

Original Research Article

Assessment of Determinants Influencing the Escalation of the Overall Price Level in Iran

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Inflation as an undesirable economic phenomenon in recent years has had devastating effects on Iran economy. This made economic researchers devote plenty of reports and researches to the causes or ways to cope with inflation in Iran. In the present study, considering the importance of inflation, it was tried to take advantage of the econometric model to examine the effect of in Iran's economy by using annual information from 1974 to 2021 and by using the Generalized Method of Moments (GMM). The results of the GMM model showed that the variables of labor wage index, liquidity volume, time-lag inflation and unofficial exchange rate growth have a positive and significant effect on inflation in Iran. Also, the GDP growth variable has a negative and significant effect on the dependent variable. The study suggests that in order to control inflation, the government in Iran should consider issues such as stability in economic policy-making, adopting appropriate fiscal policies, especially through budgetary discipline, and consistency of monetary and fiscal policies to curb inflation, to be important.

Keywords: Exchange Rate, Fiscal Policy, Generalized Method of Moments (GMM), Monetary Policy.

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1 Introduction

Iran's economy has always suffered from inflation for many years, and various factors such as liquidity, inflation expectations, economic imbalances and government budget structure have exacerbated it (Razavi & Vakil, 2019).

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Irrational increase in inflation damages the stability of the purchasing power of the national currency, deviates in consumption and savings decisions, increases inequality in income distribution and creates financial problems. It will also have a negative impact on economic growth due to investment projects. In the economies of countries, in addition to inflation, its expectations under the heading of "expected inflation" also overshadow the level of prices and economic stability. The formation of inflation expectations means that companies and people predict future inflation, and it is the result of economic and political conditions (Fan et al., 2016).

Inflation expectations are one of the important issues in macroeconomics that play an important role in stagflation (Chernov & Mueller, 2012). Under the generalized Phillips model, a decrease in inflation expectations reduces unemployment and inflation simultaneously, or in other words, exits a non-inflationary recession (Coibion et al., 2020). Therefore, the analysis of factors affecting the formation of inflation expectations in the Iranian economy, especially in recent years, can play an effective role in strengthening the exit strategy of non-inflationary recession. Decision-making related to issues such as consumption, savings, production, investment, optimal portfolio selection, wages, exchange rates and interest rates are all shaped by inflation and inflation expectations (Chernov & Mueller, 2012). Various economists and financial institutions have identified multiple contributing elements behind inflation in Iran, such as structural economic deficiencies and the execution of monetary, fiscal, and exchange rate strategies (Mohseni & Jouzaryan, 2016). As a persistent issue, inflation encompasses these elements, which do not necessarily amplify one another and may sometimes follow a sequential relationship. Consequently, numerous studies—both within Iran and internationally—have explored inflation from alternative perspectives.

The economic policymakers in any society generally try to use monetary and fiscal policy tools to overcome these problems. In this regard, not only each of monetary, fiscal and exchange rate policies should be placed in a sustainable path in the long and medium term, but also their policy combination should be designed consistent and stable in a way that the expense of the lost opportunity to achieve macro-economic goals can be minimized (Trouw, 2020; Bernard & Piedra, 1998). The existence of lags in decision-making, implementation, as well as the effectiveness of its efficiency from time and macroeconomic environment are among the salient features of these policy tools that increase the power of policy maker institution to control the price level as well as to keep the level of economic activities high (Trouw, 2020; Van & Garretsen, 2003).

In order to study the phenomenon of inflation in Iran in more detail, the continuation of the inflation trend is plotted in Figure (1). Iran has been facing the phenomenon of chronic double-digit inflation for many years. Inflation rate changes in Iran during the years 1974 to 2018 based on the official statistics of the Central Bank of the Islamic Republic of Iran, are presented in Figure (1). In the first year after the victory of the Islamic Revolution, the inflation rate was 10%, which experienced an increasing trend until the beginning of the imposed war, so that in 1980, this index reached 23.5%. During the years when Iran was at war, the inflation rate was controlled and the flow of goods was managed using quotas, coupons, and so on. Inflation rate has been declining until 1985, and in this year, for the first time after the revolution, it reached 6.9 percent.

The decrease in government foreign exchange reserves in the last three years of the imposed war caused an increase in inflation so that in 1986, 1987 and 1988, it reached 23.7%, 27.7% and 28.9%, respectively, compared to the same period of the previous year. In 1989, the inflation rate decreased to 17.4 percent and with the implementation of some economic adjustment policies, the inflation rate continued to decrease for another year. In the first year after the end of the war, the inflation rate reached 9%, but after the end of the imposed war, the inflation rate increased and in the seventies, this rate took the record and reached 49.4% in 1995 with an increasing trend for the second time in the history of inflation statistics and for the first time after the victory of the Islamic Revolution, and finally, with the withdrawal of the government from the adjustment policy, controlling the inflation rate was once again on the government's agenda. In 1996, the inflation rate experienced a significant decrease and returned to the range of 23.2 percent, but with the decrease in oil prices, foreign exchange earnings from the sale of Iranian oil decreased, and this had a very negative impact on the country's economy and led to stagflation in Iran. During this period, the budget deficit due to declining revenues was provided by borrowing from the Central Bank, which caused the inflation rate, which had decreased to about 16 percent, to reach more than 20 percent in 1999. Inflation then dropped again to less than 13 percent, and the government reformed its currency structure and implemented exchange rate unification.

Inflation in Iran never reached single digits during the 1980s, but did not increase significantly. In 2008, the inflation rate reached its highest level in this decade, reaching 25.4 percent, and then decreased again, so that in 2009 and 2010, it reached 10.8 and 12.4 percent, respectively. In 2012, after tightening the circle of sanctions and imposing European oil sanctions against Iran, the inflation index continued its growing trend, which had begun in 2012,

and exceeded the range of 30%. Inflation rates in 2012 to 2014 were reported by the Central Bank equal to 21.5 percent, 30.5 percent and 34.7 percent, respectively. The 11th government put inflation rate control on the agenda, and in 2016 and 2017, the inflation rate reached 9 and 9.6 percent, and for the first time in the last forty years, single-digit inflation was recorded in the Iranian economy for two consecutive years.

While the inflation rate was decreasing and the 11th government considered it one of its honors to control it and stated the continuation of this trend in 2017 as one of its goals, but one year after the 2017 elections with the US unilateral withdrawal from the Joint Comprehensive Plan of Action (JCPOA) and tightening sanctions, it rose again. The Central Bank stopped announcing the inflation rate in November 2018 and handed over the continuation of this work to the Statistics Center. According to the Statistics Center, the inflation rate was double-digit again in 2018 and reached 26.9 percent. During all these years, the adoption of incorrect economic policies, the strong dependence of the Iranian economy on oil revenues and the imposition of sanctions have caused many ups and downs in inflation in Iran and have caused the dream of single-digit inflation in the Iranian economy in the post-revolutionary years seems unattainable except for four years.

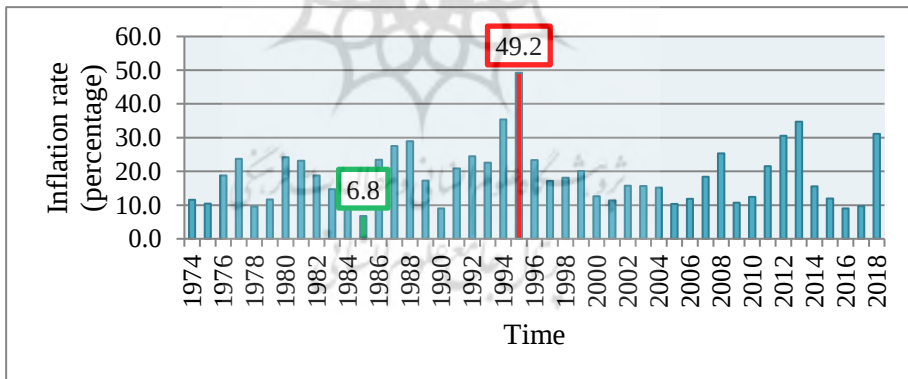


Figure 1. The trend of the inflation rate over the period (1974-2018)

Source: Central Bank of the Islamic Republic of Iran, 2020

Given the importance of inflation in the discussion of macroeconomics and economic policies, several studies based on various econometric models have been conducted. The following is a brief overview of a number of studies that

have been done in this field from economic texts and are more or less related to the topics of this research.

Izadkhasti et al., (2022), The inflation rate has been adversely influenced by several factors, including the inflation gap, the pace of liquidity growth, the disparity between GDP growth and liquidity increase, the degree of economic openness, and government spending—depending on various scenarios involving positive effects and real GDP growth. Additionally, elements such as institutional frameworks, economic incentives, human capital, research activities, and market complexity have also exerted downward pressure on inflation. Conversely, the index of information and communication technology has shown no significant impact on inflation dynamics. Turna and Özcan (2021) In their study, examined the effect of interest rates and exchange rates on inflation in the Turkish economy using the ARDL model. The results show that interest rates and exchange rates in the short and long term lead to inflation. Deka and Dube (2021) Using the ARDL coastal test method in Mexico, they showed that in the long run there is a two-way causal relationship between inflation and the exchange rate. Renewable energy consumption affects inflation and exchange rates in the long run, but exchange rates and inflation do not affect renewable energy consumption in the long run. Fattahi et al., (2020) examined the formation of inflation expectations with a laboratory approach among capital market activists in Kermanshah province. According to the results of their study, the average inflation expected by the participants in this experiment was 14.12%. Moreover, at a significance level of 95%, 34.7% of the participants in this experiment formed their expectations based on the pattern of rational expectations, 22.1% of the individuals based on the pattern of adaptive expectations and 43.2% based on learning models. Bastanifar and Samadi (2018) analyzed the factors affecting the formation of inflation expectations due to political developments and changes in liquidity. The results showed that inflation expectations with a lag and liquidity, had a positive effect on increasing inflation expectations. Political developments, including changes in government and negotiation strategies, each with different time lags, have reduced inflation expectations. However, prolonging the negotiation process will have uncertain changes in inflation expectations. Akbarifard et al., (2017), in their study, using firefly algorithm and cuckoo algorithm and applying variables affecting inflation including liquidity volume, exchange rate, real interest rate, expected inflation and industrial production during 1975-2015, provided an inflation modeling which was linear and nonlinear. The results showed that the nonlinear model was more suitable for inflation modeling and

the firefly algorithm gives better results than the cuckoo algorithm and due to the accuracy of the nonlinear model modeled by the firefly algorithm, it can be used to predict Inflation in the future. Yazdani and Zare Gheshlaghi (2016), in their research examined how fluctuations in the exchange rate influenced inflation within Iran's economy over the 2000 to 2011 period. The results indicated that in the period under study, one of the important and root factors affecting inflation has been exchange rate changes and exchange rate policies in general, which has caused a structural inflation in the country's economy; Therefore, the adopted foreign exchange policies, including the stabilization of the exchange rate in the Iranian economy, have been inflationary during the period under review. The findings of the study by Hosseini and Shokouhi (2015) showed that inflation in Iran is significantly determined by retrospective inflation expectations, futuristic inflation expectations, production gap, exchange rate, and money volume growth. Nasrasfahani and Yavari (2003) showed that the root of inflation is not only monetary and the chronicity of inflation in Iran is also related to real variables. In the short term, inflation impulses, liquidity growth, and exchange rates affect inflation fluctuations, and inflation stability in the medium term depends more on inflation expectations, but in the long-term scope, real sector impulses also have a significant effect on inflation. Ghavam Masoudi and Tashkini (2005), with the aim of a more appropriate modeling of monetary and fiscal perspectives, prove that in addition to liquidity growth, production, the price index of imported goods and the exchange rate are among the variables affecting the inflation rate in Iran's economy. Baldini and Poplawski (2008) show that monetary and fiscal policies can serve as an anchor in price stabilization. Sims (2011), Fan et al., (2016), Duarte and Wellman (2008), Moore (2014), Lovcha and Perez-Laborda (2018) recognize the role of monetary policy with emphasis on money volume and currency policy with emphasis on exchange rate fluctuations and government fiscal policies with emphasis on government debt as factors affecting the increase in the inflation rate in the economy.

Table 1

Variables affecting inflation (inf)

Variable name	Theoretical foundations	icon in the model
GDP growth	The theory of inflation caused by cost pressure	rgdp
Amount of liquidity	The theory of inflation caused by demand pressure and the monetary theory of inflation	m2
Labor wage index	The theory of inflation caused by cost pressure	wage
Unofficial exchange rate growth	Expected inflation theory	rexr
Inflation with time interval	Expected inflation theory	lag
Bank interest rate (percentage)	The theory of inflation caused by demand pressure and the monetary theory of inflation	rate

Source: research findings

A correct understanding of the concept of inflation and the factors affecting it is essential for achieving price stability and is of great importance in economic policy-making. Now the question is what effect did the policies of the Iranian government have on inflation and inflation expectations in the period 1974-2021? Therefore, considering the importance of this issue, the main focus of this research was based on the study of inflation as one of the basic components of macroeconomics.

2 Methodology

2.1 Generalized Method of Moments

This section provides a concise overview of the Generalized Method of Moments (GMM) estimator. GMM estimation begins with the premise that a set of moment conditions must be met by the K-dimensional parameter vector β . These moment conditions are typically broad in nature, and in many models, the number of specified moment conditions exceeds the number of parameters to be estimated. Accordingly, the system of moment conditions, where $L \geq K$, can be represented as:

$$E(m(y_t, \beta)) = 0 \quad (1)$$

Our focus is limited to moment conditions that can be expressed as an orthogonality relationship between the equation's residuals and a set of instruments, $u_t(\beta) = u(y_t, X_t, \beta)$, and a set of K instruments Z_t :

$$E((Z_t u_t(\beta))) = 0 \quad (2)$$

The conventional Method of Moments estimator is obtained by substituting the theoretical moment conditions in Equation (1) with their corresponding sample counterparts:

$$m_T(\beta) = \frac{1}{T} \sum_t Z_t u_t(\beta) = \frac{1}{T} \dot{Z} u(\beta) = 0 \quad (3)$$

and determining the parameter vector β that satisfies this system of L equations.

When there are more moment conditions than parameters ($L > K$), the system of equations given in Equation (3) may not have an exact solution. Such a system is said to be overidentified. Though we cannot generally find an exact solution for an overidentified system, we can reformulate the problem as one of choosing a β so that the sample moment $m_T(\beta)$ is as “close” to zero as possible, where “close” is defined using the quadratic form:

$$J(\beta, W_T) = T m_T(\hat{\beta})' \widehat{W}_T^{-1} m_T(\beta) = \frac{1}{T} u(\hat{\beta})' Z \widehat{W}_T^{-1} \dot{Z} u(\beta) \quad (4)$$

To quantify the discrepancy, a symmetric, potentially stochastic, and positive-definite $L \times L$ matrix denoted as W_T is introduced—commonly referred to as the weighting matrix—since it assigns relative importance to each moment condition in formulating the distance metric. The Generalized Method of Moments estimator is then defined as the value of β that minimizes the objective function specified in Equation (4).

Similar to other estimators based on instrumental variables, the GMM estimator requires at least as many instruments as there are parameters in the model for identification. In cases where the number of instruments equals the number of parameters, the optimized objective function will yield a value of zero. However, if there are more instruments than parameters, the value of the optimized objective function will be positive. The value of this function, known as the J-statistic, can be used to test whether there are more moment conditions than necessary, indicating potential over-identification.

Under suitable regularity conditions, the GMM estimator is consistent and $\sqrt{T}$ asymptotically normally distributed,

$$\sqrt{T}(\hat{\beta} - \beta_0) \rightarrow N(0, V) \quad (5)$$

The asymptotic covariance matrix V of $\sqrt{T}(\hat{\beta} - \beta_0)$ is given by

$$V = (\dot{\Sigma} W^{-1} \Sigma)^{-1} \cdot \dot{\Sigma} W^{-1} S W^{-1} \Sigma \cdot (\dot{\Sigma} W^{-1} \Sigma)^{-1} \quad (6)$$

For

$$\begin{aligned} W &= \text{plim } \widehat{W}_T \\ \Sigma &= \text{plim } \frac{1}{T} \dot{Z} \nabla u(\beta) \\ S &= \text{plim } \frac{1}{T} \dot{Z} u(\beta) u(\hat{\beta}) Z \end{aligned} \quad (7)$$

where S is both the asymptotic variance of $\sqrt{T}m_T(\hat{\beta})$ and the long-run covariance matrix of the vector process $\{Z_t u_t(\beta)\}$.

In the leading case where the $u_t(\beta)$ are the residuals from a linear specification so that $u_t(\beta) = y_t - X_t \beta$, the GMM objective function is given by

$$J(\beta, W_T) = T m_T(\hat{\beta})' \widehat{W}_T^{-1} m_T(\beta) = \frac{1}{T} (y - X\beta)' Z \widehat{W}_T^{-1} \dot{Z} (y - X\beta) \quad (8)$$

and the GMM estimator yields the unique solution $\hat{\theta} = (\dot{X} Z \widehat{W}_T^{-1} \dot{Z} X)^{-1} \dot{X} Z \widehat{W}_T^{-1} \dot{Z} y$.

The asymptotic covariance matrix is given by Equation (4), with

$$\Sigma = \text{plim } \frac{1}{T} (\dot{Z} X) \quad (7)$$

It can be seen from this formation that both two-stage least squares and ordinary least squares estimation are both special cases of GMM estimation. The two-stage least squares objective is simply the GMM objective function multiplied by $\hat{\sigma}^2$ using weighting matrix $\widehat{W}_T = (\hat{\sigma}^2 \dot{Z} Z / T)$. Ordinary least squares is equivalent to two-stage least squares objective with the instruments set equal to the derivatives of $u_t(\beta)$, which in the linear case are the regressors.

Data required for the present study, were collected from official statistics based on the annual reports of the Central Bank of the Islamic Republic of Iran during the period 1974-2021.

3 Results and Discussion

In this section, the experimental results of the model are reviewed using annual observations related to Iran during the period 1974-2021.

In analysis datas, what is needed first is to study the data structure in terms of stationary and determine the order of integration of variables, so that by

ensuring the type of the time series behavior, prevent spurious regression estimation and incorrect analyses. Thus, first by the unit root tests of Generalized Augmented Dickey-Fuller and the stationary of the variables should be examined. The results of the stationary test of the variables studied are reported in Table (2).

Table 2

Results of unit root test of variables

Variables	Levels	Critical values (%5)	first-order difference	Critical values (%5)	Remarks
IN_{WAGE}	-4.272	-2.947	-	-	I(0)
IN_{M2}	-3.927	-2.947	-	-	I(0)
LR_{ATE}	-3.197	-3.536	-8.237	-2.950	I(1)
L_{LAG}	-3.136	-3.536	-6.866	-2.950	I(1)
LR_{GDP}	-2.723	-3.536	-5.406	-2.950	I(1)
L_{REXR}	-2.436	-3.536	-3.340	-2.950	I(1)

Source: Research Findings

According to the results of table (2), the GMM model was used to estimate the data in table 3.

Table 3

The output of the GMM econometric model

Variable	Coefficient	Std. Error	t-Statistic	Prob
WAGE	0.016	0.006	2.658	0.011
M2	0.352	0.153	2.293	0.027
LAG	0.526	0.124	4.214	0.0001
REXR	0.121	0.027	4.364	0.0001
RATE	-0.101	0.306	-0.332	0.741
RGDP	-0.399	0.215	-1.855	0.071
R-squared	0.667	Mean dependent var		21.375
Adjusted R-squared	0.625	S.D. dependent var		11.368
S.E. of regression	6.959	Sum squared resid		1888.929
Durbin-Watson stat	1.808	J-statistic		0.674
Instrument rank	7	Prob(J-statistic)		0.411

Source: Research Findings

4 Conclusions

In the present study, the effect of monetary, fiscal and exchange rate policies on inflation in Iran during 1974-2021 was investigated using the Generalized Method of Moments (GMM) Model. The results of the GMM model showed

that the variables of labor wage index, liquidity volume, time-lag inflation and unofficial exchange rate growth have a positive and significant effect on inflation in Iran. Also, the GDP growth variable has a negative and significant effect on the dependent variable. The results of the present study are consistent with the results of studies conducted by Yazdani and Zare Gheshlaghi (2015), Bastani Far and Samadi (2018), Hosseini and Shokouhi (2015), Nasrasfahani and Yavari (2003) and Ghavam Masoudi and Tashkini (2005). This study, after introducing the factors affecting inflation in the country's economy, has expressed some of the proposed strategies and policies to control the level of inflation. Since the relationship between exchange rate and inflation is positive, so exchange rate fluctuations and instability can have devastating effects on the Iranian economy, and since foreign shocks affect the country's economy and, as a result, inflation, mainly through the exchange rate and its fluctuations, so paying attention to external shocks and forecasting them and using tools that can empower the country's economy in the face of them is a priority. Given the possibility of improving exchange rates, the increase in the nominal exchange rate, which in Iran is a determining indicator of inflation and expected inflation, should be avoided, at least until the effectiveness of government contractionary policies. The liquidity volume variable shows that the more liquidity in the economy, the higher the inflation. In other words, inflation is created by reducing the volume of goods and services. The results show that the labor wage index has a positive effect on inflation in Iran. In some studies, the results have been the opposite of the results of the present study, but in general, in the framework of cost pressure inflation theory, increasing the minimum wage with direct and indirect effects through a multi-stage mechanism increases the cost of production and inflation. The effectiveness of this mechanism can depend on the state of the country's economy in the stages of the commercial era (Kordbacheh et al., 2016). According to the obtained results, the government can play a more effective role in this field by changing the tax system and changing the executive system and collecting taxes, in other words, creating an efficient tax system. However, the transformation of the tax system will require a change in the structure of various economic sectors. The study suggests that in order to control inflation, the government in Iran should consider issues such as stability in economic policy-making, adopting appropriate fiscal policies, especially through budgetary discipline, and consistency of monetary and fiscal policies to curb inflation, to be important.

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