Determinants of Inflation in Islamic Republic of Iran

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Abstract

In this paper, we measure and analyze the determinants of inflation in Islamic Republic of Iran. After briefly reviewing the theoretical background, we use Johansen and Juselius maximum likelihood method. Additionally, we use the VAR method. For this purpose, Impulse Response Functions (IRF) and Forecast Error variance Decomposition (FEVD) are also used. Our analysis is based on time serious quarterly data from 1971:1-2005:4 and our results show that the response of the consumer price index (CPI) to shock in GDP is too weak and the response of CPI to shocks in import price index and liquidity is initially positive.

Keywords : Inflation ; VAR Method ; Iran

1. INTRODUCTION

Over the last two decades, the Iranian economy has been subject to a number of major adverse shocks. Some of them are external, including the eight-year war with Iraq and volatility in global oil prices. However, major imbalances in the economy were also policy driven, resulting from the controls on the allocation of credit and foreign exchange, intensive exchange and trade restrictions, distortions in the pricing system including exchange rates, interest rates, and domestic energy prices in an environment of inadequate demand management. This has induced inefficiently in the allocation of resources, rendered the economy less competitive, and weakened its capacity to response to external shocks. These factors have led to chronic inflation in Iran in the range of 20 per cent to 30 per cent in recent years. Iran has a history of relatively high inflation, with CPI inflation averaging more than 17 per cent since the 1979 revolution. Moreover, measured inflation after 1972, with the oil price and the quantity of oil exports increasing; the rates of inflation rose sharply and exhibited large fluctuations. The annual average rate of CPI inflation was 14.7 per cent during the period 1973-1978. The rates of inflation accelerated to an annual average of 17.0 and 18.9 per cent over the period 1979-1988.

This period was particularly rich of events that are source of inflation pressure, since the revolution, second boom, the war, third oil crisis, and the economic embargo took place. The ending of the Iran-Iraq war in August 1988 signaled the beginning of a new phase in the development of the Iranian economy. Generally, Iranian economy has experienced three Five-Year Development Plans (FYDPs) during the period 1989-2006. One primary aims of these plans was to control inflation rate in Iranian economy. But, it was successful because when we consider the average annual inflation rate during this period, we see that average annual inflation rate was 21.2 per cent. In addition, Iran has experienced highest inflation rate (49.4 per cent) in 1995. Inflation rate fluctuated widely from 1980-2009. This fluctuation has been approximately between a range of 4.37 per cent and 49.11 per cent.

Generally, the paper is organized as follows: in section 1, theoretical back ground and literature offer a brief review of the determinants of inflation. In section 2, specific models and related issues are explained. In section 3, data analysis and an estimation models are described, while in section 4 conclusion are listed.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

There are two main schools of thought which attempt to explain the main determinants of inflation. The monetary approach led by Milton Friedman, Friedman and Schwartz (1970), wrote an influential book on the monetary history of the United States, argue that" inflation is always and everywhere a monetary phenomenon". Whereas Neo- Keynesians and other critics of monetarism argue that the demand for money is directly linked to supply and that the demand for money cannot be predicted. The Keynesian economists, state that the main determinants of inflation is aggregate demand in the economy rather than the money supply. According to the Keynesians, the natural level of gross domestic product is a level of GDP where the economy is at its optimal level of production.

If GDP increases beyond natural level, inflation will accelerated as suppliers increase their prices. If GDP decrease below its natural level, inflation will decelerate as suppliers attempt to fill excess capacity by lowering prices. Keynes argued that money has significant relationship with inflation, but inflation is an outcome of the goods market many economists have researched the determinants of inflation. Here a few of them are summaries. Karimi and Tavakkoli(1999) utilized the VAR model to find out the effective factors on inflation in Iran. The variable in the model was Consumer Price Index (CPI), Money (M), Import Price Index (IPI) and Government Expenditure (RG). They concluded that inflation of imported goods has the most effect on inflation. In this analysis they divided the effect of import price on inflation in two effects such as foreign inflation on domestic inflation and other effect of changes on exchange rate. As a result, the most of these changes depend on the changes in the exchange rate.

Jalali-Naeini (1997) used the Ordinary Least Squares (OLS) method to study the inflationary trend and effect of monetary policy on inflation in Iran for the period 1959 to 1995. He used inflation (GCPI), monetary Base (GMBASE), time trend (TIME), exchange rate changes in black market(DLEXC), Gross Product without oil (GNDPCS) and inflation with one lag (GCPI(-1)) in his model. He showed that liquidity has a major role on inflation in Iran. In addition, he found the exchange rate fluctuations have significant impact on inflation in Iran. According to the model, he estimated that the growth of monetary base has a greater effect on inflation in Iran. Ghavam Masoodi and Tashkini (2005), to investigate the long term relationship between the inflation rate and its effective factors in Iran, they used the ARDL method. The results obtained via this research showed that GDP, the imported goods price index, liquidity and the exchange rate are the most significant factors contributing to inflation in Iran.

Darrat (2000) utilized an ECM to investigate if high budget deficit had any inflationary consequences in Greece over the period 1957/1993. Empirical results found that the deficit variable exerts a positive and statistically significant impact upon inflation in Greece. He concludes that besides money growth, higher budget deficit has also played a significant and direct role in the Greek inflationary process.

Concerning other research carried out on the relationship, we can point to the studies of Harberger (1963), Vogle (1974), Shirvani and Wilbrahe (1994), Chudhry and Ahmad (1995), Bonato (2007), Ikani (1978) and Tayebnia (1992),Tashkini (2005), Aramesh (2010), Aramesh(2011), Heiddari(2011), Jafari Samimi (2011).

3. THE MODEL

According to the basis of theory and research, the determinants of inflation are extensive. Researchers have recently pinpointed different models for the study. The model is as follows:

         CPIt = F[M2,GDP,IPI] t   t=1971:1-2005:4

    Where :
    CPI : Consumer Price Index (CPI)
    M2 : Liquidity
    IPI : Import Price Index (IPI)
    GDP: Gross Domestic Product (GDP)
    This study used a Log-linear equation as follows:

$$\ln CPI_t = \alpha_0 + \alpha_1 \ln M2_t + \alpha_2 lnGDP_t + \alpha_3 \ln IPI_t + U_t$$

In this research paper, new econometric methods are taken into consideration. Johansen and Juselious (1990) maximum likelihood is used as estimation method. In addition, Impulse Response Functions (IRF) and Forecast Error Variance Decomposition (FEVD) are also used to complete the analysis of the system.

3.1 MODEL ESTIMATION AND INTERPRETATION

3.1.1   TIME SERIES ANALYSIS

In this analysis, we use quarterly data-the variables comprise the consolidated CPI, M2, GDP and IPI. The information is according to time series, and the duration of the study is 1971:1-2005:4. The main source of data related to the model variables is the Central Bank of Iran (CBI).

The first step in applying the cointegration technique is to determine the degree of integration of each variable in the model. The common practice is to use Augmented Dickey-Fuller (1979) test. The results of the unit root test are shown in table 1.

Table 1

Unit Root Test

Series[1]	ADF	Series[2]	ADF[3]
LCPI	-2.90	D(LCPI)	-6.26
LM2	-2.62	D(LM2)	-5.88
LGDP	-2.78	D(LGDP)	-7.07
LIPI	-2.41	D(LIPI)	-5.39

 1 Series are in Level.

 2 Series are in first difference.

 3 95% critical value for the Augmented Dickey – Fuller – Statistic.

In Table 1. the null hypothesis of unit root is not rejected by the Augmented Dickey-Fuller (1979) test and so are the series non-stationary in the level. We have conducted the same test on the first difference of these series and have found stationary. Thus, according to the ADF test, all the four variables of LCPI, LM2, LGDP and LIPI are *I* (1).

3.1.2 MAXIMUM LIKELIHOOD ESTIMATION

Once all the series are non-stationary in the level, one can estimate an econometric model only if they are co integrated. Table 2. Shows the co integration test based on Johansen and Juselius (1990) approach. The cointegration test presented with restricted intercepts and no trends in the VAR. The selection of lag to VAR model is very important step. The order of VAR is three (Table 2). The lag order of the VAR model is selected ased on Akaike Information Criterion (AIC).

Table 2

Test Statistics and Choice Criteria for Selecting the Order of the VAR Model

Dependent variable is LCPI

Based on 137 observations from 1971Q4 to 2005Q4. order of VAR=3

	LCPI		LGDP	LM2 LIPI	
Order	LL	ATC	SBC	LR test	Adjusted LR test
3	1751.8	1703.8	1633.7	----------	-------------
2	1637.0	1605.0	1558.3	CHSQ(16)=229.6607[.000]	209.5444[.000]
1	1358.6	1342.6	1319.2	CHSQ(32)=786.4894[.000]	717.5998[.000]
0	-742.9279	-742.9279	-742.9279	CHSQ(48)=4989.5[.000]	4552.51[.000]

 AIC=Akaike Information Criterion

 SBC=Schwarz Bayesian Criterion

Table 3 and 4presents Johansen and Juselius maximum likelihood approach for multivariate cointegration test. The results indicate hypothesis that there are only two cointegration vector among the series cannot be rejected neither by the maximum eigenvalue test nor by trace test and the series are co integrated. This allows us to use cointegration approaches with the series in levels because the residuals of the model will be stationary and so the long run solution will not be spurious.

Table 3

Cointegration Test
Dependent variable is LCPI
137 observations from 1971Q4 to 2005Q4. order of VAR=3.

LCPI	LGDP	LM2	LIPI	Intercepte	
.34922	.15255	.10315	.013087	0.00	
Null	Alternative	Statistic	95% Critical Value	90%Critical Value	
r=0	r=1	58.8539	28.2700	25.8000	
r<=1	r=2	22.6761	22.0400	19.8600	
r<=2	r=3	14.9143	15.8700	13.8100	
r<=3	r=4	1.8048	9.1600	7.5300	
LCPI	LGDP	LM2	LIPI	Intercepte	
.34922	.15255	.010315	.013087	0.00	
Null	Alternative	Statistic	95% Critical Value	90 %Critical Value	
r=0	r>=1	98.2492	53.4800	49.9500	
r<=1	r>=2	39.3953	34.8700	31.9300	
r<=2	r>=3	16.7192	20.1800	17.8800	
r<=3	r=4	1.8048	9.1600	7.5300	

Estimated co integrated vectors in Johansen estimation is shown in Table 4. The co integration vectors are normalized to the consumer price index (CPI). When we consider the two individual cointegration vectors, we see that in the first cointegration vector LGDP enters with an incorrect sign, since an increase in real GDP tends to cause an increase in consumer price index (CPI). However, in the second cointegration vector, estimated coefficients have correct signs. In fact, estimates show that the coefficients of all the repressors have the hypothesized signs and are statistically significant at the 5 % level.

Table 4

Estimated Cointegrated Vector In Johansen Estimation
Dependent variable is LCPI
137 observations from 1971Q4 to 2005Q4. order of VAR=3, chosen r =2.

LCPI	LGDP	LM2	LIPI	Intercepte
		Vector 1	Vector 2	
LCPI		-.31716	-.87424	
		(-1.0000)	(-1.0000)	
LGDP		.23172	-.76056	
		(.73059)	(-.86997)	
LM2		.040089	.48405	
		(.12640)	(.55368)	
LIPI		.23779	.39615	
		(.74973)	(.45314)	
Intercept		-2.6562	6.0871	
		(-8.3747)	(6.9627)	

3.1.3 *DYNAMIC CHANGES IN THE VAR SYSTEM*

One of the advantages of VAR specifications is that it allows for the computation of Impulse Response Functions (IRF), i.e. functions of the response of any endogenous variables to one standard deviation shock in any other endogenous variable in the system. In the usual VAR toolbox, the portion of the total variance of an observed variable that is due to the various structural shocks is called variance decomposition. We use orthogonal zed Forecast Error Variance Decomposition (FEVD) to complete the analysis of the system.

The variance decomposition is another tool that may use in VAR system analysis. Table 5. presents the 30-quarter orthogonalizd forecast error variance decomposition (FEVD) for the system. Results show that the share of economic variables such as GDP, liquidity (M2) and import price index (IPI) in fluctuation of consumer price index (CPI) are about 0.15 % in the first quarter. In fact, the forecast error variance of the consumer price index (CPI) is almost exclusively accounted for by its own innovations (99.85 %). Moreover, the Fifteen-quarter ahead forecast error is 68.9 % due to variations in CPI, 28.24 % due to variations in IPI and 1.94 % due to variations in liquidity (M2). But, end period (30), ahead forecast error is 52.19 % due to variations in CPI, 43.1 % due to variations in IPI and 4.1 % due to variations in liquidity (M2).

Table 5
Orthogonalized Forecast Error Variance Decomposition
Dependent variable is LCPI
137 observations from 1971Q4 to 2005Q4. order of VAR=3, chosen r =2.

	LCPI	LGDP	LM2	LIPI	Intercepte
Horizon	LCPI	LGDP	LM2	LIPI	
0	1.00000	0.00	0.00	0.00	
1	.99850	.1646E-3	.4535E-3	.8814E-3	
2	.99140	.5154E-3	.0018175	.0062697	
3	.97521	.9182E-3	.0031799	.020697	
4	.94895	.0012527	.0034374	.046364	
5	.91535	.0014773	.0027353	.080432	
6	.87968	.0016461	.0023314	.11634	
7	.84686	.0018676	.0031200	.14815	
8	.81936	.0022701	.0049053	.17346	
9	.79698	.0029654	.0069934	.19306	
10	.77796	.0039741	.0089388	.20912	
11	.76037	.0051726	.010713	.22374	
12	.74294	.0063385	.012508	.23821	
13	.72523	.0072657	.014527	.25298	
14	.70742	.0078527	.016856	.26787	
15	.68999	.0081088	.019429	.28247	
16	.67337	.0081051	.022073	.29646	
17	.65781	.0079227	.024608	.30966	
18	.64338	.0076248	.026916	.32208	
19	.62996	.00072528	.028963	.33382	
20	.61742	.0068345	.30774	.34497	
21	.60561	.0063942	.032398	.35560	
22	.59442	.0059587	.033874	.36575	
23	.58379	.0055585	.035225	.37543	
24	.57367	.0052252	.36454	.38465	
25	.56403	.0049881	.037555	.39343	
26	.55484	.0048727	.038521	.40177	
27	.54607	.0049008	.039347	.40969	
28	.53768	.0050913	.040037	.41719	
29	.52965	.0054617	.040596	.42429	
30	.52194	.0060284	.041034	.43100	

4. CONCLUSION

In this paper, the relationship between the CPI, liquidity, real GDP and import price index (IPI) in Iran in the 1971:1-2005:4 is studied. The result can be summarized as follows:

In the Johansen and Juselius (1990) maximum likelihood, quantitative evidence indicates that liquidity and import price index have had a positive effect on inflation in Iran during the period under investigation. In addition, real GDP had a negative effect on inflation in Iran. One of the advantages of VAR specifications is that it allows for the computation of Impulse Response Functions (IRF), i.e. functions of the response of any endogenous variables to one standard deviation shock in any other endogenous variable in the system. In the usual VAR toolbox, the portion of the total variance of an observed variable that is due to the various structural shocks is called variance decomposition. We use orthogonal zed Forecast Error Variance Decomposition (FEVD) to complete the analysis of the system.

The variance decomposition is another tool that may use in VAR system analysis. We found that the share of economic variables such as GDP, liquidity (M2) and import price index (IPI) in fluctuation of consumer price index (CPI) are about 0.15 % in the first quarter. In fact, the forecast error variance of the consumer price index (CPI) is almost exclusively accounted for by its own innovations (99.85 %). Moreover, the Fifteen-quarter ahead forecast error is 68.9 % due to variations in CPI, 28.24 % due to variations in IPI and 1.94 % due to variations in liquidity (M2). But, end period (30), ahead forecast error is 52.19 % due to variations in CPI, 43.1 % due to variations in IPI and 4.1 % due to variations in liquidity (M2). The most important conclusion of this paper is that liquidity, import price index and real GDP are determinants of inflation in Iran. In fact, we tried to clarity the relationship among 3 variables with inflation in Iran

FOOTNOTES

1. Microfit (4.0) is an interactive econometric software package written especially for microcomputers. It is especially designed for the econometric modeling of time series data by Professor M. Hashem Pesaran and DR. Bahram Pesaran in 1997, that all the table of the paper is the output of this software.

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