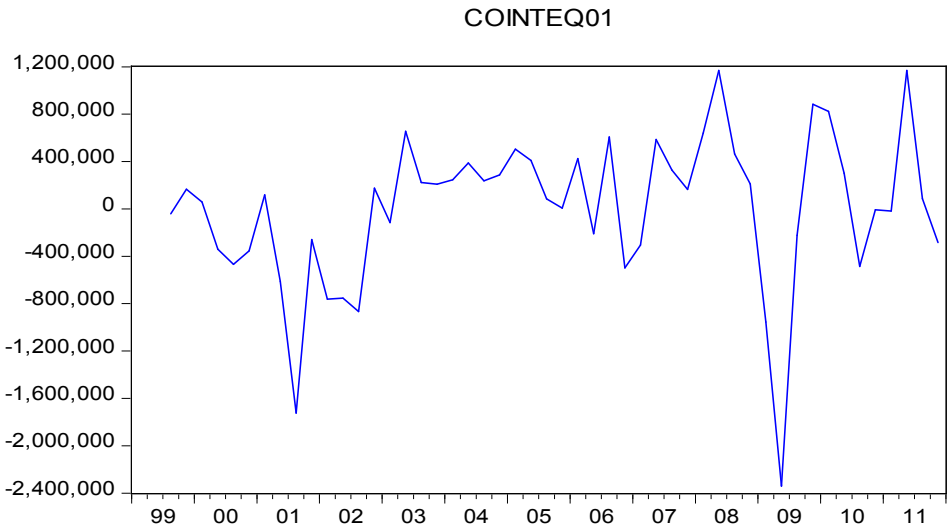
The Model 2 in Table 4 indicates the ECT_{t-1} parameter is unexpectedly positive in Model 2 that has assigned CPI as the dependent variable. Thus, we can conclude the cointegration relations between the variables are not back to their trend. However, the ECT_{t-1} parameter is negative and statistically significant in Model 1, as expected, that has assigned GDP as the dependent variable. According to Model 1, 48% of an imbalance that has emerged in a quarter can be corrected in the next quarter. This result shows the long-run balance relationship between the variables is sustainable. Furthermore, the significant ECT_{t-1} implies that there is causality from inflation (CPI) toward growth in the long term. We can also suggest there is no causality from growth toward inflation since the error correction parameter is useless in Model 2. Thus, we can see there is one-way causal relationship between inflation and growth in the long term. Table 5 gives diagnostic test results for Model 1.

Table 5. Diagnostic tests for model 1

	Test statistics
Jarque-Bera Normality	4.3218
White Heteroscedasticity	0.8477
Breusch-Godfrey serial correlation LM test	
LM (2)	19.9588
LM (5)	1.0946
LM (10)	1.2412

As is seen Table 5, the diagnostic tests estimated for Model 1 show the residuals are normally distributed. The White test indicates there is no heteroscedasticity problem in the residuals. The Breusch-Godfrey test shows no autocorrelation problems are found in the residuals.

Block exogeneity test is more preferable for the Granger causality analysis due to the presence of a long-run relationship between the variables since it reveals the individual and block causal effects of the variables.



Graph 1. Cointegration graph

Table 6. VEC Granger causality/block exogeneity wald tests

Model 1: ΔGDP_t			
Excluded	**Chi-sq**	**df**	**Prob.**
ΔCPI_t	2.072988	1	0.1499
ΔXN_t	1.480678	1	0.2237
ΔGCF_t	2.015121	1	0.1557
ΔPS_t	3.036912	1	0.0814
All	**13.21655**	**4**	**0.0103**

Table 6 informs clearly about the determinants of growth in the short term. Political Stability is the individual determinant of growth at 10% in Model 1 whereas gross capital formation is also the individual determinant of growth at 10% only. Furthermore, we have found no determinants of the two variables in the two models. The results suggest there is no causal relationship between inflation and growth in the short term. Political Stability is the individual determinant of growth at 10% in Model 1. The results suggest there is no causal relationship between inflation and growth in the short term. However, each variable has significant effect as a block on growth if Block exogeneity test is evaluated as a whole. Thus, GCF, XN and PS being used in the model are together the determinants of growth.

5. CONCLUSION

The inflation and economic growth relationship has always been discussed in the economic literature for a long time. This relation was explained by the Phillips until the 1970s and has still been examined from different perspectives since the outbreak of the stagflation crises during the 1970s. Numerous studies on the inflation-growth relationship vary by the analyzed periods, the groups of countries and by the applied econometric methods. The claims, originally based on the Phillips curve, that assert there is a positive relationship between inflation and economic growth have lost validity in the wake of recent studies and many recent researches have obtained some results that suggest there is a negative relationship.

In this regard, several studies on Turkey have found that there exists a negative relation between inflation and growth. This study empirically tests the inflation and economic growth relation in Turkey and the determinants of the growth for the 1998:1-2011:4 periods. The findings show there is a causal relationship from inflation toward growth. Inflation affects growth negatively in the long term. Furthermore, rather than attributing the reason of growth to the inflation variable only, the effects of the other variables–which are thought to have effect on growth– such as political stability (PS), gross capital formation (GCF) and net export (XN) are added to the model for drawing the attention to the determinants of growth. The regression results of error correction model show that CPI-based inflation has a negative effect on growth and 0.03% decrease in inflation will increase GDP up to 1%. However, PS, GCF and XN are positively effective on growth.

There are other variables apart from those analyzed in this study that have effects on growth. Further studies will examine the effects of other variables such as financial crisis, index of technology, saving level, budget discipline and direct movement of capital.

COMPETİNG İNTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Artan S. Türkiye'de enflasyon, enflasyon belirsizliği ve büyüme. Türkiye Ekonomi Kurumu Tartışma Metni. 2006;14:1-19.
2. Akyazı H, Ekinci A. Enflasyon Hedeflemesi, Büyüme ve Türkiye Cumhuriyet Merkez Bankası. Bankacılar Dergisi. 2009;68:1-19.
3. Holmes MJ, Silverstone B. Okun's Law, Asymmetries and Jobless Recoveries in the United States: A Markov-Switching Approach. Economics Letters. 2006; 92:293-299.
4. Artan S. Inflation, Inflation Uncertainty and Growth in Turkey. Int. J. Econ. Adm. Stud. 2008;1(1):114–138.
5. Nell KS. Is low ınflation a precondition for faster growth? The Case of South Africa. Univ. Kent Department of Economics Discussion Papers. 2000;00(11).
6. Yapraklı S. Enflasyon ve ekonomik büyüme arasındaki ilişki: Türkiye için eş-bütünleşme ve nedensellik analizi. Atatürk Üniversitesi Sos. Bilim. Enstitüsü Dergisi. 2007;10(2):287–301.
7. Karaçor Z, Şaylan Ş, Üçler G. Türkiye ekonomisinde enflasyon ve ekonomik büyüme ilişkisi üzerine eşbütünleşme ve nedensellik Analizi (1990-2005). Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilim. Fakültesi Dergisi. 2009;2(2):60.
8. TCMB. Bülten. 2008;11.
9. Guaresma CJ, Silgoner MA. Growth effects of ınflation in Europe: How low is too low, how high is too high?. University of Vienna Department of Economics Working Paper. 2004;0411(411):5.
10. Berber M, Artan S. Türkiye'de enflasyon-ekonomik büyüme ilişkisi (Teori, Literatür ve Uygulama). Atatürk Üniversitesi İktisadi ve İdari Bilim. Dergisi. 2004;18(3-4):103-117.
11. Terzi H, Oltulular S, Enflasyon-Büyüme sürecinde sabit sermaye yatırımları. Atatürk Üniversitesi İktisadi ve İdari Bilim. Dergisi. 2006;20(1):1-18.
12. Lucas RE. Some ınternational evidence on output-ınflation tradeofs. The American Economic Review. 1973;63(3):323–334.
13. Romer C. Inflation and the Growth Rate of Output. National Bureau of Economic Research. May-1996. [Online]. Available:http://www.nber.org/papers/w5575.pdf [Accessed: 07-Jul-2012]
14. Mallik G, Chowdhury A. Inflation and economic growth: Evidence from four South Asian Countries. Asia-Pasific Development Journal. 2001;8(1):123-135.
15. Thirlwall A, Barton C. Inflation and growth: The International evidence. Banco Nazionale del Lavoro Quarterly Review. 1971;24(98):263-275.
16. Wai UT. The relation between ınflation and economic development: A statistical ınductive study. IMF Staff Papers. 1959; 7: 202-209.
17. Karaçor Z, Özer H, Saraç TB. The relationship between ınflation and economic growth: An Econometric application for Turkish economy (1988-2007). Academic Review of Economic and Administrative Sciences of Niğde University. 2011;4(2):29-44.
18. Gylfason T, Herbertsson TT. Does ınflation matter for growth? Japan and the World Economy. 2001;13(4):405-428.
19. Edwards S. The relation between growth and ınflation in Latin America. UCLA Department of Economics. 1982;235.
20. Fischer S. Inflation and growth. National Bureau of Economic Research. 1983; 1235.
21. Kormendi RC, Meguire PG. Macroeconomic determinants of economic growth: Cross-country evidence. Journal of Monetary Economics. 1985;16(2):141-163.
22. Jung WS, Marshall PJ. Inflation and economic growth: Some ınternational evidence on structuralist and distortionist positions. Journal of Money, Credit and Banking. 1986;18(2):228-233.
23. Gomme P. Money and growth revisited. Institute for Emprical Macroeconomics Federal Reserve Bank of Minneapolis. 1991;55.
24. Fountas S, Karanasos M, Kim J. Inflation and output growth uncertainty and their relationship with ınflation and output growth. Economics Letters. 2002;75(3): 293-301.

25. Judson R, Orphanides A. Inflation, volatility and growth. International Finance. 1999; 2(1):117-138.
26. Apergis N. Inflation uncertainity and growth: evidence from panel data. Australian Economic Papers. 2005;44(2): 186-197.
27. Al-Marhubi F. Cross-country evidence on the link between ınflation volatility and growth. Applied Economics. 1998;30(10): 1317-1326.
28. Haslag JH. Output, growth, welfare, and ınflation: A survey. Federal Reserve Bank of Dallas Review. 1997;Q II:11–21.
29. Andres J, Hernando I. Does ınflation harm economic growth? Evidence for the OECD - ProQuest. NBER Working Paper Series; 1997.
Available:http://www.nber.org/papers/w6062
[Accessed: 07-May-2016].[Online].
30. Mehrez G, Frenkel M. Inflation and endogenous technological growth. Macroeconomics; 1998. [Online].
Available:https://ideas.repec.org/p/wpa/wuwpma/9808001.html
[Accessed: 07-Jul-2012]
31. Kim S, Willett T. Is the negative correlation between ınflation and economic growth real ? an Analysis of the Effects of The Oil Supply Shocks. Applied Economics Letters. 2000;7(3):141-147.
32. De Gregorio J. Inflation, taxation and long-run growth. Journal of Monetary Economics. 1993;31(3):271-298.
33. Alexander J, Robert W. Inflation and economic growth: Evidence from a growth equation. Applied Economics. 1997; 29(2):233-238.
34. Motley B. Growth and ınflation: A cross-country study. FRBSF Economic Review. 1998;1:15-28.
35. Caporin M, Di Maria C. Inflation and growth: Some panel data evidence. GRETA Work. Papers. 2002;2(9).
36. Valdovinos C, Fernández G. Inflation and economic growth in the long run. Economics Letters. 2003;80(2):169-173.
37. Gillman M., Nakov A. Granger causality of the ınflation-growth mirror in accession countries. Economics of Transition. 2004; 12(4): 653-681.
38. Hodge D. Inflation and growth in South Africa. Cambridge Journal of Economics. 2005;30(2):163-180.
39. Vaona A, Schiavo S. Nonparametric and semi-parametric evidence on the long-Run effects of ınflation on growth The Kiel Institute for the World Economy, Kiel Working Paper. 2007;1286.
40. Ericsson NR, Irons JS, Tryon RW. Output and Inflation in the Long Run. Journal of Applied Econometrics. 2001;16(3):241-253.
41. Hineline DR. Re-examining the robustness of the ınflation and growth relationship. Department of Economics Paper, Miami University. 2007;73(4).
42. Chowdhury A. Does ınflation affect economic growth? The relevance of the debate for Indonesia. Journal of Asia Pacific Economy. 2002;7(1):20-34.
43. Barro RJ. Economic growth in a cross section of countries. Quarterly Journal of Economics. 1991;106(2):407-443.
44. Asirim O. Output ınflation tradeoff : Evidence from Turkey. The Central Bank of the Republic of Turkey Research Department, Discussion Paper.1995;9506.
45. Kirmanoglu H. Is There Inflation-Growth Tradeoff In The Turkish Economy?; 2001.
Available:http://www.econturk.org/Turkisheconomy/kirmanoglu.pdf
[Accessed: 02-Jul-2012]. [Online]
46. Karaca O. Inflation - Growth Relationship in Turkey : Time Series Analysis. Doğuş University Journal. 2003;4(2): 247-255.
47. Çetin A. Enflasyon, büyüme ve reel-nominal belirsizlikler arasında nedensellik ilişkileri. İktisat, İşletme ve Finans. 2004; 19(221):71-79.
48. Terzi H, Oltulular S. Türkiye'de ekonomik büyüme-enflasyon süreci: Sektörler İtibariyle Ekonometrik bir Analiz. Bankacılar Dergisi. 2004;50:19-34.
49. Saraç TB. The relationship between ınflation and economic growth: An econometric application for Turkish Economy (1988-2007). Turgut Ozal International Conference On Economics And Politics-1 Global Crises And Economics Governance Conference Book. Malatya; 2010.
50. Erbaykal E, Okuyan HA. Does ınflation depress economic growth. International Research Journal of Finance and Economics. 2008;17:40-48.
51. Uysal D, Mucuk M, Alptekin V. Analysis of the relationship between ınflation and growth with vector autoregressive model ın Turkish Economy. International Journal of Management Economics and Business. 2008;4(8):55-72.

52. Taban S. Türkiye'de enflasyon-ekonomik büyüme ilişkisi: Sınır testi yaklaşımı. TİSK Akcademy. 2008;3(5):144-167.
53. Saatçioğlu C, Karaca O. Casuality relationship between exports and growth in Turkey: Effect of transformation in 1980. Yönetim; 2004. [Online]. Available:http://isletmeiktisadi.istanbul.edu.tr/wp-content/uploads/2013/ 04/Yonetim-49-2004-3.pdf [Accessed: 07-May-2016]
54. Alesina A, Perotti R. Income distribution, political stability and ınvestment. European Economic Review. 1996;40(6):1203-1228.
55. Berthélemy J, Kauffmann C, Renard L, Wegner L. Political ınstability, political regimes and economic performance in African Countries. Draft Paper for African Economic Outlook. Paris; 2000.
56. De Haan J, Siermann CLJ. New evidence on the relationship between democracy and economics growth. Public Choice. 1996;86(1-2):175-198.
57. Chen B, Feng Y. Some political determinants of economic growth: Theory and empirical ımplication. European Journal of Political Economy. 1996; 12(4):609-627.
58. Arslan Ü. Political ınstability and economic performance: The case of Turkey. Ege Academic Review. 2011;11(1):73-80.
59. Barro RJ, Lee JW. Sources of economic growth. Carnegie-Rochester Conference Series on Public Policy. 1994;40:1-46.
60. Jones CI. Time series tests of endogenous growth models. Quarterly Journal of Economics. 1995;110(2):495-525.
61. Sahbaz A. Relationship gross fixed ınvestment and economic growth: panel causality analysis. Academic Review of Economic and Administrative Sciences of Niğde University. 2014;4(1):1-12.
62. Telatar F. Türkiye''de enflasyon, enflasyon belirsizliği ve siyasi belirsizlik arasındaki nedensellik ilişkileri. İktisat İşletme ve Finans. 2003;18(203):42-51.
63. Tarı R. Ekonometri, 3rd ed. Kocaeli Üniversitesi Yayını; 2005.
64. Enders W. Applied econometrics time series. USA: John Wiley & Sons Inc; 1995.
65. Dickey D, Wayne AF. Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association. 1979;74(366a):427-431.
66. Dickey D, Wayne AF. Likelihood ratio statistics for autoregressive time series with a unit root. Econometrica. 1981;49(4): 1057-1072.
67. Karaca O. Türkiye'de faiz oranı ile döviz kuru arasındaki ilişki: Faizlerin düşürülmesi kurları yükseltir mi? Working Papers. 2005. Available:http://www.tek.org.tr/dosyalar/karaca-05.pdf [Accessed: 07-Jul-2012]
68. Phillips PCB, Perron P. Testing for a unit root in time series regression. Biometrika. 1988;75:335-346.
69. Johansen S, Juselius K. Maximum likelihood estimation and ınference on cointegration with applications to the demand for money. Oxford Bulletin of Economics and Statistics. 2009;52:169-210.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/27018