

The Long Run Relation between Inflation and Economic Growth in Iran

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Abstract: Relation between inflation and economic growth in various countries has been always struggled among economists with theoretical and experimental discussions in this field. Studying most of such issues indicates that one may not achieve an absolute result for influence of inflation on economic growth and this depends on the conditions and properties of related country. This study aims to deal with effects of inflation on economic growth in Iran by asking this question: how is the relation between inflation and economic growth in Iran? As Iran economy has now encountered with problems in both inflation and development, so general analysis of inflation and economic growth is advantageous. Therefore, such long run relation between inflation and economic growth has been evaluated by ARDL method during 1974 – 2007. Results indicate that first, there is a stability and balance between inflation and economic growth; second, there is a negative relation between both variables; third, estimating the error correction model indicates adjustment speed of 40%, i.e. each year, 40% of imbalance is adjusted.

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1. Introduction

Regarding to the importance of economic growth for increased social welfare, it is important to study the factors influencing economic growth. Studying the economic literature indicates that inflation is an effective factor on economic growth. Studies indicate that there are different views for such relation between both variables. Some views state that inflation can have a positive effect on economic growth; while others state its negative effect and some others prove that there is no relation between those variables. Some other views are also stating that the relation between inflation and economic growth is non-linear, i.e. inflation to a rate can have a positive or neutral effect to economic growth and then has a negative effect. But most studies resulted that high level inflation has negative and stable effects on economic growth. Thus, recent years most central banks increasingly stressed on price stability and monetary policies have been applied for low inflation with stability to not incur inflation costs, because it seems that inflation has considerable costs and burdens; some of such costs depend on mean inflation rate and some others depend on variable and unreliable inflation. Experimentally and theoretically studying the relation between inflation and economic growth, therefore, can be such important that both deal with mentioning different views for relation between both variables and experimental test of such relation can examine such views. This study

intends to study the effects of inflation on economic growth in Iran and indeed answering this question that how is the relation between inflation and economic growth in Iran and as Iran economy has now encountered with problems in both inflation and development, so general analysis of inflation and economic growth is advantageous.

This study initially reviews different views and related literatures. Part two deals with methodology. Part three introduces variables and explains the model using econometrics methods and interpreting the experimental results and finally we conclude with some political recommendations.

It is admitted to start this discussion by found Philips chart because this chart significantly deals with relation between inflation and development. According to Philips chart, there is a kind of negative relation between inflation and unemployment. As due to monetary phantom it has not been anticipated the effects of price changes by workers, and consequently by increasing the costs, wages may not be increased, therefore real wages will be decreased, institutions will employ more, so production and employment may be increased. So, it can be said that (according to the content of mentioned theory) there is a negative relation between inflation and unemployment and positive relation between inflation and production.

Entering the inflation expectations in Philips chart, Freedman and Phelps indicated

that such relation exists only for short run, but in long run, adjusting the inflation expectations, Philips chart will move perpendicularly, therefore (against traditional model) its slope is not negative, so there is no reverse relation between inflation and unemployment, but inflation and unemployment can be increased (decreased) proportionally. So the relation between inflation and production will be void. Robert Lucas and other theoreticians have views beyond this. They state that if monetary policies conducted expectedly and informed, Philips chart may be perpendicular even in short run so economical policy has no effect on production and employment. Therefore there is no positive relation between inflation and production neither in short run nor in long run.

There can be seen different views about relation between inflation and economical growth in development theories. One of them is Sidrauski view (1967) in which, using improvement method for behavior of economic factors and considering the real balance of money in the desirability function, indicated that the influence of monetary inflation on development is neutral. The second view is James Tobin (1965). Assuming that money is an alternative for capital, he proved the positive effect of inflation on development. This view is Stockman (1981) study which limits the influence range of Tobin. By Stockman point of view, the negative effect of inflation on development is mainly related to in-cash down payment models. He considers the money as a supplement for capital.

According to different views about relation between inflation and economic growth, experimentally studying these variables can indicate the inconsistency of consistency of each theory based on specific conditions of studied countries. Such studies can be grouped into two classes:

First class includes studies in which there are used data from several countries (on the other hand combined data). Studies by DeGregorio (1992), Barro (1995) and Alexander (1997) are of such type. Second class includes time series studies in which there is studied the influence of inflation on economic growth in a specific country. In this case, for example, one can mention Joao and Francisco (2001) study about Brazil economy as well as other studies in Iran. The results of such studies stressed non-linear results of inflation on economic growth, i.e. inflation to a rate can have a positive or neutral effect to economic

growth and then has a negative effect. Here we deal with some dimensions of such studies:

In an experimental work, DeGregorio (1992) studied the relation between inflation and economic growth in 12 countries of Latin America during 1950 – 1980 and concluded that high inflation is one of the main hindrances of economic growth during this period. Studying the influence of inflation on economic growth, Alexander (1997) used a neoclassical development equation and concluded that inflation and its changes have negative and significant effect on economic growth. In a study called “crisis of long run inflation and development”, Bruno and Easterly (1998) proved that economical development will be severely reduced during high inflation periods and after lowering the inflation, it will be improved fast. This study conducted for 1994-1961 using time series study for 31 countries with high inflation. Girijansker and Anis (2001) studied inflation and economical development for four Asian countries (Bangladesh, India, Pakistan and Sri Lanka). Results indicate that in long run there is a positive relation between GDP and inflation rate for all studied countries. There is also a considerable feedback relation between inflation and economical development for those countries.

Considering the results of above mentioned studies, one can enumerate a series of considerable policy making issues. One, a mild inflation is advantageous for development. On the other side, attempting to attain a fast economical growth may actuate the economy to a place where the inflation might not be controlled and make instability in the economy. Thus such countries are on a sword edge. Joao and Francisco (2001) studied the influence of inflation on development and production during 1980-1995 for Brazil- a country with very high inflation experienced for long run. Results indicated that short run inflation has negative effect on production, but long run inflation has no effect. Gilman et al (2002) in their paper “Inflation and Development: some theories and evidences”, studied non-linear relation between inflation and economical development in OECD and APEC countries based on inborn development monetary model during 1961-1997. Results indicate that for OECD countries, there is a negative non-linear relation such that in low inflation level, there is a positive effect on economical development but in higher inflation level, more than 10%, this relation is increasingly negative.

2. Material and Methods

This study is of type casual-inferential discovering the relations between variables. On the other side, it is an applicable study and its results can be used to attain suitable policies. Data of this study collected based on studies from 1974 to 2007. Such data are annual-based and obtained from databank of Central Bank of Islamic Republic of Iran.

Data of variables discussed in this study are based on time series. Using these data and applying the econometrics method, the relation between economical development and factors influencing it can be analyzed based on a long run framework between economical growth and inflation. Because, however time series in economy are mostly unstable, so applying common econometrics methods like Original Limit Square (OLS) method for unstable time series in most cases may result in inaccurate interpretation. Therefore, in this study there has been used new econometrics methods or evaluating and analyzing the data. Initially, based on theory and previous studies by Microfit software using ARDL method, there estimated the long run and short run relation between approximate indices and then using Error Correction Model (ECM) the adjustment rate was estimated and results analyzed by different tests.

By a classical model framework, this study dealt with studying the relation between inflation and economical development. Among different models with function forms and different variables, following model has been selected for studying the effect of inflation on economical development which is a linear model:

$$Y_t = \beta_0 + \beta_1 IN + \beta_2 K + \beta_3 G + \beta_4 X + \beta_5 P + \beta_6 D_{57} + \beta_7 D_{59}$$

Where;

Y is annual GDP growth rate, IN is inflation rate, K is private sector investment to GDP ratio, G is State Expenditures to GDP ratio, X is Exports to GDP ratio, and P is the population growth rate. D_{57} is the dummy for Revolution variable (years 1977 and 1978= 1 and other years=0) and D_{59} is dummy for War variable (for 1980 – 1988=1 and other years=0). The fundamental assumption for this model is negative effects of inflation of economical development which can be defended for Iran, because inflation rate is always more than normal state (2 – 3%).

In this model, there was used annual data of macro economy during 1974 – 2007 to

determine the kind of relation between inflation and economical development. It must be mentioned that following data have been used for estimating the model.

Y (Per Capita GDP Growth Rate) is a dependent variable based on billion Rials;

IN (Inflation Rate) - it is obtained based on index of retailing cost and used services (CPI_{76}) and it is expected that has a reverse relation with economic growth.

RK (Private Sector Investment to GDP Ratio)- one of the fundamental resources of production if investment, here we used investment to domestic gross production ration for 1997.

RG (State Expenditures to GDP Ratio)- great share of Iran economy depends on government. Undoubtedly, one of the effective economical factors is state expenditures and here it has been considered the real state expenditures to GDP ratio for 1997 and it is expected that it has positive effect on economical development in long run.

POP (Population Growth Rate)- country's population as a man factor can influence on economical development, considered based on million person.

DU₅₇ (A dummy for Revolution variable)- it has been considered for 1977 and 1978 and other years it is zero.

DU₅₉ (A dummy for War variable)- it has been considered for 1980 – 1988 and for other years it is zero.

3. Results and discussion

Presence of long run relation is proved by different tests and here we use test provided by Pesaran et al (1996)¹. Using calculation of statistics F, the presence of long run relation between variables is tested for significance of levels with variables in the error correction form. The important point is that mentioned F distribution is not standard. Pesaran et al calculated the proper critical value correspondent to the number of regressions and considering whether this model includes abscissa and round. They provided two groups of critical values; one is such that all variables are stable and another one is such that all are unstable (and became stable once differencing). If calculating F locates out of this boundary, it will be made an absolute decision with need to knowing that variables are I(0) or I(1). If calculating F locates beyond upper range, the H_0

¹ Tashkini (2005), PP. 48-147

as stating the lack of long run relation will be rejected and consequently this theorem will be proved and dynamic model moves towards long run equilibrium model. Related statistics after calculation is 4.74 and comparing mentioned statistics with critical quantity, we conclude that dynamic model moves towards long run equilibrium. On the other hand, there is a long run equilibrium relation between model variables.

For final determination, there is used Augmented Dickey Fuller test. To test unique root, software package determines the number of stops of dependent variable necessary to remove the self-correlation between disruption sentences in the regression, by Aquaic (AIC), Shouartz- Bizin (SBC) and Hanan- Queen

(HQC) models. Maximum amount of any above models determines the number of optimal pauses. SBC usually saves number of pauses, therefore the number of pauses selected based on SBC mode. Before estimating the model, avoiding the insignificant regressions, one must assure about stability or instability of data. As indicated in table (2), inflation rate (IN) and Exports: GDP ratio (RX) and stable variables and per capita GDP growth rate (Y), population growth rate (POP), investment to GDP ratio (RK) and state expenditure to GDP ratio (RG) are unstable variables. It must be mentioned that in sample size less than 100, there is usually used Shuartz- Bizin model to avoid losing more freedom degree (Tashkini (2005), P146).

Table 1. Comparing the statistical value, F, with critical values, Pesaran et al.

Statistics F	Limits of Critical Values	Result
4.7437	(2.649) – (3.805)	Presence of long run relation (95%)

Source: study results

Table 2. Augmented Dickey Fuller and Philip – Prawn test

Values of ADF and PP statistics and critical values of each variable in 5%

Variable name	ADF value with abscissa	PP value with abscissa	Critical value with abscissa	Result
Y	-2.82	-2.82	-2.95	I(1)
IN	-3.33	-3.21	-2.95	I(0)
RK	-0.52	-2.34	-2.95	I(1)
RX	-3.88	-3.90	-2.95	I(0)
RG	-0.31	-0.31	-2.95	I(1)
POP	-0.80	-0.80	-2.95	I(1)

Source: study results

According to the mentioned theoretical basics, proposed model is as follows:

$$Y_t = c + \sum_{i=1}^n \alpha_{1i} IN_{t-i} + \sum_{i=1}^n \alpha_{2i} RK_{t-i} + \sum_{i=1}^n \alpha_{3i} RX_{t-i} + \sum_{i=1}^n \alpha_{4i} RG_{t-i} + \sum_{i=1}^n \alpha_{5i} POP_{t-i} + DU_{57} + DU_{59}$$

Where;

Y: per capita GDDP growth rate

C: abscissa

IN: inflation rate

RK: Private investment to GDP ratio, on 1997

RX: real exports changes to GDP ratio, on 1997

RG: real state expenditures to GDP ratio, on 1997

POP: population growth rate

DY₅₇: Revolution virtual variable that is 1 for 1977 and 1978 and other years it is zero.

DU₅₉: War virtual variable that is 1 for 1980 – 1988 and for other years it is zero.

As indicated, estimated vectors in the model are variable indices coincidence with economic theoretical principles. There is a negative relation between inflation rate and per capita GDP growth rate. It must be mentioned that relation between POP and per capita GDP is negative as well; because population increase will positively influence the economic development when it enjoys necessary training and skill, but unfortunately working force in Iran has less skills and experience. Therefore, population growth will negatively influence on GDP. As expected, variables like investment, exports and state expenditures positively influenced on Per Capita GDP growth rate. The DY₅₇ and DU₅₉ also influences negatively.

$$Y = -0.11 - 0.15N + 0.77RK + 0.43RG + 0.41RX - 1.12POP - 0.2D_{57} - 0.06 D_{59}$$

$$T \quad (-2.37) \quad (-3.11) \quad (3.03) \quad (2.68) \quad (2.66) \quad (-2.33) \quad (-2.98) \quad (-2.26)$$

This model indicates that by changing 1% in IN, the Per Capita GDP will be increased to 15%. 1% change in RK and RG will increase Per Capita GDP about 0.77% and 0.43% respectively. 1% change in RX will increase per capita GDP to 0.41% and of course 1% change in POP will reduce per capita GDP to 1.12%.

Results in long run indicate negative relation between two main variables (economic development rate and inflation rate), such that increased inflation will reduce economic growth. It must be mentioned that such negative relation is not different from economic theoretical principles stating that inflation is a necessity for economic growth, but it has been considered mild inflation, but sever increased inflation and moving towards two figures has no positive effects on economy either, but results in

$$DY = -0.11 - 0.09DIN + 0.46DRK + 0.18DRG + 0.8DRX - 1.12DPOP - 0.29ECM (-1)$$

$$T \quad (-2.37) \quad (-2.11) \quad (1.85) \quad (3.14) \quad (3.69) \quad (-2.74) \quad (-3.99)$$

$$R^2 = 0.86 \quad \bar{R}^2 = 0.78 \quad F = 11.2095 \quad DW = 1.98$$

forming the inflation expectations influencing negatively on economy such that Iran's economy encountered with two digit inflation during this period, for this reason, its negative effects can be indicated for economic growth.

Attaining the short run relation in the model needs summing the error sentences of co-addition regression for above mentioned relation with a pause time as an explanatory variable with first order difference of other model variables together with their pauses, then estimate the model coefficient wit ordinary limit square (OLS) method. Table 3 indicates short run relation of model. Such short run relation can be estimated by ARDL methodology as indicated in table 3.

Table 3. long run coefficients estimated by ARDL method

Regresses Y dependent variable	coefficient	T- Statistic	probability
C	-0.11654	-2.3761	0.028
DIN	-0.09512	-2.1116	0.042
DRK	0.18434	1.8509	0.068
DRG	1.8999	3.1431	0.0005
DRX	0.80034	3.6932	0.002
DPOP	-1.1216	-2.7469	0.011
ecm (-1)	-.042153	-3.9971	0.000

Source: study results

Error correction model indicates the amount of adjustment rate as well as the percentage of remedy for imbalance in each period. We of course know that this coefficient must be negative and significant. In above mentioned relation, D indicates the first order difference of regresses. In this relation, ECM coefficient equals with -0.42; i.e. each year 40% of inequality or imbalance will be remedied.

Recognition tests are used for studying the self-correlation, side form, normality, variance conformity and structural stability in the model. According to Hashem Pesaran (2002) and Bahmani Oskouei (2001), this test can indicate whether estimated model is stable. Stability and recognition test is mostly used for time series data particularly when author is uncertain when structural failure occurs. When studying the long run and short run stability

coincidentally, there are used CUSUM and CUCUMQ forms. Choosing related choice, this test presents cumulative recursive residuals and square of cumulative recursive residuals between two smooth lines (95% confidence). If provided diagram is in the confidence interval, H_0 , stating the lack of structural failure will be accepted and if chart is out of confidence interval (crossed the confidence interval), H_0 , stating the lack of structural failure will be rejected and presence of structural failure will be accepted. Statistics CUSUM and CUSUMQ provide the possibility of structural stability test (CUSUM statistic is used for finding the systematic changes in regression coefficients and CUSUM OF SQUARE statistic used when deviation from regression coefficients is accidental). Table 4 indicates the recognition statistics.

Table 4. Recognition Tests

Test	objective	Coefficients
LM	Studying the self-correlation of error sentences	0.437
RAMESY RESET	Recognizing the model explanation problem	0.306
NORMALITY	Recognizing the normality of error sentences distribution	0.122
WHITE	Recognizing the inconsistency of error sentences variance	0.289

Source: study results

LM used for studying the presence or lack of self-correlation of error sentences, Ramsey test is used for recognizing the model explanation problem, Normality test is used for recognizing the normality of error sentences distribution, and White test is used for recognizing the inconsistency of error sentences variance. Because probability level of calculated error for all tests must be more than 5% error level, the result is that estimated model lack

error sentences self-correlation problem, model explanation problem, lack of normal distribution of error sentences problem and variance inconsistency problem in error sentences and has a reliable estimation. As explained before, CUSUM and CUSUMQ tests are used for studying the presence of structural failure in the estimating model. As diagrams indicated in figure 1 are located between determined intervals (not cut the intervals), so H_0 , stating the lack of structural failure, will be accepted.

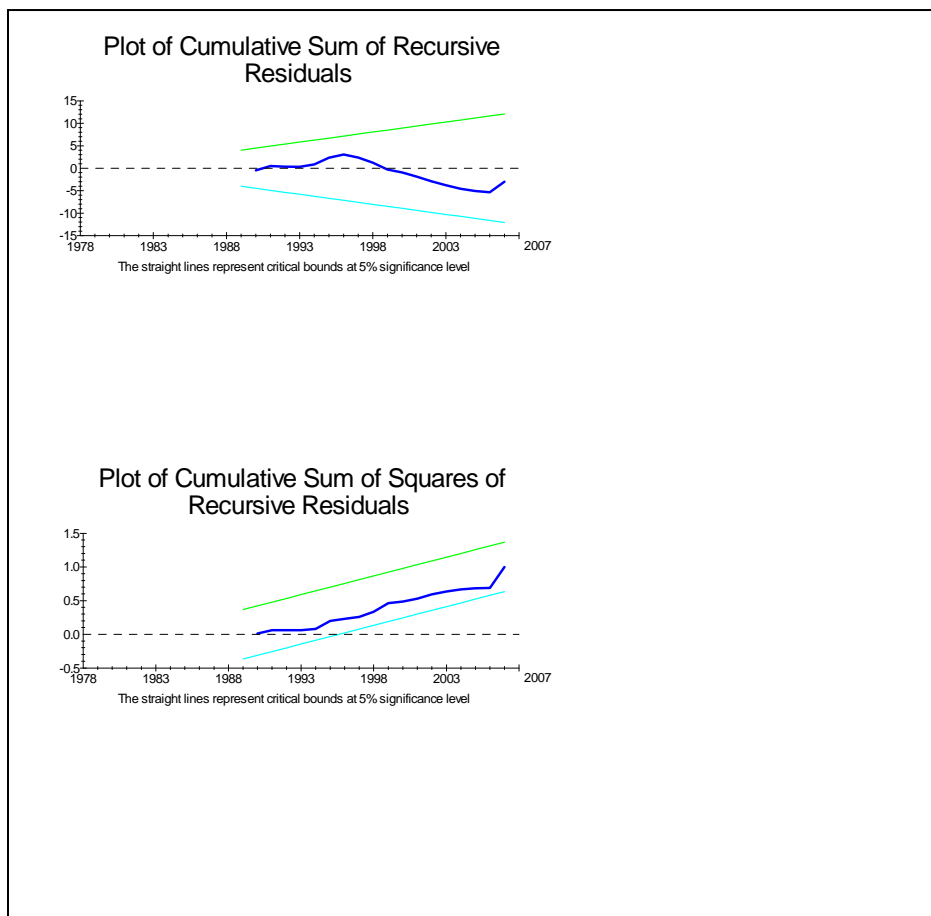


Figure 1. CUSUM and CUSUMQ tests

Results of this study could be summarized as below:

1- Short run relations indicate there is a negative relation between inflation and GDP such that if there is 1% change in the inflation rate will reduce per capita GDP to 0.09%.

2- Short run relations indicate there is no significant relation between investment and GDP, but change in export and state expenditures will increase per capita GDP to 0.8% and 1.89% respectively.

3- Estimation model for ECM indicates that the coefficient of error correction sentence is negative and significant. Significance ECM coefficient means presence of a casual long run relation from model variables to GDP. The size of such coefficient estimated to -0.42 and this indicating that if we move from period t to $t+1$, 40% of deviation in GDP by its long run route will be corrected by model variables.

4- Long run relations indicate negative and significant relation between inflation and economic growth such that increasing 1% in inflation will reduce GDP to 0.15%.

5- Long run relations indicate that investment variables, state expenditures and exports have positive and significant relation with GDP such that 1% increase in investment ratio and state expenditure ration will increase the GDP to 0.77% and 0.43% respectively. Increasing 1% in export changes will also increase GDP to 0.41%.

4. Conclusion

Regarding to the importance of economic development for increased social welfare, it is important to study the factors influencing economic growth. Studying the economic literature indicates that inflation is an effective factor on economic growth. Generally, results of experimental studies indicate that estimated effects of inflation on growth are negative and this can be indicated both in short run and long run. Therefore, increasing the inflation results in reduced GDP with some fluctuations. Exports and state expenditure changes will also influence positively on GDP both in long and short runs. Therefore, increasing the exports and state expenditures will increase GDP. Investment in long run can apply its positive effects on GDP, i.e. increasing the investment will increase GDP. Therefore, due to presence of negative effects of inflation on economic growth in short and long runs requires controlling the inflation as an initial objective. Thus, to make a development, the

inflation needs to be reduced or at least kept in a level that can remove its damaging effects, for this reason, it is necessary to recognize the factors related to inflation and economic growth to reduce or control the inflation and increase economic growth.

This study indicated some factors that can change the relation between there variables, of which include how to supply the budget shortfall, how to allocate the budget, non performance in investment,... therefore, independency of state expenditures to oil incomes and supplying the needed financial sources will be beneficent by making the tax system efficient to attain sustainable development. Modifying the general structure of country's general budget can be a good step for increasing the economical development and controlling the inflation, for this reason, government's current credits needs to be controlled. Thus, lack of optimal systems for controlling the inflation rate and keeping it stable for at least one year can make instability in the economy and this will increase the inflation and reduced economic growth. Because during inflation, there is no production investments or investments making value added and dominated by false activities and playing exchange, and attract such investments. Economic instability will also reduce foreign investments in the country, on one side, and escape of capital from manufacturing part towards false activities, on the other side.

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