

## Research Article

### Measuring Monetary and Debt Roots of Inflation by Panel Data Approach (Case Study: Iran, South Korea, China and India)

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**Abstract:** The main objective of this survey is testing the Fisher's quantity theory of money and the Fiscal Theory of the Price Level (FTPL) to measure the root of money or debt of inflation; for Iran, South Korea, China and India by panel data approach. Thus at the first step we expressed the theoretical fundamental of Fisher's quantity theory of money, FTPL theory and checking research background (similar internal and external studies). In the next step we estimate panel models by considering various conditions and the related tests (F Leamer and Hausman) and finally we identified the monetary root and debt of Inflation by selecting a fixed effects panel model. The survey results also indicate that in the panel estimates of all models (fixed effects), the coefficient of annual amount of money growth variable (MQMgr) was a significant factor and other factors are meaningless, including the annual growth rate of government debt to GDP. So in these countries, the monetary root of inflation confirmed but the debt root of inflation is not verified. The results of this study adapt with all internal and external studies in the field of monetary roots of inflation in most developing countries. Therefore we suggested liquidity management, adjustment of debt monetary policy, enhancing the productivity and technological power of production, currency control and reducing the dependence on foreign earnings from oil exports as well as controlling the budget deficit and government debt as a policy solution for inflation adjustment.

**Keywords:** Debt root, panel data approach, fisher's quantity theory of money, inflation, monetary root, The Fiscal Theory of the Price Level (FTPL)

## INTRODUCTION

Inflation and the rise of its main roots are the most important topics in economics. Generally the continuous and indiscriminate increase of general level prices is called inflation. This issue is the major concern in third world countries. This matter returns to 1972 and sudden jump of oil price. Moreover, in 1974 due to sharp increase in world oil prices (about four times); many macro-economic variables were seriously affected because of its economic reliance on oil in Iran. For example, a currency shortage at that time, was a major problem, were destroyed with 250% growth in revenue from oil exports. Current construction costs and the government grew. (More than 300%) and liquidity growth due to increased foreign exchange reserves, has greatly increased. Thus, double-digit inflation that has not been seen since appeared in the Iranian economy, while about 7% inflation rate in 1973 respectively. This trend continued until 1987 and the inflation rate rose to 25%. With the onset of war in 1981 and increased government spending, inflation soared. Once reached from 11.4% in 1980 to 23.5% in

1981. In time of war, inflation was bubbling and decline to 6.9% in 1986. In 1987 due to lower oil prices, foreign exchange revenues greatly reduced (Iranian currency revenues in 1987 were about \$ 6 billion) that reduce the volume of imports and the sharp decline in output growth was lower. Consequently, inflation rise into 28.9% in 1989. By end of the war with the reconstruction program which was developed, foreign exchange revenues improved by increasing exports and rising oil prices. In this period (1990-1994), the government sought to implement expansionary monetary and fiscal policies and move towards a single exchange rate and liberalization of imports. Following these policies (i.e., devaluation of national and moving to the currency float), another momentum come into the economy and led to our country experiences the highest inflation rate in the years 1976 to 2005, so that the inflation rate in 1996 reached to 49.4% (50%). In 1996 the government stabilized exchange rate and outlaws the informal exchange market and try to stabilize prices by determining two nominal and exports rates, (1750, 3000 Rials per dollar), thereby the government struggled to control liquidity by tight control of bank

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credit and reduction in power of bank lending of banks. Thus, in later years (1997, 1998) the inflation rate fell to 17% in 1998. In the years after 1998, successive reduction in world oil prices was reduced the gross national product growth in Iran. The year 1999 was a bad year for Iran due to oil revenues, so that this year oil revenues of 26 billion dollars a year ago, fell to 16 billion dollars. This situation leads to a decrease (the product of GDP declined from 3.4% in 1998 to 1.6% in 2000), while due to increasing budget deficit and liquidity growth, inflation again rose to 20% and reached in 2000. With improved oil prices and its effects on the Iranian economy, the economic boom was rampant in the country. It should be noted, in 2001 the average price per barrel of crude oil in 2000, grew more than 56% and from 16.78 dollars per barrel to 26.13 dollars. Thus, in the years 2001 and 2002, inflation fell according to the economic prosperity and improving the state budget. But in 2003 because of some policies including the move to single-rate currency and ... Without the necessary measures, the inflation rate increased from 14% in 1381 rose to 16% in 2004 and reached 15% in 2005. According to the World Bank, the inflation rate dropped to 13% in 2006. But between 2008 and 2009 according to increasing the historical price of oil more than \$ 1,000 per barrel, inflation rate, respectively, increase to 17 and then 26% and eventually declined by reducing the upward trend in oil prices, compared to 14% in 2009. Considering the above process, Iran has been applied budget deficit policy and public debt in several years. This research suggests identity the root of money or debt of inflation for the country with developing countries in Asia (emerging) that the main goal of this study.

### THEORETICAL FUNDAMENTAL OF QUANTITY THEORY OF MONEY AND FISCAL POLICY OF THE PRICE LEVEL THEORY

**Quantity theory of money:** Before publishing the book "General Theory of Employment, Interest and Money" by the economist John Maynard Keynes, there was cause a general consensus about the causes of inflation. The economists were analyzed the origin of the inflation on the well-known economic theory that called Quantity theory of money. There are two interpretations of this theory that if we talk briefly about each. Fisher's equation: Irving Fisher begins its analysis through exchange equation. This equation is the following:

$$MV = PY$$

- M : Total volume of reserve money.
  - V : Velocity of circulation of money or number of times that each currency is used in a calculation.
  - P : In this equation refer to the price level.
  - Y : Represents the product produced in the economy.
- To illustrate the effect of these variables, we can perform the natural logarithm from above equation

of the variable and then can be derived according to the time:

$$\begin{aligned} \ln M + \ln V &= \ln P + \ln Y \\ \frac{d \ln M}{dt} + \frac{d \ln V}{dt} &= \frac{d \ln P}{dt} + \frac{d \ln Y}{dt} \\ \dot{M} + \dot{V} &= \dot{P} + \dot{Y} \end{aligned}$$

Fisher makes two constraints into this equation: First, the level of manufacturing in economic production, which the economy is independent of the volume of currency reserves. Means that if the volume of money increase (decrease), in the economy; this increase doesn't have any effect on real economic variables such product in long-term certainty. Although the followers of this theory believe that in short-term this increase in the amount of money will lead to economic prosperity for a short time, but they know this issue is temporary and believe this change in the volume of money in the long run has no effect on product. Economists generally believe that this level of product and real variables determining by real factors such as size and skill of employees, their age composition and production efficiency Capital equipment and etc., that is not the money factor (Gorgi and Madani, 2005).

Second, money velocity is constant and does not react itself according to changes in volume of money. Fisher believed that the velocity of money determined by structural or institutional factors that change slowly. However, we consider the left of Fisher's equation, which is volume and velocity of money. Obviously this statement is equivalent to the monetary value that is paid for goods and services. And the right side, i.e., the general level of Prices in equal value is sold in the prices of goods and services. If the velocity of money equation and the product level or change in the volume of money considered fixed, the prices change in the same percentage.

That is the essence of the "Quantity Theory of Money". Cambridge equation: another expression of the quantity theory of money, which in many cases is more persuasive, is a form that has been proposed by economists at Cambridge University. Mathematically, this equation can be written as follows:

$$M = KPY$$

Variables in this equation have the same concepts before. The only new component in this equation is known as the K. Cambridge. Comparing this equation with the Fisher equation can be easily realized to the following relationship:

$$K = \frac{1}{V}$$

Now if only K is the reversed of V. So why is this equation more superior to the equation of Fischer? The reason is that economists have considered the issue of

vision and perspective of microeconomics and they established microeconomic foundations. This means that our economists whether the questions were justified: Why do people keep their money? What is the most important determinant of money demand? And concluded the most important factor in keeping money is the income level of people's money. But Fisher considers the issue of macroeconomic vision.

The economists of Cambridge school have accepted the assumptions of the previous school, which means that they agree to the production level set by real factors and secondly money velocity is constant and is influenced by structural factors. The result of this discussion will be achieved is that regardless which of the equations are selected, due to the restrictions we can turn this simple relationship into an equation that has predictive power. This basic prediction is that the increase in the amount of money leads to a corresponding change in the general price level. These can be summarized as economists believed the quantity theory of money, the only cause of inflation in the Iran's economy is changes in money volume and the only way to control them is control of the amount of money.

P : In this equation refer to the price level.  
 Y : Represents the product produced in the economy.

To illustrate the effect of these variables, we can perform the natural logarithm from above equation of the variable and then can be derived according to the time:

$$\frac{LnM + \ln V = \ln P + \ln Y}{\frac{d \ln M}{dt} + \frac{d \ln V}{dt} = \frac{d \ln P}{dt} + \frac{d \ln Y}{dt}}$$

$$\dot{M} + \dot{V} = \dot{P} + \dot{Y}$$

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The primary and traditional function of central bank is the control of price level. It is the inherent concepts in economic theory as Friedman's quantity

theory of money that the summary says, "The inflation is always monetary event (phenomenon)." But this traditional analysis has been challenged by fiscal theory of the price level; it says that the price level is determined by budgetary (financial) policies and through creating liabilities. This theory is an unusual and controversial framework of a new developed analysis that Sims (1994), Leeper (1991) and Woodford (1994, 1995 and 2001) were expressed. Next Topics was presented by Buiter (2002). Of course the FTPL was formally introduced by Woodford. Woodford believed that the price level approach in the FTPL theory is that by the performance stocks of bonds is different with Fisher's quantity theory of money approach. So according to FTPL theory, the government budget constraint as the most important factor in determining inflation (not the most necessary factor), can lead to publication (sales) of government bonds. The wealth effect arising from the debt crisis (due to the government debt (by people) as the traditional channels of financial impact (the effect of a fiscal policy)) is raised to identify inflation. So this theory thinks that government debt increase household wealth and consequent increase demand for goods and services and ultimately will lead to pressure on prices. Thus increasing public debt and fiscal theory of price level in Sargent and Wallace's work is the same. So increasing in government debt (according to FTPL theory), increases bondholder wealth but does not reduce the wealth of others. Thus by increasing the prices of bond in long-term, aggregate demand increases and raises the price level. The money supply is exogenous in this system and also increases in response to higher pay demand so the price level increases. But under the unpleasant financial calculations theory of Sargent and Wallace, increasing the public debt, are not supported fully by the present value of future surpluses and therefore it increases the monetary aspect of the public debt. Thus, inflation expectations increases and demand for bonds reduces and interest long-term rates rise.

Instead, money demand decreases and prices increase (without increasing the money supply). Therefore in the FTPL theory; increasing in the price level up to differences in present value of future surpluses and is the nominal bond that occurs from wealth effect origins from holding government bonds with people. The main concern is making money off the debt against the wealth effect due to its maintenance. In other words, holding government bonds according to the wealth effects can lead to increasing in aggregate demand and consequently the general price level increases. This condition occurs more in monetary making to the domestic public debt, as studies show that public debt growth on inflation is positive and significant, but the domestic public debt on inflation is not significant. It is noted that FTPL theory, the effect of money supply on inflation is depended on its cooperation with fiscal policy (the release of public debt). So according to the FTPL theory, the growth of

public debt in countries with higher debt inflationary than countries with lower debt, but this relationship (debt-inflation) is weaker in flexible exchange rate regimes. Despite the important role of monetary policy in managing and achieving short-term inflation expectations, monetary policy can be a dominant factor on inflation in developing countries with high debt. Studies also show that after controlling money growth variables, real output growth, devaluation of national currency and the output gap and rising public debt are significantly associated with high inflation in developing countries with excessive debt.

## LITERATURE REVIEW

**Internal study:** By review of internal studies, including researches that examine monetary root mainly in the form of monetary inflation and have not been seen any research specifically in terms of FTPL theory. Some of these studies include:

- In a study has been done by the "Shirvani and Wilberate" to examine the relationship between money and inflation using the convergence technique. The result is that only money and inflation are associated with countries that experiencing high inflation. In other words, this model is applicable only in countries with high inflation and in countries with low or moderate inflation this model fails to explain their ability.
- In a study are doing by the "Olin Liu" and others, they offer a framework for examining the determinants factor of inflation in Iran from 1990 to 2000. Given these imbalances in money market, foreign exchange and commodities is estimated an empirical model to understand the main factors determining the response of inflation and related variables to shocks originating from the money markets, commodities was used foreign exchange functions and techniques of immediate reactions analysis of variance. The results show that the sudden shock to the nominal money equation lead to positive trend in the price level.
- Islamy Bidgoli in his studies has tried to interpret the inflation by using the quantity theory. The period of his research is 1968 -1989. This researcher by relying on the quantity theory of money called inflation as a linear function and primarily degree of liquidity and consumer price index as a measure of inflation has concluded that probably there is a linear relationship between these two variables. He concluded the accuracy of quantity theory after fitted regression model in Iran. Fitted regression model is as follows:

$$CPI = 41.82 + 0.437M_2$$

Finally, the researcher using the obtained model to estimate the consumer price index for 1990, which have

very little difference with the criteria announced by the central bank.

- Another joint research in Iran by Kazerooni and Asghari (2003) is done with compatibility test of monetary inflation model with the features of the Iranian economy and founding the relationship in money supply growth variables and inflation. Summarized in this review, the result is that inflation and money growth are converge and in the long run 1 percent increase in money growth increases the inflation about 0.9 percent and also in this hypothesis the relationship between variables not be rejected. As a matter of fact in Iran, inflation is a monetary phenomenon (Kazerooni and Asghari, 2003).
- In another review by Tabibian and Souri (1996) is doing with the aim to identify factors affecting inflation in the Iranian economy. There are two linear relationships have been estimated for both before and after the revolution:

$$CPI = 3.045 + 0.344M_2 - 0.438Y + 0.57PIM$$

$$CPI = -0.196 + 1.15M_2 - 0.54Y - 0.089PIM$$

$M_2$  : Nominal volume of liquidity  
 $Y$  : The actual volume of production  
 $PIM$  : The price index of imported goods

Comparing these two equations show that; first, variable coefficient of liquidity volume is four times than before the revolution. Second, before the Islamic Revolution the sensitivity of price to production is more than the sensitivity of price to money supply, while after the Islamic Revolution, this relationship was reversed. And third, after the Islamic Revolution the coefficient of the PIM is not economically significant (Tabibian and Souri, 1996).

- In another study by TayebNia (1995) is done in conjunction with the desired appropriate model for assessing the monetary explanation of inflation in Iran and has its estimated amount of money involved in the formation of inflationary pressures.

Tayeb Nia for survey of explanatory power of net monetary model in explanation of inflation in Iran; estimated Harberger model which is as follows for the period 1962-1992:

$$P_t = a_0 + a_1M_t + a_2M_{t-1} - a_3Y_t + a_4A_t$$

$P$  : Indicates the growth rate of goods price and services in urban areas of Iran.  
 $M_t$  : Is liquidity growth rate of the private sector in period t.  
 $Y$  : Is GNP growth rate according to the price of the year 1361.  
 $A$  : Represents the difference of expected price in the current period and previous period.

The above model is estimated by ordinary least squares and the following results were also obtained from it:

$$P_t = 9.55 + 0.216M_t - 0.482Y_t + 0.3A_t$$

The results of the estimation model are that monetary theory doesn't explain enough the behavior of prices in Iran (TayebNia, 1995).

- Tashkini (2004) in his dissertation using from 1960 to 2002 data for survey of long-term relationship between inflation rate and monetary policy has used three econometric methods 'Engel-Granger' method, 'Own explaining with wide intervals' method and 'Johansson - Joe Sylios' method. The survey results show that growing 10 percent in money volume leads to increase the inflation rate about 3%. So the hypothesis that inflation is monetary in the Iran's economy won't be accepted; and the production, import price index and exchange are recognized important factors affecting Iran's economy. Reaction method and results of variance analysis shows that money is endogenous in the Iranian economy. Thus the monetary authorities cannot control it and eventually other results obtained from this method is that the inflationary effects of the monetary policy does not appear in a period, therefore the active monetary policy is not recommended (Tashkini, 2004).
- In another dissertation is done by Kazeminezhad, to test the causality between exchange rates and inflation has been estimated the monetary model of inflation in Iran. The final equation is estimated by the investigator as follows:

$$\log CPI = 0.87 \log M_2 - 0.351 \log GDP + 0.571 \log BMER + 0.43 \log IPI$$

**Log BMER:** It's the logarithm of exchange rates on the open market that obtained from average annual rate value of the rial against the dollar on the open market.  
**Log IPI:** It's the logarithm of export price index of major trading partners of Iran, which is used as global prices of commercial goods. The results indicate that in the long term and short term, the liquidity is the main proponent of national inflation in this period (1974-2002).

**Foreign Studies:** The bulk of studies suggest in this part that perform with emphasis on FTPL.

Several studies have been done on the quantity theory of money. Some studies on FTPL theory include:

- Charles and Timothy (2000) express in an study entitled Fiscal theory of the price level that in this theory of inflation, government debt is considered the effect of wealth is weak and another kind of it is a strong type of FTPL. So the weak form of wealth effect with public bonds among people, after increasing in aggregate demand, consequently increasing in prices and money demand, which also comes money supply with its own that it causes increasing in price. In other words, fiscal policy will eventually carry monetary policy. But in strong type of FTPL, fiscal policy of open market operations (public debt and the wealth of its release) impact on prices level and inflation path independent monetary policy changes (increasing the money supply). In this study is concluded that if the central bank was disabled and the financial ability is active (government diffusing bonds actively) then FTPL can perform and also have effect on the price level and monetary policy (money supply). Friedman said he believed that with fiscal policy on prices and inflation, only in its impact on money affects; Weak form FTPL (Charles and Timothy, 2000).
  - Daniel (2007): In an study entitled price level policies theory and initial debt of government has stated there is a wide belief that the FTPL theory will not work in an environment where the initial debt of government is zero, but he shows in his study that when government issued the set of bound financial assets according to standard nominal debt contracts and the money, this view was incorrect. As in a standard dynamic macroeconomic model, FTPL theory can operate up to a set of safety and constraints that government limit. Therefore, the FTPL cannot determine the price at which government disclosure debt is zero, the determination of price level is compatible through a fiscal policy with balance in subsequent period, after the government moved the nominal debt; FTPL acts (Daniel, 2007).
  - Kocherlakota and Phelan (1999), in an study entitled 'describing the fiscal theory of price level'; explain the FTPL and discuss experimental concepts and its policies. He believe that controlling the money supply (according to Fisher's quantity theory of money), is not sufficient to describe for time path of inflation rate (controlling the inflation) because the household, for example, how much money to keep for a day it can absolutely depend on their beliefs of future inflation. On the other hand, governments also have the choice that plays an important role in determining the time path of inflation rate how to play direction. The study suggests that the key force behind the financial theory is that the government varies with a household fundamentally. Households need to solve their budget limit for all prices, regardless of whether or not prices are moderate. But a government does not this study. It cannot be believed that fiscal policy instrument (the root of debt-inflation) and monetary instruments (monetary origins of inflation) exist together simultaneously and symmetrically (Kocherlakota and Phelan, 1999).
  - Bennett and Nelson (2006), in an study entitled "Monetary and fiscal theories of price level, incompatible differences" deal with the key points of the price level, fiscal policy and monetary origins of inflation (based on the quantity theory of money).
  - In this study, behind the various studies related to fiscal theory of the price level, examining the relationship between velocity of circulation of money and FTPL and also investigating the FTPL with this assumption that it is an exogenous monetary stock, in fact consider to review two different forms of the FTPL (one of them under interest rates and other under the rules of monetary stock). As at the first case, the path of influence of debt origins of inflation due to wealth effect from debt and increasing in aggregate demand and demand money from it ultimately does not conflict with the money supply but make it in order to increases along price. But in the second case, the path (root) of inflation is money supply and it is independent of the route. So they argue that the central bank can control inflation regardless from fiscal policy, therefore detailed coordination is not required between monetary and fiscal capabilities for effective macro-economic policies (Bennett and Nelson, 2006).
- Bassetto (2006) explains in a study entitled "fiscal theory of the price level" that FTPL with financial perspective shows that the money supply ultimately determines the price level and inflation (due to the wealth effect of public debt to people). He believes that until the central bank has unlimited ability to generate money don't let the government failure in nominal debt (to the public debt). Otherwise, the FTPL works, because FTPL requires clear and explicit organizational commitment and it is inevitable (Bassetto, 2006).

#### **ANALYSIS OF RESEARCH FINDINGS**

##### **Method of research:**

##### **Variable of research and econometric models:**

Generally in this study dependent and independent variables have been considered to the Table 1 for the section (country):

Table1: The variables of research mode

Row	Type of variable	Variables name	Symbols
1	Dependent	Growth rate of consumer price index (annual inflation)	ICPgr
2	Independent	Growth rate of money volume (including money and quasi money)	MOMgr
3	Independent	Growth rate of central government debt to GDP	CGDTgr
4	Independent	Growth rate of domestic real GDP	CDPgr

Considering the aforementioned factors, the research model in the first mode is a pooled model can be expressed as follows:

$$\begin{cases} ICPgr_{it} = \beta X_{it} + C + \varepsilon_{it} \\ W_{it} = \alpha + \varepsilon_{it}, \alpha = u_i \\ t = 1, 2, 3 \dots 21 \\ i = 1, 2, 3, 4 \end{cases}$$

Moreover ICPgr<sub>it</sub> shows the annual inflation rate of 4 sections (countries) for 21 years. (1989-2009). And X<sub>it</sub> represents a batch of explanatory variables in model such as; MQMgr<sub>it</sub>, GDPgr<sub>it</sub> and is CGDTgr<sub>it</sub>. Also ε<sub>it</sub> is a part of the standard error (one-way pooled error model). In pooled models with common effect model, the width of the source and coefficient of angles consider fixed for all time periods and sections. This model using OLS, give efficient and consistent estimates. In this study first, the model is estimated and after analyzing the estimated outputs, Leamer F test have been conducted to diagnose the type of model (selecting the pooled model or panel from FE type). At this stage, a model has been selected is based on panel data techniques with the FE. Panel data method have two forms: a fixed effects and random effects, that choosing one of these two methods is based on the Hausman test. The Hausman test was selected. In later stage of research, the selected model (FE panel Model) in different scenarios (considering autocorrelation of disorder sentences with the same coefficient and with different coefficients and also considering between the cross-sectional variance as well as the case of (SUR) put the run and according to the good fit and significance of coefficients, the best mode has been analyzed to achieve the desired results (Hozhabr, 2011).

- **Limitations of the study:** The limitations of the study include:
  - Due to lack of data on CGDTgr variable for Iran is used from World Bank statistics on external debt growth than gross national income (GNI).
  - Instead of data for the CGDTgr variable for China is used World Bank statistics about foreign debt to gross national income (GNI) from 2000 to 2009.
  - Instead of data for the CGDTgr variable for South Korea is used World Bank statistics about the growth rate of government final consumption expenditure as a symbol of the budget deficit (public debt) from 1998 to 2009.

Table 2: The results of pooled panel for total country

Variable	Coefficient	t-statistics	Prob.
GDPGR	-0.799	-3.581	0.0006
MQMGR	0.574	5.347	5.347
CGDTGR	0.003	0.094	5.347
C	3.156	1.163	0.248
R <sup>2</sup>	0.29	D-W	1.144

**Analysis of panel models estimated:**

**The estimation of Pooled model at the first stage**

**(Panel Data):** As mentioned, first we can estimate data based on a Pooled method. We assume that for all sections, the width of the source and the coefficient is constant and the same. So the parameters do not give index i. Estimation results in Table 2 show that the GDPgr and MQMgr variables according to Prob smaller than 0.05, have negative correlation and significant and positive and significant correlation with inflation, respectively. For CGDTgr variable and the width of the source of model (C), the Prob value is greater than 0.05 and therefore, despite the positive relationship between CGDTgr and inflation, the coefficient is not significantly related to it. So according to the significance of coefficients and according to the non-significance coefficient of CGDTgr variable, this model is compatible with the Fisher quantity theory of money, but not consistent with the FTPL. The R<sup>2</sup> and adjusted R<sup>2</sup> (good fit) for the Pooled model of estimation achieved (respectively) equal to 31 and 29% that is not satisfactory. (Hamilton proved that the combination tabling data, the R<sup>2</sup> above 50% is suitable.)

**Estimation of fixed effects model in the second step**

**and Leamer F Test:** In this section, we estimate the desired model with fixed effects method. Generally, fixed-effects models assume that the coefficients angles are constant; therefore the widths of the source levels change for each section that these changes occur consecutively but fixed over time. The heterogeneity in these models can work on the width of the source in different sections terms. The research model can be expressed as follows:

$$ICPgr_{it} = \beta + \alpha_i + \varepsilon_{it}, \quad \alpha_i = \alpha_i \quad i=1,2,3, \quad t=1,2,\dots,21$$

Therefore, in this case, due to correlation between ε<sub>it</sub> and X<sub>it</sub>, estimates with OLS method are biased and inconsistent. Therefore, this problem can be solving with the help of virtual variables and using LSDV method and estimates will be unbiased and compatible.

Table 3 shows the FE model results. According to this mode can be seen that these estimative coefficients

Table 3: The results of fixed effect; FE model for country and F Leamer test

Variable	Coefficient	t-statistics	Prob.
GDPGR	-0.799	-3.581	0.0006
MQMGR	0.574	5.347	0.000
CGDTGR	0.003	0.094	0.924
C	3.156	1.163	0.245
R <sup>2</sup>	0.32	D-W	1.144 cross section F = 13.29

Table 4: The results of random effects; RE model for total country

Variable	Coefficient	t-statistics	Prob.
GDPGR	-0.799	-04.365	0.000
MQMGR	0.574	6.517	0.000
CGDTGR	0.004	0.116	0.909
C	3.157	1.419	0.160
R <sup>2</sup>	0.31	D-W	1.144

Table 5: The results of random effect; RE model for total country and Hausmsn test

Variable	Fixed	Random	Prob.
GDPGR	-0.319611	-0.779	0.0000
MQMGR	0.263624	0.574	0.0000
CGDTGR	0.107322	0.004	003437
X <sup>2</sup>	36.43	41.82	0.000

Research finding

Table 6: The results of FE model (according to the different with of source in the section over time

Variable	Coefficient	t-statistics	Prob.
GDPGR	-0.319611	-2.067	0.043
MQMGR	0.263624	0.996	0.323
CGDTGR	0.107322	0.778	0.016
C	36.43	2.491	1.403
R <sup>2</sup>	0.77	D-W	1.403

Research finding

is correct, but only MQMgr variable is significant (based on the Prob smaller than 0.05 and t statistics computational greater than 2). It is noted that R<sup>2</sup> also has increased 32% (improved). Therefore, this model also is applicable with monetary origin of inflation (Fisher's theory).

Table 3 shows the Leamer F test process. This test used to detect whether our model is a pooled model or panel (analytical FE). In Leamer F: H<sub>0</sub> hypothesis consider the same width of the sources (pooled method) against H<sub>1</sub> hypothesis consider the dissonance of width of the source, using panel data from FE type. So if we reject H<sub>0</sub>, we will accept FE Model. (With 95% confidence coefficient) Therefore, according to the output of Leamer F- test can be seen that the computational F equals 13.93 (with degrees of freedom = 3.77 and prob = zero) indicates that H<sub>0</sub> is rejected and the FE model is accepted.

**Estimation of random effects model and the Hausman test:** At this stage due to estimating random effects method and Hausman test, the aim is setting the panel model type (fixed effects or random effects). The random effects models, the coefficients angles remain constant but the width of the source is different, but this difference is random. Then U<sub>i</sub> = α<sub>i</sub> and U<sub>i</sub> is random. In other words, in this case there is no correlation between X<sub>it</sub> and ε<sub>it</sub>. Because the size of sample is high in these models the OLS estimates is unbiased, consistent but

they're inefficient. For this reason we use GLS method (or EGLS in software) in order to keeping the performance of estimators. As Table 4 shows the estimated results, so the mark of coefficient is correct (based on target theories), but the coefficients of GDPgr and MQMgr variables are significant. In this approach R<sup>2</sup> is similar to the OLS method and equals 0.31 that it is less than FE model. The next step is to select the type of panel model (fixed or random effects), Hausman test done. As Table 5 shows, first, computational statistic X<sup>2</sup> is greater than the X<sup>2</sup> of table (and it's significance), second β<sup>0</sup><sub>FE</sub> & β<sup>0</sup><sub>RE</sub> are very different with together and of course these estimates for GDPgr and MQMgr are meaningful and again it can be meaningless for CGDTgr. So the FE model can be accepted. Therefore according to the previous test (Leamer F) and a recent test (Hausman), the selected model in this study is fixed effects type of panel data. The estimate coefficients of MQMg and GDPgr variable in both FE and RE are significant and the coefficient of CGDTgr variable is meaningless.

**Selecting FE model according to the Hausman test and estimate it according to the different width of the source in section over time:** Table 6 is the estimation FE model with the width of source over time. R<sup>2</sup> and adjusted R<sup>2</sup> improved and increased 0.66 and 0.77 respectively, but instead the coefficient associated with GDPgr variable other coefficients are meaningless. Of course the width of source is significant in this case. So it seems that the majority of the estimated coefficients are meaningless (but non-compliance with the theory despite the high R<sup>2</sup>), FE models with different widths of the source may not be in desirable sections and time periods (together) to this investigate. The estimated model is contrary to both theory and basically does not approve the monetary root or debt of inflation.

**Estimation of FTPL, according to autocorrelation of cross sections residue with the same coefficients:** At this stage we assume that disorder sentences of all sections have an autocorrelation with the same coefficient. Therefore, considering its position in the Common part and independent variables, enter the AR (1) and estimate the model. According to FE estimated model in Table 2, based on the following Table 7, although R<sup>2</sup> improved from 0.55 to 0.66, but unlike the theory the coefficient of MQMgr is negative and except coefficient of AR (1) and width of the source, the coefficient of the main variables are meaningless. Therefore, considering the state of the FE model is not consistent with both of FTPL theories and Fisher's theory.

**Estimation of FE model according to autocorrelation of sections residue with different coefficients:** At this stage we assume that the disorder sentences of various sections have the autocorrelation



Table 7: The results of estimate of EF models-AR (1) in common

Variable	Coefficient	t-statistics	Prob.
GDPGR	0.236	-1.127	0.244
MQMGR	0.330	-0.229	0.771
CGDTGR	0.330	0.204	0.839
C	10.186	0.204	0.031
$\bar{R}^2$	0.66	D-W	1.56

Research finding

Table 8: The results of estimate of EF models-AR (1) in cross section specific

Variable	Coefficient	t-statistics	Prob.
GDPGR	-0.257	-1.232	0.222
MQMGR	-0.052	-0.443	0.659
CGDTGR	0.182	1.289	0.262
C	7.934	1.723	0.089
$\bar{R}^2$	0/66	D-W	1.54

Research finding

Table 9: The results of estimate EF models-with attention to cross-section weight

Variable	Coefficient	t-statistics	Prob.
GDPGR	-0.137	-1.091	2.787
MQMGR	0.139	2.318	0.023
CGDTGR	-0.016	0.017	0.865
C	7.796	2.318	0.001
$\bar{R}^2$	0.46	D-W	1.026

Research finding

Table 10: The results of estimate EF model-with attention to cross-section SUR

Variable	Coefficient	t-statistics	Prob.
GDPGR	-0.158	-1.496	0.138
MQMGR	0.120	2.115	0.037
CGDTGR	-0.005	-0.0794	0.937
C	8.069	4.392	0.000
$\bar{R}^2$	0.60	D-W	1.05

Research finding

and different coefficients. Therefore, we entered the AR (1) in Cross-sections Specific in the field and run the model. Results in Table 8 again shows that the estimated model in Table 2,  $\bar{R}^2$  again improved 0.66 but the coefficient of original estimation model is meaningless (except for the coefficient of AR (1) and the width of the source C) and it against the theory. Therefore it would not be desirable from the FE model. Since the desired coefficients unlike the FTPL and Fisher theories are not meaningful.

**Examining the dissonance of sectional variance (analysis of covariance matrix of disturbance terms):** The Residual Covariance Matrix that is used to detect the dissonance of sectional variance, so that after the estimation of model by FE method, we enter the Residuals by View option and then choose Residuals Covariance Matrix. The above table shows that the ingredients on basic diagonal are dissimilar and therefore OLS estimators are consistent but inefficient. Thus, we should use WLS estimators that they're a subset of GLS. (i.e., give different weights to the sections), but considering to the sectionals dissonance charts during 21 years indicating range of different

variances for the four sectionals that confirm dissonance of variance between the sections.

**Estimation of FE model considering dissonance variance of cross-sectional:** After identifying the Sectional variance with the help of Residual Covariance Matrix of estimated FE model, we can estimate the FE model by choosing Cross-section Weights with GLS method. Table 9 shows that according to all of the estimated FE models,  $\bar{R}^2$  is lower in this case. (0.50 for the weighted method and 0.53 for non-weighted method) and only the coefficient of MQMGR variable and width of the source are significant. The sign of CGDTGR variable coefficient is not consistent with the theory and also not significant.

Therefore, it seems, this type of FE model is also consistent with the FTPL theory. Therefore it can verify (based on Fisher's theory) the monetary inflation. (According to Prob less than 0.50 and significance of MQMGR variable coefficient).

**Estimation of FE model considering the dissonance variance of sectional and at the same time (simultaneously) the autocorrelation between sections (Cross-section SUR):** In this case, the sections be affected due to the reasons behind the existence of a Panel that are apparently unrelated between the levels of disorder sentences simultaneously. (Contemporaneous Correlation), so in this case instead of dissonance on the major diagonal's elements of covariance matrix, the elements of minor diameter are nonzero. (Previous pages). So because of this section unrelated apparently but have correlated residues thank to influence of common elements. So use Cross-section SUR option and estimate the model. Table 10 shows that in this case, despite the improvement in  $\bar{R}^2$  compared with non-weighted mode (0.59 to 0.53), the sign of CGDTGR coefficient was negative and meaningless and also the other coefficients are meaningless (except the width of source). Therefore, despite the Improvement in  $\bar{R}^2$ , this case has been approved Fisher's quantity theory of money based on making monetary the inflation and rejects the FTPL theory.

## RESULTS AND DISCUSSION

**Results:** The survey of inflation roots shows that in Iran during the period 1974 to first 6 months of 2011 some factors such as, a sharp increase in world oil prices in 1974, growing foreign exchange reserves, growth of money volume (liquidity), increasing in the current and civil costs of government, expansionary monetary and fiscal policies, integration and making single exchange rate, excess aggregate demand and not associated production with it and also the inflationary effects from making beneficial subsidies policy have been effective for inflation in Iran.

- Results of the econometric models estimated in this study (using fixed effects based on panel data) with regard to different conditions, showed that the inflation has monetary origins in the studied countries and this result is consistent with Fisher's quantity theory of money.
- Results of the econometric models estimated in this study (using fixed effects based on panel data) with regard to different conditions, showed that in 5% of the standard error (95% confidence), the fiscal theory of the price level ( FTPL), is not approved based on having debt root of inflation for the studied countries.
- 4- The result of this study is similar to the results of internal studies based on having monetary origins of inflation for Iran.

### **DISCUSSION**

- Having regard to the monetary origins of inflation in the studied countries, in order to contain inflation in Iran and other countries considered in this study (South Korea, India and China), control of money volume (cash rate) strongly recommended.
- In addition to control of liquidity rate, according to the review process under study (1974 to first half 2011) and identify the structural causes of inflation in Iran conducted in internal studies, targeted control of exchange rates and improve the productivity of production factors and technical efficiency of production, reducing dependency on foreign exchange revenues from oil exports, consider to industrial and non-oil exports, more fiscal and monetary discipline of government and (precaution) the adjustment of short-term and long-term and foreign debt, have an important role in the control of inflation rate in Iran.

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