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THE RELATIONSHIP BETWEEN INFLATION, ECONOMIC GROWTH AND BUDGET DEFICIT IN TURKEY

TÜRKİYE'DE ENFLASYON, EKONOMİK BÜYÜME VE BÜTÇE AÇIĞI ARASINDAKİ İLİŞKİ

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ABSTRACT

As in the past, inflation remains one of the most significant concepts affecting the prosperity levels of countries today. Especially during economic crises, the price instability and high inflation rates experienced have compelled countries to study in this area. The characteristics of variables related to inflation have been studied, and many theories have emerged. Just as there are many macroeconomic factors affecting inflation, there are also macroeconomic components affected by inflation. It is crucial to determine the direction of the relationship between economic variables, as there can be both one-way and two-way relationships among these components. Policymakers aim to keep inflation levels as low as possible by shaping their policies in accordance with these relationships. This way, countries strive to achieve minimal inflation, fostering economic growth and maintaining budget balance. Examining the relationship between inflation, economic growth, and budget deficits is essential not only for price stability but also for reducing external dependency and positively influencing growth. This study utilizes annual inflation, budget deficit, and economic growth data for Turkey from 1990 to 2022 to analyze the relationships among these variables using econometric methods. In accordance to the results of the causality analysis, a unidirectional causality from growth to inflation and from inflation to budget deficit has been identified. This suggests that growth triggers inflation, and inflation, in turn, triggers budget deficits.

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ÖZET

Geçmişte olduğu gibi günümüzde de enflasyon, ülkelerin refah seviyelerini etkileyen en önemli kavramlardan biri olmuştur. Özellikle ekonomik buhran döneminde hissedilen fiyat istikrarsızlığı ve yüksek enflasyon oranları, ülkeleri bu alanda çalışmaya zorlamış, enflasyon ile ilişkili değişkenlerin karakteristiği araştırılmış ve ortaya pek çok teori atılmıştır. Ekonomide enflasyonu etkileyen pek çok makroekonomik faktörler olduğu kadar enflasyondan etkilenen makro iktisadi bileşenler de vardır. Bu bileşenler arasında tek yönlü bir ilişki olduğu gibi çift yönlü bir ilişki de olabileceği için iktisadi değişkenler arasındaki ilişkinin yönünü belirlemek önem arz etmektedir. Karar vericiler politikalarını bu ilişkilerin yönüne göre oluşturarak enflasyon seviyesini mümkün olduğunca minimum seviyede tutmak isterler. Bu sayede ülkeler minimum enflasyon seviyesine ulaşarak hem ülke ekonomisinde büyümeyi hem de bütçe dengesini sağlamaya çalışırlar. Enflasyon, iktisadi büyüme ve bütçe açığı arasındaki ilişkinin incelenmesi sadece fiyat istikrarın sağlanmak için değil, aynı zamanda ekonomide dışa bağımlılığı azaltmak ve büyümeyi olumlu yönde etkilemek adına oldukça önemlidir. Bu çalışmada Türkiye'nin 1990-2022 yıllarına ait yıllık enflasyon, bütçe açığı ve ekonomik büyüme verileri kullanılarak değişkenler arasındaki ilişkiler ekonometrik yöntemler kullanılarak incelenmiştir. Çalışmanın nedensellik analizi sonuçları, büyümeden enflasyona doğru tek yönlü bir nedensellik ilişkisi bulunduğunu, ayrıca enflasyondan bütçe açığına doğru tek yönlü bir nedensellik ilişkisi olduğunu ortaya koymaktadır. Buna göre, büyümenin enflasyonu ve enflasyonun da bütçe açığını tetiklediği yorumu yapılabilir.

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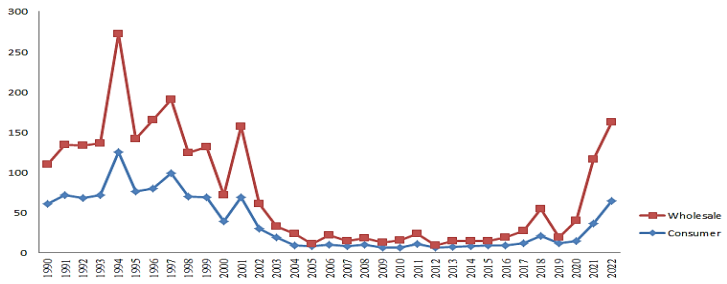
Ensuring price stability and its continuity are fundamental objectives of today's central banks. In discussions regarding the correlation between growth and inflation, there is a growing consensus that growth is adversely affected by inflation. Contrary to these views, there are also opinions in the literature that inflation positively affects growth. Mundell (1963) and Tobin (1965) concluded in their studies that inflation indirectly positively influences growth by increasing capital accumulation. The relationship between inflation and growth remains a topic of debate today. While some studies reveal a negative relationship between these two variables, others suggest a positive interaction. An important issue here is the interaction of other variables added to the model with inflation and growth. If the contribution of the added variable to the model is high, the results obtained will differ from those obtained with a variable that has a low contribution to the model. Therefore, when conducting a study on inflation, the selection of other variables to be included in the model will be extremely important. Another topic discussed in the literature is the relationship between inflation and budget deficits. Some opinions argue that inflation causes budget deficits, while others emphasize that budget deficits lead to inflation. Developed countries aim to ensure price stability in both the domestic and foreign markets and keep inflation rates at a minimum level by maintaining budget balance. In contrast, developing countries like Turkey tend to proceed more cautiously regarding inflation because they are more susceptible to any shocks. Particularly, Turkey has been struggling with high inflation for over thirty years. According to data from the Ministry of Treasury and Finance, Türkiye has been struggling with high inflation for more than thirty years. We can see the high inflation rates, both in consumer prices and wholesale, in Chart 1.

Chart 1: Inflation Rates of Turkey



Source: Ministry of Treasury and Finance

Between 1990 and 2002, inflation followed a higher trajectory compared to other periods. Especially in years of economic crises, such as 1994 and 2001, inflation figures reached peak levels. Although the inflation rate was relatively moderate until 2018, an increase in inflation rates has been observed with the onset of the pandemic.

Meanwhile, the economy's growth rate has become increasingly unstable in recent years, with its long-term average declining. This situation has led economists to widely adopt the view that there is an inverse correlation between economic growth and inflation. Conversely, some argue for a positive correlation between growth and inflation, with the Phillips Curve method being a proponent of this view. Furthermore, while there is widespread research suggesting that inflation could lead to budget deficits, some studies have also indicated that budget deficits can result in inflation.

Maintaining inflation, which affects purchasing power, at stable and reasonable levels is possible by identifying the macroeconomic factors that influence inflation. Determining how each variable affects inflation, and how much and in what direction inflation impacts each variable, will be guiding for decision-makers. In this context, this study, which investigates the interactions between inflation, budget deficits, and economic growth variables, will offer information on inflation to policymakers with its contribution to the literature. This study targets to elucidate the nature of the correlation between inflation, growth, and budget deficits in Turkey. To achieve this goal, annual data from the years 1990-2022 were utilized for a time series analysis. The conceptual framework is discussed in the second section. The analysis results are presented in the third section. Finally, the study's findings are summarized in the fourth section.

1. CONCEPTUAL FRAMEWORK

Under this section, the essential correlation between growth and inflation, along with the relationship between the budget deficit and inflation, has been examined, providing the foundation for the research.

1.1. Inflation – Growth Relationship

The topic of whether growth is affected by inflation has been a long-standing topic of debate in the economics literature, shaped by changing ideologies in the field. Following World War II, Keynesian policies that argue that markets cannot automatically regulate themselves and therefore state intervention is necessary predominated, implementing policies aimed at increasing aggregate demand, which observed to not only boost demand but also inflation as a consequence of increased production. However, during this period, the inflation problem was not seen as a concern; in fact, views began to develop suggesting that it could positively influence growth (Grimes, 1991).

While there are views in the economics literature suggesting that Economic growth is positively affected by inflation, there are also arguments that growth can be adversely affected by inflation. Particularly after experiencing high inflation and economic contractions due to inflation in many countries during the 1970s, these perspectives have continued to be debated. Hyperinflations observed in Latin American countries in the 1980s disrupted price stability in their economies and negatively impacted their growth. This situation contributed to the advancement and widespread acceptance of the viewpoint that growth is negatively affected by inflation (Cardoso, 1988; Yalçın, 2020).

1.2. Inflation – Budget Deficit Relationship

The concept of budget deficit is briefly described as the difference between budget revenues and expenditures. The interaction between budget deficit and inflation exerts effects on economies both in developing and developed countries. Numerous studies have been done in the field of economics regarding these two concepts, and various perspectives have been put forward. Some views suggest that budget deficits affect inflation, while others argue that inflation affects budget deficits (Satıcı, 2019: 100).

The inability to clearly define the direction of the correlation between inflation and budget deficits has led to differing views in economic approaches. Advocates of classical economics start from the concept of balanced budgets, whereas Keynesian economic approach allows for the use of budget deficits particularly as a tool for demand management during periods of economic downturn (Corsetti and Roubini, 1997: 27). According to this approach, Keynes emphasized the importance of fiscal policies in addressing macroeconomic instabilities and viewed budget deficits as a component of total demand (Şimşek, 2000: 51).

The interaction between budget deficits and inflation is mutual. Budget deficits not only cause inflation but inflation also leads to the budget deficit (Tanzi, 1978; Darrat, 1984).

2. EMPIRICAL STUDIES

In today's economy, both globally and in Turkey, the concept of inflation has been extensively studied. In macroeconomic studies related to inflation, the VAR model is generally used to establish the model, and the relationships between variables are examined through causality analysis. Alongside studies that show inflation positively affects growth, there are also studies that argue there is a negative relationship between these two variables. While Mundell (1963) and Tobin (1965) state that there is a positive relationship between the two variables, Arai and Kinnwall (1997) conclude that there is a negative relationship between them.

Another topic that has been frequently examined in the literature is the relationship between inflation and budget deficits. Many economists from various regions of the world have studied the relationship between these two variables and made various recommendations. For example, Fischer and Easterly (1990) found that if low inflation prevails in a country's economy, the relationship between inflation and budget deficits is weak, whereas if high inflation prevails, the correlation between the two variables is strong.

Table 1 provides a summary of studies conducted on the correlation between inflation, budget deficit, and growth in both Turkey and globally.

Table 1: *Literature Rewievs Of Inflation*

Author(s) - Year	Data Set	Methodology	Conclusion
Miller (1983)	Inflation and budget deficit data for the U.S. economy from 1948 to 1981	Causality	The author has stated that the budget deficit variable is a cause of the inflation variable in the study.
Arai & Kinnwall (1997)	Inflation, budget deficit, and growth data for 115 countries from 1960 to 1995	Causality	The study has discovered a negative relationship between growth and inflation, establishing growth as a cause of both inflation and budget deficits.
Faria & Carneiro (2001)	Inflation and economic growth data for the Brazilian economy from 1980 to 1995	VAR Model, Variance Decomposition	Faria & Carneiro's study indicates that, although inflation and growth do not exhibit a long-term relationship, they do show a negative correlation in the short term.
Karaca (2003)	Turkey's quarterly inflation and growth data for the period 1987 to 2002	Granger Causality Analysis	In the study, the author has indicated a unidirectional causality from the growth variable to the inflation variable.
Berber & Artan (2004)	Inflation and growth data for Turkey from 1987:Q1 to 2003:Q2	Least Squares, Granger Causality	The study found that a negative relationship exists among the variables examined, and that the inflation variable is a cause of the economic growth variable.
Kesbiç et al. (2004)	Budget deficit and inflation data for Turkey from 1989 to 2003	Least Squares	The authors have emphasized in the study that inflation increases when budget deficits are financed with short-term advances.
Yapraklı (2007)	Inflation and growth data for Turkey from 1987:Q1 to 2007:Q1	Granger Causality, Cointegration Analysis	In the study, the researcher has indicated that inflation negatively affects growth and that causality flows unidirectionally from inflation to growth.
Makochekanwa (2008)	Budget deficit and inflation data for Zimbabwe from 1980 to 2005	Cointegration Analysis, Causality	The study emphasizes that changes in the budget deficit variable significantly increase inflation.

Datta & Mukhopadhyay (2011)	Growth and inflation data for Malaysia from 1971 to 2007	Variance Decomposition, VECM	The authors found in the study that the growth variable positively affects inflation in the long term, and that inflation also contributes positively to economic growth over the long term. However, they identified a negative correlation among the variables in the short term.
Ekanayake (2012)	Budget deficit and inflation data for Sri Lanka from 1959 to 2008	ARDL Model	The study reveals a long-term positive relationship between the budget deficit and inflation, suggesting that a 1% rise in the budget deficit results in an 11% increase in inflation.
Devapriya & Ichihashi (2012)	Budget deficit and inflation data for Sri Lanka from 1950 to 2010	VAR Model, Causality	The authors have emphasized that both variables are both cause and effect, and that the relationship between them is positive
Khumalo (2013)	Quarterly inflation and budget deficit data for South Africa from 1980 to 2012	VAR Model, Impulse-Response Analysis	The author of the study observed a persistent equilibrium relationship between budget deficits and inflation, in which both variables exert a positive influence on one another.
Kasidi & Mwakanemela (2013)	Inflation and growth data for Tanzania from 1990 to 2011	VAR Model, Cointegration Analysis	The study suggests that inflation negatively impacts economic growth, that the two variables are not cointegrated, and that there is no long-term equilibrium relationship between them.
Inam (2014)	Budget deficit and inflation data for Nigeria from 1970 to 2010	VECM, Granger Causality	In the study, the author has indicated that a unidirectional causality from the budget deficit variable to the inflation variable exists.
Özpençe (2016)	Inflation and economic growth data for Turkey from 2003: Q1 to 2015: Q4	Vector Error Correction and Granger Causality	The author has identified a unidirectional causality from the growth variable to the inflation variable in the results of the study.
Ipek & Akar (2016)	Budget deficit and inflation data for Turkey from 2004: Q1 to 2015: Q2	Causality Analysis, ARDL, Impulse-Response Analysis	The study suggests that a bidirectional causality between budget deficits and inflation exists, with increases in budget deficits leading to higher inflation both in the long term and in the short term.
Börü & Çelik (2019)	Inflation and economic growth data for Turkey from 2002:Q1 to 2018: Q3	VAR Model, Granger Causality	In their studies, Börü and Çelik have posited that a unidirectional causality between inflation and growth exists, indicating that increases in growth lead to a rise in inflation, thereby establishing a positive correlation between the two variables.

3. METHODOLOGY

3.1. Dataset

In this study, the relationship between variables was investigated using Turkey's inflation, economic growth and budget deficits data for the years 1990-2022. The aim of the study is to determine which variable is the cause and which variable is the result variable and to make recommendations to decision makers accordingly.

Under this heading, the variables used in the study are introduced. Information about the series is as follows.

Table 2: *Information About Series*

Variables	Abbreviation	Period	Data Source
Inflation (%)	INF	1990-2022	TUIK/EVDS
Economic Growth (%)	EG	1990-2022	TUIK/EVDS
Budget Deficit (%)	BD	1990-2022	Ministry of Treasury and Finance

** The budget deficit variable is expressed as a percentage relative to the GDP series and has been seasonally adjusted using the Tramo-Seats procedure.*

** The type of inflastion used is demand inflation.*

Unit Root Tests (ADF and PP)

In econometric time series analysis, achieving stationarity necessitates two conditions. The first condition is that the mean and variance of the series must remain constant over time. The second condition is that the covariance between two time periods should depend solely on the interval separating them.

The Augmented Dickey-Fuller (ADF) test is frequently employed to assess the stationarity of a time series. To investigate stationarity, the following regression equations are utilized:

$\triangle Xt = \alpha_1 X_{t-1} + \sum_{i=1}^{k} \beta_i \triangle X_{t-i} + u_t$

$\triangle Xt = \alpha_0 + \alpha_1 X_{t-1} + \sum_{i=1}^{k} \beta_i \triangle X_{t-i} + u_t$

$\triangle Xt = \alpha_0 + \alpha_2 Trend + \alpha_1 X_{t-1} + \sum_{i=1}^{k} \beta_i \triangle X_{t-i} + u_t$

In the ADF test, the null hypothesis states that the series contains a unit root, or in other words, that it is non-stationary (H0:γ=0). The alternative hypothesis proposes that the series is stationary (H1:$\gamma \neq 0$).

In practice, in addition to the ADF test, the Phillips-Perron (PP) test is also widely utilized. This method has more flexible assumptions regarding the residuals and assumes that the residuals are heteroscedastic. A key difference between the PP and ADF tests is that the PP test does not include lagged values of the dependent variable as independent variables in the model. Unlike the ADF test, which incorporates lagged values of the dependent variable as explanatory variables to address autocorrelation issues, the PP test omits these lagged values from the equations. The models for the PP test, with no constant, with a constant, and with a constant and trend, are as follows:

$\triangle Xt = \alpha_1 X_{t-1} + u_t$

$\triangle Xt = \alpha_0 + \alpha_1 X_{t-1} + u_t$

$\triangle Xt = \alpha_0 + \alpha_1 X_{t-1} + \alpha_2 Trend + u_t$

To determine whether the series is stationary in the ADF and PP unit root tests, the t-statistics for the $\alpha 1$ coefficient are compared with the critical values provided by MacKinnon (1996). (Gujarati, 2012: 754-758).

3.2. Johansen Cointegration

The concept of cointegration was first introduced by Granger in 1981. In their study, Engle and Granger (1987) modeled cointegration theoretically. Cointegration analysis is necessary to analyze the relationship between variables that have unit roots. Non-stationary series at the level have a risk of containing unit roots, which can lead to spurious regression during the modeling phase. To prevent this situation, the differences of the series need to be taken to achieve stationarity. When investigating the long-term equilibrium relationship in non-stationary series, it is important to ensure that all series are stationary at the same level. In this study, since the series are stationary at the same level (I(1)), the condition for cointegration analysis is satisfied. Therefore, there is no issue in investigating the long-term equilibrium relationship between the variables.

Cointegration refers to the long-term equilibrium relationship between variables. In other words, it is defined as a common movement among variables. This technique is used to determine whether variables are related to each other over the long term. Once the presence of cointegration is detected, the direction of the relationship should be determined through causality analyses. However, it is important to note that when series are cointegrated, classical causality tests are not valid, and the causality relationship should be investigated using the "Vector Error Correction Model (VECM)" (Granger, 1988: 39). In the study, since the variables are not cointegrated, the VECM was not used.

3.3. Granger Causality

The Granger causality test is a method utilized to identify which variable among two or more variables is the cause variable and which is the effect variable. This helps detect the direction of the correlation among variables. The regression models utilized in this technique are as follows:

$$\triangle X_t = \alpha_0 + \sum_{i=1}^{m} \beta_i \Delta X_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta Y_{t-i} + \varepsilon_t$$

$$\triangle X_t = \delta_0 + \sum_{j=1}^{p} \theta_i \Delta Y_{t-j} + \sum_{j=1}^{q} \varphi_i \Delta X_{t-j} + \varepsilon_t$$

For this method to be applicable, the series must not involve a unit root, in other words, they must be stationary. However, it is not necessary for the levels of stationarity to be the same degree (Tarı, 2012: 437). In the equations mentioned above, the values m, n, p, and q, which represent the upper limits of the summation symbols, denote the lag lengths. When determining the appropriate lag length in applications, decisions are made based on information criteria. In this study, the appropriate lag length was identified using various information criteria, including the Akaike Information Criterion (AIC), Likelihood Ratio test statistic (LR), Schwarz Information Criterion (SC), Final Prediction Error (FPE), and Hannan-Quinn Criterion (HQ). Causality is evaluated by computing the F-statistic within the model. To determine the F-statistic, the number of lags for the dependent variable is first established to formulate a restricted regression equation. Subsequently, the lagged values of other variables are incorporated into the equation to develop an unrestricted regression equation, from which the F-statistic is derived.

$$F=((SSR\_R - SSR\_UR)/q)/((SSR\_UR)/(T - k))$$

H_0: It is not Granger-causal.

H_1: It is Granger-causal.

If the p-value is less than 0.05, the null hypothesis is rejected, and it is concluded that there is a causal relationship between the variables. Conversely, if the p-value is greater than 0.05, it indicates that there is no causal relationship between the variables. In the evaluation of Granger causality results, the α significance level and the F-statistic with (q, T-k) degrees of freedom are used. If the F-statistic surpasses the critical value from the table, the null hypothesis cannot be rejected (Gujarati, 2012: 620).

3.4. Variance Decomposition

Variance decomposition, which is a moving average of the VAR model, shows what percentage of the shocks occurring in a variable are explained by shocks in itself and other variables. It indicates how much of the percentage change in the shocks is due to itself versus other variables. If a large portion of the percentage change comes from itself, that variable is considered to be an exogenous variable. This method also reveals the strength and direction of the correlation between variables. (Enders, 1995: 311).

In general, the two-variable VAR model is expressed as follows:

$$y_t = a_0 + \sum_{i=1}^{p} a_{1i} y_{t-1} + \sum_{i=1}^{p} a_{2i} y_{t-i} + v_{1t}$$

$$x_t = b_0 + \sum_{i=1}^{p} b_{1i} y_{t-1} + \sum_{i=1}^{p} b_{2i} y_{t-i} + v_{2t}$$

In the above equations, the delay length is expressed as “p”. v represents the error term. Here, the error term has constant variance and its mean and covariance with its lagged values are zero.

4. FINDINGS

The stationarity of variables for the years 1990-2022 was examined using the ADF and PP tests, and the analysis outcomes are displayed in Table 3. According to the table, the inflation, growth, and budget deficit variables are not stationary at levels (prob>0.05). Nevertheless, the series become stationary after taking the first difference (prob<0.05). (△ indicates that the difference of the series is taken).

Table 3: *Unit Root test results of Variables (%)*

Test	ADF		PP	
Variables	**Intercept**	**Trend and Intercept**	**Intercept**	**Trend and Intercept**
INF	-1.6258	-0.2112	-1.4967	-1.2776
Prob.	0.7218	0.6416	0.6773	0.6923
△INF	-7.9000	-8.1486	-7.8287	-8.3302
Prob.	**0.0012***	**0.0008***	**0.000***	**0.000***
EG	-6.1135	-6.1352	-7.105	-8.4679
Prob.	0.1856	0.1339	0.4832	0.4853
△EG	-9.6784	-9.5041	-34.3492	-33.8055
Prob.	**0.0001***	**0.0001***	**0.0004***	**0.0004***
BD	-1.7228	-2.3348	-1.9354	-2.3587
Prob.	0.1236	0.1410	0.2208	0.2109
△BD	-4.9777	-4.9240	-4.9799	-4.9345
Prob.	**0.0016***	**0.0019***	**0.0023***	**0.0023***

Granger causality analysis was utilized to discern the causal relationships among the variables. To perform this analysis accurately, it is crucial to first develop a VAR model to determine the suitable lag length. To determine the optimal lag length, several statistical measures are employed, including LogL, Akaike Information Criterion (AIC), Likelihood Ratio test statistic (LR), Schwarz Information Criterion (SC), Final Prediction Error (FPE), and Hannan-Quinn Criterion (HQ). As shown in Table 4, the 3rd lag length is identified as optimal based on the AIC, LR, FPE, and HQ statistics.

Table 4: *Determination of the Appropriate Lag Length*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-262.0288	NA	33425.92	18.93063	19.07336	18.97426
1	-247.0093	25.74775	21871.36	18.50066	**19.07161***	18.67520
2	-239.1449	11.79652	24358.22	18.58178	19.58093	18.88723
3	-225.0900	**18.07064***	**18139.85***	**18.22071***	19.64807	**18.65707***
4	-218.7915	6.748340	25106.94	18.41368	20.26925	18.98095

After determining the appropriate lag length, Johansen cointegration procedure is employed to examine whether cointegration exists, using maximal eigenvalue and trace statistics. To select one of the five different models demonstrated by Johansen (1995), based on critical values computed with a lag length of 4, AIC and SC information criteria indicate Model 2, which is the model without intercept and trend (None Intercept & No Trend), as shown in Table 5.

Table 5: *Johansen Model Selection Statistics*

Data Trend	**None**	**None**	**Linear**	**Linear**	**Quadratic**
Test Type	**No Intercept**	**Intercept**	**Intercept**	**Intercept**	**Intercept**
	No Trend	**No Trend**	**No Trend**	**Trend**	**Trend**
Trace	0	2	1	1	1
Max-Eig	0	1	1	1	1
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	6.128439	6.128439	6.128506	6.128506	6.245461
1	5.931577	**5.596170***	5.631438	5.686049	5.739091
2	5.982436	5.721134	5.721134	5.599405	5.599405
Schwarz Criteria by Rank (rows) and Model (columns)					
0	6.778816	6.778816	6.891572	6.891572	7.110004
1	7.646379	**7.418285***	7.480896	7.582130	7.689268
2	7.980341	7.835628	7.835628	7.796157	7.796157

Using the linear trend model determined by the AIC and SC information criteria, trace and maximal eigenvalue statistics were

calculated. The calculated trace and maximal eigenvalue statistics are presented in Table 6 below.

Table 6: *Trace and Maximal Eigenvalue Statistics*

Trace Statistic	Critical Value	Prob.	Max. Eigenvalue Statistic	Critical Value	Prob.
38.62636	21.0109	0.4497	33.88146	17.14769	0.4497
3.74489	8.39771	0.8881	3.841466	6.80996	0.8881

Analysis of the Johansen test results indicates that the null hypothesis (H0) cannot be rejected based on both the maximum eigenvalue statistic and the trace statistic. Consequently, it can be concluded that no long-term relationship exists between the dependent and independent variables.

According to the Granger causality results presented in Table 7, there is a causal correlation from growth to inflation in the first equation (0.0009<0.05). Upon examining the second equation, it is observed, indicating no causal impact of inflation and budget deficit on growth. In the third model, there exists a causal correlation from inflation to budget deficit. The results ultimately reveal a unidirectional causal relationship between growth and inflation, as well as between the budget deficit and inflation.

Table 7: *Granger Causality Test Results*

Dependent Variable: INF			
Independent Variable	**Chi-sq**	**df**	**Prob.**
BD	5.1961	3	0.1580
EG	16.4764	3	**0.0009**
Dependent Variable: EG			
Independent Variable	**Chi-sq**	**df**	**Prob.**
INF	5.8369	3	0.1198
BD	3.4150	3	0.3320
Dependent Variable: BD			
Independent Variable	**Chi-sq**	**df**	**Prob.**
INF	7.7051	3	**0.0425**
EG	6.0906	3	0.1073

Table 8 shows the variance decomposition for the inflation variable. According to the results, in the initial period, 100% of the variance in the inflation variable is explained by itself, whereas in the latest period, this percentage has decreased to 5.4%. On average across all periods, the inflation variable explains 65% of its own variance. It was found that the growth variable explains an average of 26% of the variance in the inflation variable across all periods, while the budget deficit variable explains an average of 8% of the variance in the inflation variable across all periods.

Table 8: *Variance Decomposition of Inflation*

Period	S.E.	INF	EG	BD
1	16.56378	100	0	0
2	21.30195	69.92316	23.28197	6.79487
3	21.90588	67.45658	24.25404	8.289377
4	22.0965	66.33492	25.47484	8.190238
5	22.3571	65.24322	26.47434	8.282435
6	22.44094	65.42631	26.30395	8.269746
7	22.49522	65.54249	26.18461	8.272895
8	22.52044	65.45364	26.16199	8.384366
9	22.52574	65.42439	26.16466	8.410955
10	22.52944	65.41899	26.17281	8.408201

Table 9 displays the variance decomposition for the growth variable. According to the findings, the percentage of variance explained by the growth variable itself decreased from 78.7% in the initial period to 66.2% in the latest period. It was concluded that the inflation variable explains an average of 30% of the variance in the growth variable across all periods, while the budget deficit variable explains an average of 3% of the variance in the growth variable across all periods.

Table 9: *Variance Decomposition of Growth*

Period	S.E.	INF	EG	BD
1	5.961564	21.30253	78.69747	0
2	7.041834	25.36942	74.46613	0.164447
3	7.341299	30.44904	69.39164	0.159316
4	7.475696	30.77002	67.58049	1.649493
5	7.536091	30.33136	66.71700	2.95164
6	7.556732	30.6693	66.36858	2.962118
7	7.588039	30.75863	66.22089	3.020481
8	7.601905	30.74938	66.20903	3.041588
9	7.602949	30.76098	66.19492	3.044095
10	7.604801	30.74601	66.20413	3.04986

Table 10 provides the variance decomposition for the budget deficit variable. According to the results, the percentage of variance explained by the budget deficit variable itself decreased from 79.2% in the initial period to 60.3% in the latest period. It was found that the inflation variable explains an average of 13% of the variance in the budget deficit variable across all periods, while the growth variable explains an average of 25% of the variance in the budget deficit variable across all periods.

Table 10: *Variance Decomposition Table of Budget Deficit*

Period	S.E.	INF	EG	BD
1	1.898292	2.779007	17.9766	79.24439
2	1.990634	2.843815	24.60665	72.54954
3	2.117378	14.04585	21.79058	64.16357
4	2.21235	13.11685	25.61655	61.2666
5	2.217492	13.2423	25.75672	61.00098
6	2.22457	13.1586	26.22735	60.61405
7	2.22931	13.15321	26.43934	60.40745
8	2.230686	13.23575	26.41683	60.34742
9	2.231575	13.28433	26.40604	60.30962
10	2.232085	13.2821	26.40828	60.30962

5. CONCLUSION

In this study, by examining inflation, growth, and budget deficit variables, it has been concluded that there is a causal relationship from growth to inflation and from inflation to budget deficit. Accordingly, it can be interpreted that growth causes inflation, and inflation, in turn, causes the budget deficit. According to the variance decomposition analysis results, 100% of the variance in the inflation series was entirely clarified by itself in the initial term, this percentage diminished to 5.4% in the recent period. It was found that on average across all periods, the growth variable explains 26% of the variance in the inflation variable, and the budget deficit variable explains 8%. For the growth variable, 78.7% of the variance was explained by itself in the initial period, decreasing to 66.2% in the recent period. Across all periods, inflation explains 30% of the variance in the growth variable, while the budget deficit explains 3%. Lastly, for the budget deficit variable, 79.2% of the variance was explained by itself initially, decreasing to 60.3% in the recent period. It was observed that across all periods, inflation explains 13% of the variance in the budget deficit variable, and growth explains 25%.

According to the study findings, it has been concluded that growth in Turkey triggers inflation, and inflation causes the budget deficit. Accordingly, it is recommended that decision-makers first investigate the impact levels of the variables that are effective on economic growth and examine which variable affects growth while also causing inflation and, indirectly, the budget deficit. The relationship between inflation and the variables that are effective in growth and positively affect growth should be examined. In this way, it is anticipated that studies on these variables will contribute to both a healthier progression in growth and a reduction in inflation rates.

AUTHOR DECLARATIONS

Declarations of Research and Publication Ethics: This study has been prepared in accordance with scientific research and publication ethics.

Ethics Committee Approval: Since this research does not include analyzes that require ethics committee approval, it does not require ethics committee approval.

Author Contributions: The author has done all the work alone.

Conflict of Interest: There is no conflict of interest arising from the study for the author or third parties.

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