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Estimating Threshold Effect of Inflation on Economic Growth: Evidence from Iraq

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Abstract

The forthcoming is an empirical study that tries to determine and estimate the threshold level of inflation in economic growth in the Iraqi economy covering the period of (2004 – 2022). In this study, we applied threshold estimation techniques in addition to causality analysis to test the direction of the relationship. The econometric empirical model consists of (gross domestic product) as a regressing variable, while the regressor variable includes (inflation rate) Moreover the control variables were (Domestic investment, money supply, investment and term of trade). The outcome of the study indicates that all the variables were non-stationary at levels rather they become stationary at first difference. Furthermore, the causality test of Granger causality analysis indicates that there is a bi-directional causality run from the inflation rate towards economic growth and vice versa. However, the regressor and controlled variable carry out the significant impacts on economic growth in case the threshold inflation level is less than 8%. Finally, the ideal level of the threshold inflation was estimated (8%), as promoting economic growth. Rather the negative effects on economic growth when the threshold level exceeds the ideal level of (8%).

Keywords: Inflation rate, economic growth, investment, government spending, threshold inflation.

1. Introduction

The primary objective of macroeconomic policy, regardless of the country's level of development, is to achieve economic stability. This is achieved through the implementation of monetary and fiscal policies that aim to sustain high economic growth rates while keeping inflation rates low, which is also known as price stability, as defined by Frimpong and Oteng-Abayie (2010).

The goal is to maintain a supportable rate of inflation that might not affect the aspects of investment, consumption, and savings choices. It is crucial to prevent the general price level from exceeding certain limits, which is the fundamental aspect of price stability. Price stability is essential for guaranteeing financial, economic and social stability in both the run (short and long) in addition to promoting workable rates of progress. The lack of price stability in a country's economy can have serious economic, political, and social repercussions, as highlighted by Aydın et al. (2016).

The negative effects of high inflation are numerous and alarming. It carries out significant expenses based on social, and economic order, impairs well-organized apportionment of resources through masking changes in relative prices, hinders financial development by increasing the cost of intermediation, exacerbates poverty levels among the less well-off who lack financial assets to protect in counter to the rates of inflation, diminishes of competitiveness of nation's worldwide by raising the comparative price of exports, and undermines long-run economic growth (Adusei, 2012).

The inflation and economic progress correlation as a point of contention among policy entablatures and academic researchers for

a long time. The concept of encouraging long-term money growth, which results from insignificant inflexibilities, has been commonly recognized, while the awareness of undesirable inflation rates proposed by Milton Friedman and his followers has not been incorporated into the policy program of any central bank worldwide (Friedman, 1969). In the past decade, there has been a significant increase in research attention to economic growth and its determining factors.

Nowadays, there is a vast frame of literature that employs panel data to analyze modifications in development rates among states over long periods. Among the notable discoveries made in this research is a robust empirical correlation between financial sector expansion and economic growth (Rousseau & Wachtel, 2002).

Inflation has far-reaching negative effects not just on the economy, but also on society and individuals. Hyperinflation causes macroeconomic imbalances and exacerbates income inequality. Low-income individuals are especially vulnerable to inflation, as they are less able to save and benefit from high real interest rates. It is important to maintain price stability to achieve steady and sustainable economic growth, which in turn can improve people's quality of life. After the end of the Bretton Woods system, many countries experienced double-digit inflation rates due to rapid monetary expansion. The nexus between development and rates of inflation was brought into question as growth rates declined in the wake of debt crises and supply shocks. Price stability has since become the top priority for economic policy in scale of both undeveloped and developed countries. Central banks now target inflation to achieve price stability and determine their policies accordingly. The general agreement is that inflation curries out negative influence on growth in the short and

long term, and maintaining price stability is crucial for sustained economic growth. However, questions remain regarding the optimal inflation rate, whether there is a threshold value for every country group, and how long it will take to achieve stability after reducing the general level of prices to the desired level. (Adapted from Esen, 2016 and Ountries, 2017).

2. Theoretical and literature review

Various empirical and theoretical studies have been conducted to investigate the association between inflation and the growth of the economy. However, current studies have not yielded a definitive trend on the nature of this relationship. Entries (2017) questioned what level of inflation is hurtful to economic growth, as economic theories have come to different conclusions regarding the effect of inflation on output growth. The aggregate supply-aggregate demand model predicts a positive relationship between inflation and output growth, where increasing output leads to rising inflation. The Phillips curve suggests a trade-off between inflation and unemployment rate, with higher inflation leading to lower unemployment, and vice versa. However, the Phillips curve fails to explain situations of stagflation, where both inflation and unemployment rates are high.

Exclusively every economic philosophy contributes a unique perspective to the bond between inflation and growth, and there is no specific school of economic thought that advocates for accelerating inflation due to its negative impact on social welfare and distribution. The effects of inflation on growth are subject to the conditions of macro levels that might disagree significantly across countries (Eggoh & Khan, 2014).

(Zaman et al., 2011) suggest that in empirical research, many factors are examined as important determinants and regulators of price inflation. Such factors consist of the supply of the monetary base, levels of interest rate, potential levels of productivity, of exchange rate, wage rate, trade openness, and expectations. Meanwhile, (Jiranyakul & Opiela, 2010) claim that the ASEAN countries have their specific characteristics and unique economic conditions that should be taken into account when analyzing the nexus between rates of inflation and the above determinants.

There has been limited research that considered the nonlinear connection between inflation and growth in the context of countries (ASEAN), despite having lower inflation rates compared to further developing marketplaces.

A certain study was conducted for Malaysia using an endogenous (TAR) model proposed by Hansen (2000) to estimate and infer the linkage between general price levels and the growth of the economy. The study analyzed the data from Malaysia that covered a period of 1970 to 2005 and found that the certain level of threshold inflation above which it significantly harms growth is 3.89%. rather, below the 3.89% threshold level, results referred to a positive and significant correlation between inflation and growth, indicating a non-linear relationship between the two variables for Malaysia.

(Khan & Senhadji, 2001) conducted a study using threshold estimation as a procedure developed by (Hansen, 2000) and discovered that the existence of threshold inflation levels varies depending on the country's development status. Specifically, developed countries have a threshold level of 1-3%, developing countries have a threshold level of 7-11%, and the threshold level for all countries is 8-12%.

(Rousseau & Wachtel, 2002) conducted a study regarding financial development, inflation, and growth measures for an average of five years, for eighty-four countries which covered from 1960 to 1995. The imperial findings showed that there is an inflation level as a threshold between 13 and 25 per cent for the finance-growth relationship. In case of inflation exceeds this threshold, the fiscal sector can no longer boost economic growth.

According to a study conducted by (Kremer et al., 2013) that used panel data from 63 countries, both industrial and non-industrial countries are affected by inflation in terms of long-term economic growth. The outcomes revealed that there was a specific level of inflation as a threshold that was equal to 2% and the impacts were positive and statistically significant for manufacturing countries rather, than the per cent of 12% for non-industrial countries. Nevertheless, the study suggested that the appropriate level of inflation target and threshold might vary based on country-specific factors. Therefore, identifying the country-specific threshold could help determine the appropriate inflation-targeting band.

Meanwhile, (Mubarik, 2005) used an annual dataset from 1973 to 2000 to evaluate the inflation level as a threshold for Pakistan. He employed the Granger Causality test and sensitivity analysis of the model to conclude that an inflation rate that exceeds 9% carried negative impacts on the development of the economy in Pakistan. Consequently, when the rates of inflation are below the predictable level of 9% is considered favourable for economic growth.

Aydin et al. (2016) conducted a study on the impact of inflation on economic growth in Turkish Republics in the transition

(Turkmenistan, Kazakhstan, Azerbaijan, Uzbekistan and Kyrgyzstan) using dynamic panel data analysis with threshold estimation. The outcomes designate a nonlinear relationship between inflation and growth rate, where an inflation rate above the threshold of 7.97% hurts economic growth, while an inflation rate below this threshold has a positive impact on economic growth.

3. Inflation and Economic Performance Trends in Iraq

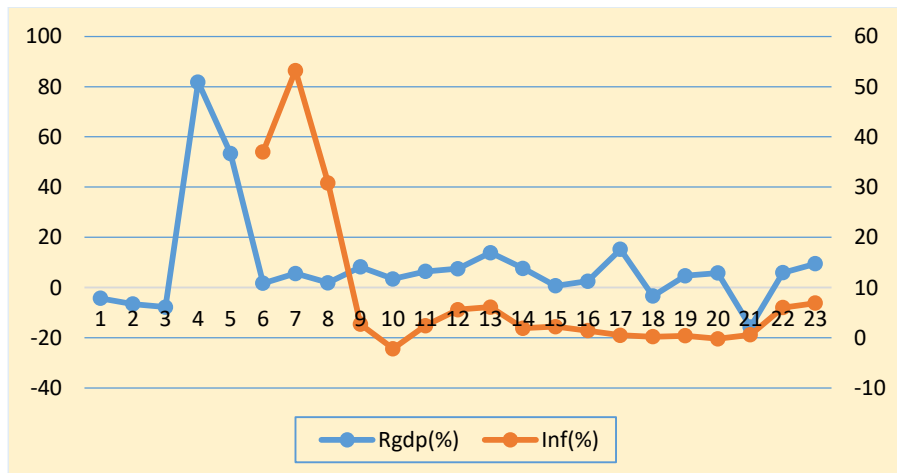
Between 2004 and 2022, Iraq experienced periods of both economic growth and high inflation. After the US-led invasion of Iraq in 2003, the country faced significant political instability and economic challenges, which led to a contraction in economic growth. However, from 2005 to 2013, Iraq experienced strong economic growth, averaging 8.8% per year, driven mainly by the oil sector (World Bank, 2013). However, since then, Iraq has struggled to maintain this growth rate, with growth slowing to an average of 2.5% per year from 2014 to 2019 due to declining oil prices, regional conflicts, and domestic political instability (World Bank, 2021).

In terms of inflation, Iraq has experienced high levels of inflation over the past two decades, with the annual inflation rate peaking at 66% in 2006 due to rising food and fuel prices and a worsening security situation (Trading Economics, 2022). Since then, inflation has remained relatively high, with an average rate of 4.7% between 2004 and 2021, and reaching a peak of 28.5% in 2020 due to the COVID-19 pandemic and low oil prices (Trading Economics, 2022).

Overall, Iraq has experienced periods of strong economic growth and high inflation over the past two decades, with the

country's economic performance being heavily influenced by oil prices and political stability.

Graph 1: Inflation Rate and Economic Growth Trends



Source: *International Monetary Fund Outlook* (2023)

4. Methodology and Empirical Model

4.1. Threshold Model

Many researchers have developed a theoretical framework for the threshold model, which was introduced by Khan and Senhadji in 2001. This model has been applied by various authors, including Hussain and Malik in 2011 and Salami and Kelikume in 2010. An empirical model was developed to estimate the correlation between economic growth and inflation in Iraq. The model is expressed as follows:

$$\text{Growth} = \beta_0 + \beta_1 \text{INFLATION} + \beta_2 \text{INVESTMENT} + \beta_3 \text{TRADE OPENNESS} + \beta_4 \text{MONEY SUPPLY} + \beta_5 \text{GOVERNMENT SPENDING} + U_t \quad (1)$$

Adding threshold effect to the equation (1), the general empirical model takes the following form:

$$\Delta \text{RGDP}_t = \alpha_0 + \beta_1 (\Delta \text{INF}_t) + \beta_2 D_t (\text{INF}_t - K) + \beta_3 (\Delta X_t) + \mu_t \quad (2)$$

The variable Y_t refers to the real gross domestic growth rate, while the annual per cent change of the consumer price index (CPI) is used as a proxy for the inflation rate. The controlled explanatory variable, ΔX_t , consists of gross fixed capital formation (investment) and trade liberalization (exports plus imports), Money supply (M_2) and government spending (GS). The coefficients to be estimated in the empirical model are represented by β_1 , β_2 , β_3 , and α . The dummy variable D_t is defined as:

$$D_t = \begin{cases} 1, & \text{if } \text{INF} > 0 \\ 0, & \text{if } \text{INF} \leq 0 \end{cases} \quad (3)$$

According to the definition provided in (Mubarik, 2005), the threshold inflation level (parameter K) has a specific property that relates economic growth to inflation. Specifically, (i) the coefficient β_1 represents the relationship between economic growth and low inflation, and (ii) the sum of coefficients ($\beta_1 + \beta_2$) represents the relationship between economic growth and high inflation. When the long-run inflation estimate is significant, both

coefficients ($\beta_1 + \beta_2$) are added to determine their impact on growth, which represents the threshold level of inflation.

The estimation procedure involves calculating regressions for various values of k , which are chosen incrementally starting from 2 up to 11. The optimal value of k is determined by identifying the value that yields the highest R-squared (R^2) or lowest Residual Sum of Squares (RSS) from the regressions. However, determining the optimal number of threshold points and their corresponding values can be challenging, which adds complexity to the estimation and inference process. Despite this, the procedure is widely accepted in the empirical literature, albeit it can be tedious because it requires the estimation of several regressions. Khan and Senhadji (2001) provide a detailed discussion of the estimation procedure and computation methods, and the RSS minimization can be computed using the following formula.

The process of approximating the ideal k value involves running regressions with different values of k , starting from 2 and increasing to 11. The chosen value of k is then the one that maximizes the R-squared (R^2) or minimizes the Residual Sum of Squares (RSS) from these regressions. However, determining the optimal number of threshold points and their values can be challenging and time-consuming, even though this method is widely used in empirical research. Khan and Senhadji (2001) provide more information on the estimation procedure and computation methods. To minimize RSS, the following formula is used:

$$k^* = \arg \min \{RSS_k: k = k_1 \dots k_{11}\}$$

(4)

4.2. Data Issue

This study utilized yearly time series data to analyze the threshold effect of inflation on economic growth in Iraq, covering the period from 2004 to 2019. The data for most of the variables, except for the investment variable, were collected from the World Bank (WDI) and the Central Bank of Iraq. The included variables were the growth rate of real GDP (RGDPG), the annual percentage of Consumer Price Index Inflation (INF), (M2) stands for the money supply, the growth rate of real Gross Fixed Capital Formation as total domestic investment (INV), and the growth rate of (exports + imports) as trade liberalization (TOT). Annual data was used for estimates for several reasons: firstly, most of the studies use annual data for the estimation of the threshold level. Secondly, monetary policymakers are more interested in the annual inflation rate for targeting and adjustment rather than quarterly or monthly rates. Thirdly, if seasonally adjusted quarterly time series were used for estimation, the exact threshold level of inflation may be lost due to seasonal adjustment. (Khan & Senhadji, 2001).

It is important to mention that GFCFG (Gross Fixed Capital Formation) and TR (Trade Liberalization) are included as control variables in the model estimation. This choice is consistent with the equations used in previous studies such as Khan and Senhadji (2001), Drukker and Hernandez-verse (2005), and Sergii (2009). However, unlike these studies, the authors of this paper do not include more than one control variable (GFCFG) in the equation due to the limited number of observations.

5. Estimation Techniques

5.1. Stationarity Test

This study will use two common tests, the Augmented Dickey-Fuller (ADF) and Philips Perron (PP) tests, to determine whether

the data is consistent with a process with a stochastic trend (I(1)) or a stationary process with a deterministic trend (I(0)). In unit root tests, a stationary model requires differencing to achieve stationarity, and the resulting process is known as an integration of order 1, or I(1) process (Hall, 1994).

The ADF model can be applied to any variable X, and is defined as follows:

$$\Delta X_t = \beta_1 + \beta_2 t + \delta X_{t-1} + \sum_{i=1}^m \alpha_i \Delta X_{t-i} + \varepsilon_t \quad (5)$$

In this study, the Augmented Dickey-Fuller (ADF) and Philips Perron (PP) tests will be used to determine whether the data is consistent with a process with a stochastic trend (I(1)) or a stationary process (I(0)) with a deterministic trend. In the unit root test, differencing is required to achieve stationarity, and these processes are also referred to as integration of order 1, I(1). The ADF model is defined as follows, where X is the series, t is the trend factor (time), B1 is the constant, m is the lag order, ε_t is a pure white noise error term, and $\Delta X_{(t-1)} = (X_{(t-1)} - X_{(t-2)})$, $\Delta X_{(t-2)} = (X_{(t-2)} - X_{(t-3)})$, $\Delta X_{(t-i)} = (X_{(t-i)} - X_{(t-j)})$, where i represents the number of recent time and j represents the number of previous times or years. The null hypothesis of the ADF test is that $\delta=0$ and X_t are non-stationary (there is a unit root), while the alternative hypothesis is that $\delta \neq 0$ and X_t are stationary (there is no unit root).

$H0: \delta = 0$, X_t is non- stationary, (there is a unit root)

$H1: \delta \neq 0$, X_t is stationary, (there is no unit root)

The null hypothesis (H0) assumes that the series has a unit root and is therefore non-stationary, while the alternative hypothesis suggests that the series is stationary and has no unit root. If the coefficient is larger than the critical values, we reject H0 and conclude that the variable is stationary. If the coefficient is smaller than the critical values, we fail to reject H0 and conclude that the variable is non-stationary.

5.2. Causality Test

Before model estimation, a Granger Causality test is conducted to evaluate the linear relationship between economic growth and inflation (Mubarik, 2005). To clarify, the Granger Causality Test (Granger & Newbold, 1988) assumes that there are two series, X and Y, and seeks to determine if X has a causal influence on Y. This would be the case if previous values of X could accurately predict current values of Y while taking into account other relevant historical information. The causal relationship between the two variables is assessed through the following regression:

$$X_t = \sum_{i=1}^n \alpha_i Y_{t-i} + \sum_{j=1}^n \beta_j X_{t-j} + u_{1t} \quad (6)$$

$$Y_t = \sum_{i=1}^n \lambda_i Y_{t-i} + \sum_{j=1}^n \delta_j X_{t-j} + u_{2t} \quad (7)$$

In this study, the Granger Causality test is used to measure the linear causation between two variables before estimating the model. The test determines whether one variable can be used to predict the future values of the other variable. If a unidirectional causality exists from Y to X, the estimated coefficients on the lagged Y in Equation I will be statistically different from zero, while the set of estimated coefficients on the lagged X in Equation II will not be statistically different from zero. Conversely, if a unidirectional causality exists from X to Y, the set of lagged Y coefficients in Equation I will not be statistically different from zero, while the set of lagged X coefficients in Equation II will be statistically different from zero. Bilateral causality exists when both sets of coefficients are statistically significantly different from zero. It is assumed that and are not correlated and the study will investigate the bilateral causality between the two variables.

5.3. Threshold Model Estimation

Equation (2) is estimated for each threshold level of inflation, from $k = 1$ to $k = 11$, to minimize RSS or maximize R^2 .

$$\Delta RGDP_t = \alpha_0 + \beta_1 (\Delta INF_t) + \beta_2 D_t(INF_t - K) + \beta_3 (\Delta X_t) + \mu_t \quad (8)$$

5.4. Robustness Check

To ensure that the estimated model is robust, a robustness check will be performed using the Two-Stage Least Square (TSLS) estimation procedure. This is necessary because the high-frequency time series data for inflation and output growth may show a reverse causality from growth to inflation, which could lead to biased estimates of the effect of inflation on growth. Furthermore, investment rates may be endogenous, as they tend to increase when

the economy achieves sustainable growth, making the country more attractive for investment. To address these issues, the threshold model will be re-estimated using the TSLS estimation procedure, as the standard OLS approach may result in inconsistent estimates. This approach will help to verify the robustness of the results obtained from the initial model.

6. Findings and Discussion of Results

To minimize the residual sum of squares (RSS) or maximize the coefficient of determination (R^2), equation (1) is estimated for each threshold level of inflation, ranging from $k=2$ to $k=17$. Following the approach of Mubarik (2005) and Frimpong and Abayie (2010), the first step involves estimating Equation (1) using Ordinary Least Squares (OLS), followed by the application of Two-Stage Least Squares (TSLS) to address potential issues with specification bias in the estimations.

6.1. Stationarity Test Results

The author conducted the Augmented Dickey-Fuller test to check for the presence of a unit root in all the variables included in the analysis. Table (1) presents the results of the stationarity test.

Table 1: Results of the Stationary Test

Augmented Dickey-Fuller (ADF) Test					
Variables	ADF (At Levels)		ADF (First Difference)		Rank order
	T.test	Prob. Value	T. Test	Prob. Value	
RGDP	-3.476199	0.051	-4.121868	0.00000	<i>I(1)</i>

		45			
INF	- 4.262735	0.163 42	-4.686729	0.00225	<i>I(1)</i>
INV	- 4.211868	0.990 04	-4.339126	0.00302	<i>I(1)</i>
TOT	- 4.95210	0.165 48	-4.822314	0.00092	<i>I(1)</i>
M2	- 5.35521	0.112 99	-4.445822	0.00000	<i>I(1)</i>
G	- 5.87741	0.071 27	-5.811210	0.00602	<i>I(1)</i>
* Rejection of null unit root hypothesis at 5%significance point					

Source: Estimated by Authors using (E-Views 11).

The results of the stationarity test showed that the null hypothesis of a unit root (non-stationarity) was not rejected at a 5% significance level for all the included variables, including RGDP, INF, INV, TOT, M2, and G, with probability values of 0.05145, 0.16342, 0.99004, 0.16548, 0.11299, and 0.07127, respectively. However, the null hypothesis of stationarity was rejected at a 5% significance level for all variables, indicating that they are integrated of order one ($I(1)$) and become stationary after first differencing. The probability values for the variables after first differencing were 0.0000, 0.00225, 0.00302, 0.00092, 0.00000, and 0.00602, respectively, which were all less than 0.05. Therefore, the variables were found to be stationary and suitable for further analysis.

6.2. Causality Analysis Results

According to the results presented in Table (2), there is evidence of bi-directional causality between the inflation rate and economic performance. The first null hypothesis, which suggests that economic growth does not Granger cause the inflation rate, was rejected since the probability value was equal to 0.0095, which is less than 5%. This implies that economic growth can cause changes in the inflation rate. The second null hypothesis, which suggests that the inflation rate does not Granger cause economic performance, was also rejected since the probability value was equal to 0.0077, which is less than 5%. This implies that changes in the inflation rate can cause changes in economic performance. Overall, the results suggest that there is a feedback loop between inflation and economic performance.

Table 2: Causality Test results

Null Hypothesis:	Obs.	F-Statistic	Prob.
#1 - GDP does not Granger Cause INF	16	6.07370	0.0095
#2 - INF does not Granger Cause GDP	16	8.85981	0.0077

Source: Estimated by Authors using (E-Views 11).

6.3 Threshold Model Findings

The threshold regression analysis conducted in this study, following the methodology of Khan and Senhadji (2001), identified the threshold level of inflation in Iraq to be at 8%. The results indicate that inflation has a positive effect on economic performance below the threshold level, ranging from 1% to 8%. However, beyond the threshold level, from 9% to 17%, inflation

hurts economic performance. These findings are consistent with previous studies conducted by Khan and Senhadji (2001), Hansen (2000), and Kremer and Nautz (2013). The threshold regression analysis is a useful tool in identifying the nonlinear relationship between inflation and economic performance and determining the optimal level of inflation that maximizes economic growth.

It seems that the study has found a non-linear relationship between inflation and economic performance, where there is a threshold level of inflation that separates the positive and negative impact on economic growth. Specifically, inflation rates below the threshold level (1, 3, 4, and 6) have a positive and significant impact on economic performance, while inflation rates above the threshold level (9, 10, and 11) hurt economic growth. This finding implies that policymakers in Iraq should aim to keep inflation rates below the identified threshold level to promote economic growth.

It is important to note that the impact of explanatory variables on economic performance varied depending on whether they were below or above the threshold level of inflation. For instance, the results showed that investment (INV) had a positive and significant impact on economic performance below the threshold level of inflation, but its impact became negative above the threshold level. On the other hand, government spending (G) hurt economic performance below the threshold level, but its impact became positive above the threshold level.

In addition, the instrumental variables used in the threshold model were found to be statistically significant. This is important as it suggests that the use of instrumental variables in the model helped to address potential endogeneity issues that could arise from omitted variables or reverse causality. Overall, the study provides insights into the complex relationship between inflation and

economic growth and highlights the importance of considering threshold effects and using appropriate econometric techniques to analyze this relationship.

Finally, Inflation threshold levels can vary across countries and regions, and thus the appropriate target level for inflation should be tailored to the specific economic conditions of each country. It is important to consider factors such as the structure of the economy, the level of development, and the historical inflation rates when determining the appropriate inflation target. Additionally, the relationship between inflation and economic growth may also differ across countries and should be taken into account when setting inflation targets. The use of cointegration analysis can be a useful tool in determining the appropriate inflation-targeting band.

Table (3): Threshold Model Estimation Results

Rank: K(#)	Variables	Coefficients	Probability value	R²
K 1	<i>Dcpi</i>	-0.2235	0.0517	0.270097
K 1	<i>Dgs</i>	0.3814	0.0624	0.270097
K 1	<i>Dinv</i>	0.0136	0.0701	0.270097
K 1	<i>dM2</i>	-0.1412	0.7012	0.270097
K 1	<i>Dtot</i>	0.2231	0.1422	0.270097
K 2	<i>Dcpi</i>	0.4522	0.5411	0.276034
K 2	<i>Dgs</i>	-0.3112	0.5332	0.276034
K 2	<i>Dinv</i>	-0.0399	0.7611	0.276034
K 2	<i>dM2</i>	-2.4121	0.2542	0.276034
K 2	<i>Dtot</i>	0.2928	0.2245	0.276034

K 3	<i>Dcpi</i>	0.3891	0.6721	0.278151
K 3	<i>Dgs</i>	-0.2374	0.5112	0.278151
K 3	<i>Dinv</i>	0.0303	0.6458	0.278151
K 3	<i>dM2</i>	-2.3325	0.4425	0.278151
K 3	<i>Dtot</i>	-0.1254	0.1281	0.278151
K 4	<i>Dcpi</i>	0.3932	0.2415	0.280163
K 4	<i>Dgs</i>	-0.3270	0.1102	0.280163
K 4	<i>Dinv</i>	0.0352	0.4062	0.280163
K 4	<i>dM2</i>	-0.1250	0.2233	0.280163
K 4	<i>Dtot</i>	-2.3672	0.0957	0.280163
K 5	<i>Dcpi</i>	0.0181	0.9711	0.215456
K 5	<i>Dgs</i>	-0.1889	0.5011	0.215456
K 5	<i>Dinv</i>	0.01832	0.8894	0.215456
K 5	<i>dM2</i>	-0.0510	0.2755	0.215456
K 5	<i>Dtot</i>	-1.9222	0.1225	0.215456
K 6	<i>Dcpi</i>	-0.3652	0.0593	0.283652
K 6	<i>Dgs</i>	0.2477	0.0402	0.283652
K 6	<i>Dinv</i>	0.0380	0.0924	0.283652
K 6	<i>dM2</i>	-0.1270	0.0744	0.283652
K 6	<i>Dtot</i>	2.110	0.0231	0.283652
K 7	<i>Dcpi</i>	-0.6307	0.0225	0.285011

K 7	<i>Dgs</i>	0.2477	0.0214	0.285011
K 7	<i>Dinv</i>	0.0450	0.0787	0.285011
K 7	<i>dM2</i>	-0.2145	0.0044	0.285011
K 7	<i>Dtot</i>	2.3250	0.0023	0.285011
K 8	<i>Dcpi</i>	-0.3652	0.0401	0.290288
K 8	<i>Dgs</i>	-0.2914	0.0012	0.290228
K 8	<i>Dinv</i>	0.0400	0.0662	0.290228
K 8	<i>dM2</i>	-0.1874	0.0041	0.290228
K 8	<i>Dtot</i>	1.1778	0.03660	0.290228
K 9	<i>Dcpi</i>	-0.3755	0.0114	0.268612
K 9	<i>Dgs</i>	0.2881	0.0024	0.268612
K 9	<i>Dinv</i>	0.0398	0.0633	0.268612
K 9	<i>dM2</i>	-0.2590	0.0488	0.268612
K 9	<i>Dtot</i>	2.2889	0.0442	0.268612
K 10	<i>Dcpi</i>	-0.4187	0.0221	0.269976
K 10	<i>Dgs</i>	0.2522	0.0448	0.269976
K 10	<i>Dinv</i>	0.0489	0.0844	0.269976
K 10	<i>dM2</i>	-0.1766	0.0472	0.269976
K 10	<i>Dtot</i>	0.1899	0.0335	0.269976
K 11	<i>Dcpi</i>	-0.3911	0.0593	0.271494
K 11	<i>Dgs</i>	0.3155	0.0488	0.271494
K 11	<i>Dinv</i>	0.0493	0.0924	0.271494

K 11	$dM2$	-0.2250	0.0577	0.271494
K 11	$Dtot$	2.2245	0.0398	0.271494

Source: Estimated by Authors using (E-Views 11).

6.4. Sensitivity Analysis Findings

It is important to note that the use of Instrumental Variable (IV) regression in Table 4 helps to address the issue of endogeneity that can occur in the OLS regression used in Table 3. The IV regression estimates the causal effect of inflation on economic growth by exploiting the exogenous variation in the instrumental variable, which in this case is the lagged inflation rate. This allows for a more accurate estimation of the relationship between inflation and economic growth. Moreover, the finding that the positive relationship between inflation and economic growth turns negative at inflation levels higher than 8% is consistent with the results from Table 3. This threshold level of inflation can serve as a useful guide for policymakers in setting an appropriate inflation target that balances the benefits of low inflation with the costs of excessively tight monetary policy.

Overall, the results from both Table 3 and Table 4 provide evidence of a non-linear relationship between inflation and economic growth in Iraq, highlighting the importance of considering threshold effects and state-specific inflation targets in monetary policy decisions.

Table (4): Results of (2 Steps Least Squares) for Threshold Model

Rank: K(#)	Variables	Coefficients	Probability value	R ²
K 1	<i>Dcpi</i>	-0.2235	0.0517	0.24566
K 1	<i>Dgs</i>	0.3814	0.0624	0.24566
K 1	<i>Dinv</i>	0.0136	0.0701	0.24566
K 1	<i>dM2</i>	-0.1412	0.7012	0.24566
K 1	<i>Dtot</i>	0.2231	0.1422	0.24566
K 2	<i>Dcpi</i>	0.2125	0.4745	0.24821
K 2	<i>Dgs</i>	-0.2142	0.4901	0.24821
K 2	<i>Dinv</i>	-0.0272	0.7733	0.24821
K 2	<i>dM2</i>	-2.3218	0.2635	0.24821
K 2	<i>Dtot</i>	0.2874	0.2358	0.24821
K 3	<i>Dcpi</i>	0.3758	0.6625	0.25599
K 3	<i>Dgs</i>	-0.3655	0.5147	0.25599
K 3	<i>Dinv</i>	0.0325	0.6474	0.25599
K 3	<i>dM2</i>	-2.324	0.4658	0.25599
K 3	<i>Dtot</i>	-0.1298	0.1345	0.25599
K 4	<i>Dcpi</i>	0.3954	0.2721	0.26014
K 4	<i>Dgs</i>	-0.3284	0.1124	0.26014
K 4	<i>Dinv</i>	0.0363	0.4177	0.26014

K 4	<i>dM2</i>	-0.1632	0.2687	0.26014
K 4	<i>Dtot</i>	-2.3953	0.0998	0.26014
K 5	<i>Dcpi</i>	0.0198	0.9711	0.20336
K 5	<i>Dgs</i>	-0.1890	0.5011	0.20336
K 5	<i>Dinv</i>	0.0197	0.8894	0.20336
K 5	<i>dM2</i>	-0.0542	0.2755	0.20336
K 5	<i>Dtot</i>	-1.9855	0.1225	0.20336
K 6	<i>Dcpi</i>	-0.3666	0.0594	0.27744
K 6	<i>Dgs</i>	0.2487	0.0445	0.27744
K 6	<i>Dinv</i>	0.0398	0.0934	0.27744
K 6	<i>dM2</i>	-0.1245	0.0787	0.27744
K 6	<i>Dtot</i>	2.1364	0.0239	0.27744
K 7	<i>Dcpi</i>	-0.3807	0.0266	0.28992
K 7	<i>Dgs</i>	0.258	0.0312	0.28992
K 7	<i>Dinv</i>	0.0479	0.0688	0.28992
K 7	<i>dM2</i>	-0.2255	0.0041	0.28992
K 7	<i>Dtot</i>	2.6328	0.0028	0.28992
K 8	<i>Dcpi</i>	-0.3666	0.0440	0.33583
K 8	<i>Dgs</i>	-0.2954	0.0012	0.33583
K 8	<i>Dinv</i>	0.0501	0.0662	0.33583
K 8	<i>dM2</i>	-0.1904	0.0041	0.33583
K 8	<i>Dtot</i>	1.1845	0.03660	0.33583

K 9	<i>Dcpi</i>	-0.3688	0.0104	0.29793
K 9	<i>Dgs</i>	0.2721	0.0047	0.29793
K 9	<i>Dinv</i>	0.0301	0.0624	0.29793
K 9	<i>dM2</i>	-0.2355	0.0501	0.29793
K 9	<i>Dtot</i>	2.0558	0.0522	0.29793
K 10	<i>Dcpi</i>	-0.4157	0.0222	0.29001
K 10	<i>Dgs</i>	0.2520	0.0457	0.29001
K 10	<i>Dinv</i>	0.0462	0.0802	0.29001
K 10	<i>dM2</i>	-0.1704	0.0463	0.29001
K 10	<i>Dtot</i>	0.1865	0.0302	0.29001
K 11	<i>Dcpi</i>	-0.3941	0.0590	0.27883
K 11	<i>Dgs</i>	0.315	0.0447	0.27883
K 11	<i>Dinv</i>	0.0443	0.0932	0.27883
K 11	<i>dM2</i>	-0.2270	0.0547	0.27883
K 11	<i>Dtot</i>	2.2245	0.0328	0.27883

Source: *Estimated by Authors using (E-Views 11).*

6. Conclusions and Policy Implications

The findings of this paper have important implications for policymakers in Iraq. The results suggest that maintaining inflation below the threshold level of 8% is crucial for promoting economic growth. Additionally, the study highlights the importance of considering the specific context of Iraq when setting an appropriate target level of inflation, as the threshold level may be state-specific.

The results also indicate that government expenditure, money supply, domestic investment, and trade liberalization have significant impacts on economic performance at the threshold level of 8% inflation. Therefore, policymakers should take these variables into account when designing economic policies aimed at promoting economic growth.

Finally, the study suggests that the inflation rate can granger economic performance in the long run, highlighting the need for policymakers to consider the long-term impacts of inflation on economic performance. Overall, the findings of this study provide useful insights for policymakers in Iraq and other developing countries that are looking to promote economic growth while managing inflation.

The finding of all included variables have a significant impact on economic performance at a certain level of threshold is important, as it suggests that policies aimed at promoting economic growth in Iraq should take into account not only inflation but also government expenditure, money supply, domestic investment, and trade liberalization. The results of this study are consistent with previous research that has found that these variables are important drivers of economic growth.

For example, Khan and Senhadji (2001) found that government expenditure has a positive impact on economic growth in developing countries, but only up to a certain point. Similarly, Hansen (2000) found that money supply has a significant impact on economic growth, but this effect diminishes as the level of inflation increases. Kremer and Nautz (2013) also found that trade liberalization has a positive impact on economic growth, but only up to a certain point.

Therefore, the policy implications of this study are that policymakers in Iraq should consider a multi-faceted approach that takes into account not only inflation but also government expenditure, money supply, domestic investment, and trade liberalization to promote economic growth. This could involve implementing policies aimed at increasing government spending on infrastructure and education, increasing access to credit for small and medium-sized enterprises, and promoting trade liberalization to boost exports and foreign investment. The results of causality analysis explored that there is a uni-directional causality that runs from inflation rate to economic performance. This means that the inflation rate can granger cause economic performance in the long run.

Concerning the policy implication, the outcomes of the study could hold a significant background for the Central Bank of Iraq to build a policy recommendation to promote economic growth, however, the monetary policy of the Central Bank of Iraq was successful in controlling the inflation rate below the threshold level 8% in the past 6 years.

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