

## **The Asymmetric Effects of Tax Revenues on Government Expenditures in Iran**

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### **Abstract**

The tax-expenditure hypothesis posed by Milton Friedman emphasizes a positive causal relationship between government tax revenues and government expenditures. If citizens do not have a correct perception of the real tax burden and under-estimate the price of public goods and services, there is a negative causal relationship between tax revenues and government expenditures, which indicates existence of fiscal illusion. Using quarterly data for the period 2001-2012, this paper investigates fiscal illusion in Iran. In order to achieve this goal, two symmetric and asymmetric error correction models, are estimated. According to results from Wald test in symmetric model, there is a negative causal relationship between real tax revenues, and real government expenditures. This result hence, confirms the presence of fiscal illusion in Iranian economy. Moreover, the results obtained from the asymmetric model show that there is merely fiscal illusion in the case of tax revenues reduction and there is no Granger causal relationship for the positive changes of tax revenues. Therefore, by a decline in tax revenues, government expenditures increase after a year due to fiscal illusion. Thus, it seems that in the state of government's budget deficit, raising the taxes is an efficient instrument.

**Keywords:** Government Expenditures, Fiscal Illusion, Tax Revenues, Seasonal Unit Root Test, Seasonal Error Correction Model (SECM), Iranian Economy.

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### **1. Introduction**

When the tax-payer does not have a correct perception of the tax amount paid to the government or the received amount from government, fiscal illusion takes place. From Pinar's (1998) point of view, people's perception of the imposed tax burden affects their economic behavior. When people under-estimate their fiscal commitments and consider their payments for public goods and services less than real measures, they have fiscal illusion and therefore people's demand for public goods and services increases in the society.

Studies carried out by Wagner (1976), Buchanan and Wagner (1977) and Niskanen (1978, 2002, 2006) demonstrate that fiscal illusion leads to a negative causal relationship between tax revenues and government expenditures, though this issue contradicts the traditional hypothesis posed by Friedman (1978). He believed considering government's inclination for expending all feasible funds, if tax revenues increase, government expenditures also raise; and if the tax revenues decrease, government expenditures will be reduced. Hence it is expected that there is a direct relationship between tax revenues and government expenditures. In this regard, Niskanen (2002) claims that fiscal illusion leads to a demand curve with negative slope, based on tax prices. Reduction in tax revenues could decrease the receiving price of government expenditures and increase demand. Reversely, increase in taxes could provoke tax-payers against government expenditures in a way that it forces them to pay high prices for government expenditures directly.

The Proponents of fiscal illusion believe that decrease in tax has a reverse effect on government expenditures, because due to decrease of receiving prices of government expenditures in case of fiscal illusion, people are encouraged to the raise of demand for government expenditures. Proponents of fiscal illusion may call for an increase in taxes in case of budget deficit, in order to force people to oppose high prices of government expenditures. In this regard, the main question is whether fiscal illusion is confirmed in Iranian economy or not.

This article aims at finding an appropriate answer to this question. Therefore, time series models in Iranian economy are used via seasonal data during 2001-2012.

## 2. Literature Review

Studies carried out in field of fiscal illusion date back to early twentieth century. Puviani (1903), who is known as the father of economic study in field of fiscal illusion, coined the term "fiscal illusion" for the first time. Puviani and later Fasiani (1941) were concerned by government comprehensive role in citizens' lives. As Hayek believed, a large government tends to lower citizens' rights like a monopolist supplier of goods and services in society, which leads to inefficiency of the government. According to Fasiani (1941), monopolist governments of this kind, make use of various strategies in order to deceive tax-payers. These strategies have been investigated in details by Buchanan and it has made a path for further economic study of fiscal illusion as a phenomenon.

Dollery and Worthington (1996) categorized the studies carried out in field of fiscal illusion by investigating the experimental literature in this regard which had been expanded till 1990. These categories include (i) studying the complexity of field of tax structure; (ii) studying income elasticity; (iii) studying Flypaper effect; (iv) studying rent illusion and studying debt illusion. In the separate studies related to complexity of tax structure, Wagner (1976), Cullis and Jones (1987), Heyndels and Smolders (1995), Dollery and Worthington (1999a) showed the more complex of tax system prepares the ground for an increase in government expenditures without tax-payers knowing the amount of tax payment. In the second group of studies (Green and Hawely (1991), Heyndels and Smolders (1994), Dollery and Worthington (1999a)) claimed that the higher tax's income elasticity leads to easier gathering tax revenues automatically. In these conditions, political supports will accelerate stability of greater government expenditures.

Studies in field of Flypaper effect test the hypothesis that one-time transfer payment lead to an increase in public expenditures more than other sources of budget maximizing. In this regard some studies have been conducted by Wycoff (1991), Heyndels and Smolders (1994), Hines and Thaler (1995), Dollery and Worthington (1999a) and Inman (2008). In studies carried out in field of rent illusion it has been observed that by an increase in number of renters in a particular location, public expenditures rise. In fact, renters are compared to the owners' desire to increasing public expenditures as they are not aware of hidden tax on properties in their rents. In this regard, some studies have been carried

out by Heyndels and Smolders (1994), Carroll and Yinger (1994), Worthington (1994) and Gemmell et al. (2002). In the fifth group of studies, researchers believe that current taxes make a higher level of perception by voters paying taxes relative to public debts (Dollery and Worthington (1999b)). In four experimental studies carried out by Oates (1969), Epple and Schipper (1981) and Dalamagas (1992, 1993), debt illusion is analyzed.

The phenomenon of fiscal illusion is based on a reverse relationship from tax revenues to government expenditures. In some studies, researchers such as Bohn (1991), Mounts and Sowell (1997), Koren and Stiassny (1998), Garcia and Henin (1999) and Chang et al. (2002) have confirmed the traditional hypothesis of Heyndels regarding the direct relationship between tax revenues and government expenditures. Opposing them, Baghestani and McNown (1994) stressed there is no the relationship between tax revenues and government expenditures. Ross and Payne (1998) also presented some evidence based on a causal relationship of expenditures to tax revenues and Darrat (1998, 2002) confirms fiscal illusion hypothesis and providing evidences of a negative causal relationship between tax revenues and government expenditures for Turkey, Lebanon and Tunisia.

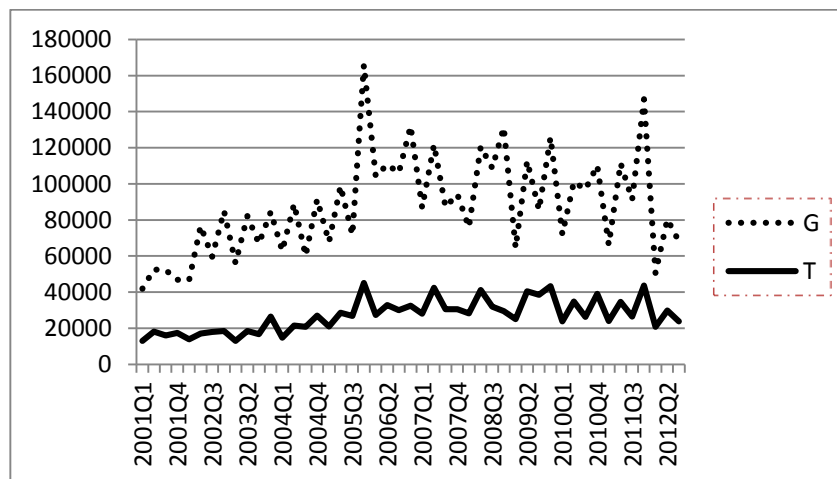
In field of domestic surveys, the relationship between government expenditures and revenues has been investigated; however the subject was not dedicated to fiscal illusion. Negin (2002) showed that a unilateral causal relationship exists between oil revenue and government expenditures. Karegar Haji Abadi (2003) confirmed the existence of a unilateral causal relationship between government expenditures and tax revenues. Samadi and Zare' Haghghi (2013) found that there is fiscal simultaneity among tax revenue and government expenditures; and in the long-run, the celerity of decrease of tax revenues in the state of improving budget is more than increase of tax revenues in the state of exacerbating budget. In another study, Maddah et al. (2014a) investigated the relationship between tax revenues and public expenditures based on public choice theory and after specifying and estimation of ARDL and ECM models found taxes invisible having no association with increasing level of government expenditures; in fact, fiscal illusion is due to high share of oil revenues in Iranian economy. In another study, Maddah et al. (2014b), using the standard median voter model, also showed that increasing share of taxes in government

revenues doesn't have any effect on public expenditure in Iranian economy during (1981-2011) and fiscal illusion due to oil revenues has the positive effect on government expenditures.

### 3. Research Methodology

#### 3.1 Data Collection, Organization and Description

In this research, in order to test fiscal illusion hypothesis, government expenditures and tax revenues data are used in the time span of 2001's first season to 2012's fourth season. Figure 1 shows variables' trend in fixed prices. According to this information, government expenditures are in higher levels compared to tax revenues in all seasons of investigation. Government expenditures fluctuations are more than tax revenues. In this period, the average seasonal changes of value of government expenditures and tax revenues are 573.89 and 236.29 billion rials, respectively. Hence the average growth of government expenditures is higher than that of tax revenues. Also, during the investigated period, average government expenditures and tax revenues are 87677.68 and 27018.87 billion rials; therefore, average government expenditure is in higher levels compared to tax revenues. At the stage of model estimation, the logarithm form of government expenditures and tax revenues are used.



**Figure 1. Government Expenditures and Tax Revenues Trend**

### 3.2. Seasonal Unit Root Test

In order to test fiscal illusion in Iranian economy, based on government expenditures and tax revenues data, first the stationary of time series data should be investigated. Hylleberg et al. (HEGY) (1990) applied the seasonal unit root test for quarterly data. Based on HEGY test, in order to determine the number of unit roots in quarterly data, first the model below must be estimated:

$$\Delta_4 Y_t = \Pi_1 Y_{1,t-1} + \Pi_2 Y_{2,t-1} + \Pi_3 Y_{3,t-1} + \Pi_4 Y_{4,t-1} + \mu_t + U_t \quad (1)$$

In this relation the deterministic component  $\mu$  is added in the regression to include seasonal dummies (SD), linear time trend (Td) and a constant term (I). The term  $U_t$  is a normally and independently distributed error term (*i. e.*  $U_t \sim (0, \sigma^2)$ ).

Other variables are defined as below:

$$\begin{aligned} Y_{1,t} &= Y_t + Y_{t-1} + Y_{t-2} + Y_{t-3} \\ Y_{2,t} &= -Y_t + Y_{t-1} - Y_{t-2} + Y_{t-3} \\ Y_{3,t} &= Y_t - Y_{t-2} \\ Y_{4,t} &= -Y_{t-1} + Y_{t-3} \end{aligned} \quad (2)$$

The null hypothesis of unit root is tested based on t statistic on  $\Pi_1$  and  $\Pi_2$  for zero and biannual frequency. Also, in order to test annual unit root, the F test assuming  $\Pi_3 = \Pi_4 = 0$  or the t statistic on  $\Pi_3 = 0$  is applied; in which significant coefficients indicate absence of the pertinent root in the time series. Hence, the time series related to seasonal data can have any of the above roots or a set of them.

As in this research the time series related to two variables of logarithm of government expenditures and logarithm of tax revenues are seasonal, the HEGY unit root test is used with an inception, without any trends or seasonal dummy variables. The results from this test for the two variables in fixed prices of 2004 are depicted in table (1).

By comparing the calculated statistics of HEGY test with critical values, it is obtained that at the significance level of 5 percent, the time series of two variables of the logarithm of government expenditures and logarithm of tax revenues, have a seasonal unit root (biannual) and a non-

seasonal unit root.

**Table 1. The Results from Seasonal Unit Root Test Based on HEGY Test**

Seasonal variable	$t_1(\Pi_1)$	$t_2(\Pi_2)$	$F_{3,4}(\Pi_3 = \Pi_4 = 0)$
LT	-0.694955	-1.562991	8.248564
LG	-0.861410	-1.914315	9.296132

Source: Research results

Notes: The critical values of t test for  $\Pi_1$  at significance level of %1 and %5 equals -3.66 and -2.96, respectively; and for  $\Pi_2$  equals -2.68 and -1.95 for %1 and %5 level of significance, in order. Also, the critical values of F test for %1 and %5 level of significance equals 4.78 and 3.04 correspondingly.

In order to make the two time series stationary, second-order differentiation is applied. The HEGY test is repeated for the two differentiated time series which are stationary at the significance level of 5 percent, based on the results illustrated in table (2).

**Table 2. The Results from Seasonal Unit Root Test for First Difference of Variables Based on HEGY Test**

seasonal variable	$t_1(\Pi_1)$	$t_2(\Pi_2)$	$F_{3,4}(\Pi_3 = \Pi_4 = 0)$
LT	3.382697	-4.222958	3.701821
LG	3.528442	-4.219115	5.240450

Source: Research results

Notes: The critical values of t test for  $\Pi_1$  at significance level of %1 and %5 equals -3.66 and -2.96, respectively; and for  $\Pi_2$  equals -2.68 and -1.95 for %1 and %5 level of significance, in order. Also, the critical values of F test for %1 and %5 level of significance equals 4.78 and 3.04 respectively.

### 3.3. Seasonal Cointegration Test

Engle and Granger (1987) point out that a linear combination of series including two or more non-stationary variables could be stationary. If such stationary linear combination exists, non-stationary time series are cointegrated. The stationary linear combination of variables is known as cointegration equation. Seasonal cointegration test is the extended form of Engle and Granger (1987) cointegration test. According to the method of Engle et al. (EGHL) (1993), in order to test cointegration in seasonal time series, the below regression is estimated:

$$G_{1,t} = \alpha_0 + \alpha_1 T_{1,t} + w_t \tag{3}$$

$$G_{2,t} = \beta_0 + \beta_1 T_{2,t} + v_t \tag{4}$$

$G_{i,t}$  and  $T_{i,t}$  are defined based on the relations mentioned in previous section. The residuals of equation (3) and (4) being stationary confirm the cointegration in zero and biannual frequencies. The stationary of  $w_t$  and  $v_t$  is tested through auxiliary regressions (5) and (6):

$$\Delta w_t = \Pi w_{t-1} + \sum_{i=1}^p \theta_i \Delta w_{t-i} + \mu_{1t} + e_{1t} \tag{5}$$

$$v_t + v_{t-1} = \Pi v_{t-1} + \sum_{i=1}^p \theta_i (v_{t-i} + v_{t-1-i}) + \mu_{2t} + e_{2t} \tag{6}$$

According to equations (5) and (6), the hypothesis of non-cointegration at zero and biannual frequencies is confirmed if the  $t$  statistic corresponding to  $\Pi$  is less than the critical value presented by Engle and Yoo (1987, table 2: p. 157), while the cointegration of  $G_{1,t}$  and  $T_{1,t}$  at zero frequency implies long-run equilibrium.

The results obtained from cointegration test on residuals from equations (3) and (4) are presented in table (3), considering an inception, no trends or seasonal dummy variables, which confirm the cointegration at zero and biannual frequencies at the significance level of 5 percent.

**Table 3. The Results of Seasonal Cointegration Test**

	Deterministic Term	Lags	$t_{\hat{\Pi}}$	DW	$R^2$
Long run frequency	I	1	-3.356146	2.165688	0.276534
Bi-annual frequency	I	1,2,3,4	3.239679	2.056236	0.498539

Source: Research results

Note: Critical values at 5 percent and 10 percent for  $N=2$  and  $t=50$  are respectively 2.93 and 2.60 from Engle and Yoo (1987).



### 3.4. Vector Error Correction Model

As the two variables, government expenditures and tax revenues, are cointegrated, in order to investigate the causal relationship between them, an error correction model is used, following the carried out studies by Bohn (1991), Mounts and Sowell (1997), Koren and Stiasny (1998), Garcia and Henin (1999), Ewing et al. (2006) and Young (2009). In this research, as the variables are seasonal; the seasonal vector error correction model (SECM) is applied and according to the aim of this survey which is testing the traditional hypothesis of positive causal relationship between tax revenues and government expenditures versus the hypothesis of fiscal illusion, estimating the below regression is concerned:

$$\Delta_2 G_t = \sum_{i=1}^p \alpha_i \Delta_2 G_{t-i} + \sum_{i=1}^p \beta_i \Delta_2 T_{t-i} + \rho_1 \hat{w}_{t-1} + \rho_2 \hat{v}_{t-1} + u_t \quad (7)$$

In this equation,  $\hat{v}_{t-1}$  and  $\hat{w}_{t-1}$  are respectively the residuals of cointegrated equations (3) and (4).  $\hat{w}_{t-1} < 0$  indicates budget surplus in period t-1, hence in order to attain long-run equilibrium, government expenditures must respond positively. In the opposite, in the state of budget deficit, it is expected that government expenditures respond negatively and therefore the predictable sign for the coefficient of  $\hat{w}_{t-1}$  is negative.

In order to estimate this model, the length of optimum lags for government expenditures and tax revenues variables are of importance; therefore, Schwarz-Bayesian (SC), Akaike (AIC) and Hannan-Quinn (HQ) criteria are used. The results obtained from the test, related to the length of optimum lags are presented in table (4), considering lags 1-5.

**Table 4. Model's Optimum Lags Test**

Lag	AIC	SC	HQ
1	-1.460905	-1.256115	-1.385385
2	-1.954104	-1.667397*	-1.848375
3	-2.004682*	-1.632324	-1.868198*
4	-1.966310	-1.506571	-1.798898
5	-1.951593	-1.402707	-1.753133

Source: Research results

The results from table 4 indicate that the two criteria of Hannan-Quinn (HQ) and Akaike (AIC) have the least values in third lag and hence the optimum number of lags is 3. By considering 3 lags, model 7 is estimated. The results are presented in table (5). According to ECM estimation results, the cause among variables could be determined. For this purpose, the explanatory variable Granger causality relative to the dependent variable of the model is investigated by testing the significance of coefficients related to all explanatory variable lags, using Wald test.

**Table 5. ECM Test**

Variable	$\Delta_2 T_{t-1}$	$\Delta_2 T_{t-2}$	$\Delta_2 T_{t-3}$	$\hat{w}_{t-1}$	$\hat{v}_{t-1}$
Coefficient	0.509743	-0.299281	0.378366	-0.228161	-0.071238
Prob	0.0176	0.0814	0.0970	0.0213	0.5946

Source: Research results

According to the results from estimating SECM model, the causation between variables can be determined. In order to do so, the Granger causation of explanatory variable relative to the dependent variable is investigated through examining the significance of coefficients related to all lags of the explanatory variable in the equation using Wald test.

In order to examine the hypothesis of fiscal illusion the null hypothesis is tested which states that all variables' coefficients related to tax revenues in second model including the first to the third lag of tax revenues are equal to zero. The results are shown in table (6).

**Table 6. Wald Test**

Null hypothesis	Test statistic	probability	result
$\Delta_2 T_t$ does not Granger Cause $\Delta_2 G_t$	2.555044	0.0721	$\Delta_2 T_t \longrightarrow \Delta_2 G_t$

Source: Research results

From this table, in the short-run the hypothesis that coefficients of first, second and third lags of tax revenues in equation 7 are equal to zero is rejected. Accordingly, changes in tax revenues are the Granger cause of changes in government expenditures. The causation relation in the first and third lags is significant and positive and significant and negative for the second lag. Therefore, an increase (decrease) in tax revenues,

decreases (increases) government expenditures after two lags. The results from estimation of model 7 show that in the short-run, by considering the real quantity of government expenditures and tax revenues variables, people because of fiscal illusion, do not recognize the real burden of paying tax till two periods after changing tax revenues that lead to estimating the price of public goods and services incorrectly.

Here the question is whether in the short-run, changes in tax revenues lead to changes in government expenditures asymmetrically or symmetrically. To answer this question, another case in estimating SECM model is consecrated. This case provides the possibility to testing the asymmetrical effect of tax revenues on government expenditures. To do so, by considering a dummy variable in model (7), this model is rewritten as below:

$$\begin{aligned} \Delta_2 G_t = & \gamma_0 + \alpha_1 \Delta_2 G_{t-1} + \dots + \alpha_\rho \Delta_2 G_{t-\rho} + \beta_1^{NEG} D^{NEG} \Delta_2 T_{t-1} + \dots \\ & + \beta_\rho^{NEG} D^{NEG} \Delta_2 T_{t-\rho} + \beta_1^{pos} D^{pos} \Delta_2 T_{t-1} + \dots \\ & + \beta_\rho^{pos} D^{pos} \Delta_2 T_{t-\rho} + \rho_1 \hat{w}_{t-1} + \rho_2 \hat{y}_{t-1} + U_{1t} \end{aligned} \quad (8)$$

In which, in case of  $\Delta_2 T > 0$ ,  $D^{pos} = 1$  and otherwise,  $D^{pos}$  is equal to zero. Also, if  $\Delta_2 T < 0$ ,  $D^{NEG} = 1$  and otherwise it is considered to be equal to zero. Also  $\beta^{pos}$  and  $\beta^{NEG}$  are respectively indicating coefficients related to positive and negative changes in tax revenues. Equation (8) provides the possibility that positive and negative changes in tax revenues impose different effects on government expenditures changes. Considering lags' length from 1 to 5 and based on 3 criteria of Schwarz- Bayesian (SC), Akaike (AIC) and Hannan-Quinn (HQ), the optimum lag length in model (8) was selected to be 2. The results are presented in table (7).

Now considering the lag length to be 2 for variables on the right side of equation (8), this model was estimated. Table (8) presents results from estimation.

**Table 7. Asymmetric ECM Optimum Lag Test**

Lag	AIC	SC	HQ
1	-1.420034	-1.174285	-1.329410
2	-1.992490*	-1.623867*	-1.856553*
3	-1.955104	-1.458627	-1.773125
4	-1.856599	-1.229682	-1.628310
5	-1.898444	-1.138448	-1.623653

Source: Research results

**Table 8. Asymmetric ECM Results**

Coefficients	$\beta_1^{NEG}$	$\beta_2^{NEG}$	$\beta_1^{pos}$	$\beta_2^{pos}$	$\rho_1$	$\rho_2$
Asymmetric I effect	0.395456	-0.611891	0.083418	0.107862	-0.243705	-0.207607
Prob	0.1137	0.0181	0.6685	0.6287	0.0063	0.0841

Source: Research results

As the information in table 8 shows, the coefficient of  $\hat{w}_{t-1}$  equals -0.243705 and is significant which implies that in the long-run government expenditures respond to disequilibrium, in such a way that when budget condition exacerbates, government expenditures decrease by 0.243705 and in the opposite, when the budget condition improves, government expenditures increase by 0.243705. According to the results obtained from estimating the asymmetrical SECM, two hypotheses based on absence of Granger causality relationship from positive and negative changes in tax revenues are investigated through Wald test, so to test the asymmetrical effect of tax revenues on government expenditures. Wald test results are presented in table (9).

**Table 9. Wald Test Results in Asymmetric Model**

Null hypothesis	Test statistic	Probability
$\beta_1^{pos} = \beta_2^{pos} = 0$	0.309524	0.7358
$\beta_1^{NEG} = \beta_2^{NEG} = 0$	4.013637	0.0272

Source: Research results

Wald test results in asymmetrical SECM do not reject absence of Granger causality relationship from positive changes in tax revenues to changes in government expenditures in a high level of significance.

While the absence of Granger causality relationship for negative changes in tax revenues is rejected in a high level of significance, it could be asserted that an increase in tax revenues does not have a significant effect on changes in government expenditures during the investigated period; while decrease in tax revenues leads to changes in government expenditures. According to the negative sign of  $B^{NEG}$  in the second lag, it could be concluded that by a decrease in tax revenues, government expenditures are increased after a year.

According to the findings from research, in Iranian economy, changes in tax revenues do not lead to symmetrical changes in government expenditures. Due to fiscal illusion in time of decrease in tax revenues, meaning incorrect perception of tax burden by tax payer, after a year from a decrease in tax revenue, people increase their demand for public goods and services which leads to an increase in government expenditures. Reversely, by an increase in tax revenues, fiscal illusion does not hold and consequently government expenditures do not decrease.

The results of survey show that contrary to Friedman's belief, decrease in tax revenues leads to an increase in government expenditures, considering fiscal illusion. Because people and economic units underestimate prices of public goods and services in case of fiscal illusion and therefore their demand for public goods and services increase and budget deficit would become greater. Hence in case of budget deficit in Iranian economy, raising taxes could be used as an efficient tool for decreasing budget deficit.

Also, in this research, considering seasonal data and the logarithm form of tax revenues and that of government expenditures in current prices, the traditional hypothesis of a positive causal relation from tax revenues to government expenditures is investigated versus the hypothesis of fiscal illusion. So firstly in order to examine the stationary of variables, HEGY test was applied. The results in table (10) indicate the existence of a unit root at zero frequency and another at seasonal (biannual) frequency, at the significance level of 5 percent. After second-order differentiation from the two time series, the results confirm stationary at 5 percent level of significance.

**Table 10. Seasonal Unit Root Test of HEGY**

<b>The results of seasonal unit root test for model variables</b>			
<b>Seasonal variable</b>	$t_1(\Pi_1)$	$t_2(\Pi_2)$	$F_{3,4}(\Pi_3 = \Pi_4 = 0)$
LT	-1.808762	-0.397562	5.000622
LG	-2.876195	-0.672419	3.565271
<b>The results of seasonal unit root test for differentiated variables</b>			
<b>Seasonal variable</b>	$t_1(\Pi_1)$	$t_2(\Pi_2)$	
LT	-3.826083	-4.237971	
LG	-3.584343	-4.494158	

Source: Research results

Notes: The critical values of t test for  $\Pi_1$  at significance level of %1 and %5 equals -3.66 and -2.96, respectively; and for  $\Pi_2$  equals -2.68 and -1.95 for %1 and %5 level of significance, in order. Also, the critical values of F test for %1 and %5 level of significance equals 4.78 and 3.04 correspondingly.

In order to investigate the existence of cointegration relation, the results of the test designed by Engle, Granger, Hylleberg and Lee (EGHL) (1993) are presented in table (11) considering an inception, no trends or dummy variables, which indicate cointegration at zero frequency and non-cointegration at biannual cointegration.

**Table 11. Seasonal Cointegration Test**

	<b>Deterministic Term</b>	<b>Lags</b>	$t_{\hat{\Pi}}$
Long run frequency	I	1,2,3,4,5	-3.412721
Bi-annual frequency	I	1,2,3,4	0.393209

Source: Research results

Note: critical values at 5 percent and 10 percent for N=2 and t=50 are respectively 2.93 and 2.60 from Engle and Yoo (1987).

According to the cointegration of logarithm of tax revenues and logarithm of government expenditures in current prices, SECM model is estimated based on the below relation:

$$\Delta_2 G_t = \sum_{i=1}^p \alpha_i \Delta_2 G_{t-i} + \sum_{i=1}^p \beta_i \Delta_2 T_{t-i} + \rho_1 \hat{w}_{t-1} + u_t \quad (9)$$

Where  $\hat{w}_{t-1}$  is the residual of the cointegrated equation (3). Considering lags 1-5, equation (9) is estimated and according to the criteria of Schwarz- Bayesian (SC), Akaike (AIC) and Hannan-Quinn (HQ) in table (12), the optimum length of lag is chosen equal to 2. The results of SECM estimation by considering 2 lags are presented in table (13).

**Table 12. Optimum Lags Test**

Lag	AIC	SC	HQ
1	-1.535973	-1.373774	-1.475822
2	-2.038259	-1.794960*	-1.948032*
3	-2.086873*	-1.759207	-1.966040
4	-2.019785	-1.606055	-1.868137
5	-2.005340	-1.503807	-1.822709

Source: Research results

**Table 13. Estimation Results of SECM**

Variable	$\Delta_2 G_{t-1}$	$\Delta_2 G_{t-2}$	$\Delta_2 T_{t-1}$	$\Delta_2 T_{t-2}$	$\hat{w}_{t-1}$
Coefficient	0.036651	-0.494076	0.223170	-0.230686	-0.236291
Prob	0.7951	0.0014	0.1763	0.1620	0.0067

Source: Research results

The results of Wald test shown in table (14), confirm the non-causal relation from tax revenues to government expenditures.

**Table 14. Wald Test**

Null hypothesis	Test statistic	Probability
$DT_t$ does not Granger Cause $DG_t$	1.737530	0.1896

Source: Research results

Therefore, in the short-run, by considering variables of research in current prices, the causal relationship between tax revenues and government expenditures does not hold and hence Friedman's hypothesis and fiscal illusion hypothesis is not confirmed; while in the long-run,

government expenditures respond to budget disequilibrium significantly, so that when budget condition exacerbates, government expenditures decrease by 0.236291 and reversely, when budget condition improves, government expenditures increase by 0.236291.

#### **4. Conclusion**

Friedman believes that there is a positive causal relationship between tax revenues and government expenditures as the government expenditures are consisted to the level of available revenues. According to Friedman, one of the main ways for preventing growth in government size is decreasing taxes. Also, in case of government's budget deficit, as more revenues lead to higher government expenditures, taxes could not be used as an efficient tool. Opposing Friedman's hypothesis, there exist another hypothesis named fiscal illusion which emphasizes the negative causal relationship between tax revenues and government expenditures. In this research, using seasonal data of government expenditures and tax revenues from during 2001-2012 fiscal illusion hypothesis in Iranian economy was tested. Results from research showed that considering the real measures of variables, the causal relationship between tax revenue and government expenditures was confirmed, while based on current measures of variables, casual relation was not confirmed. Also, by specification of two symmetrical and asymmetrical error correction models, the traditional hypothesis of Friedman and fiscal illusion hypothesis were analyzed and tested experimentally. The symmetrical model indicated that there is a negative causal relationship between tax revenues and government expenditures after one year, which designates the existence of fiscal illusion in Iranian economy in the investigated period. In another part of the research, the fiscal illusion was tested in two cases of increase and decrease in tax revenues. In order to investigate this issue, an asymmetrical error correction model was used, dividing the positive and negative changes in tax revenues. Based on results from estimated model, in case of an increase in tax revenues, fiscal illusion does not hold for Iranian economy, while in case of a decrease in tax revenues, this hypothesis holds true. So that if tax revenues decrease, after the passage of one year, people increase their demand for public goods and services due to their under-estimation of receiving prices for government expenditures, which leads to an increase in government expenditures



The estimation results show that in the long-run, government expenditures respond to budget disequilibrium significantly, in a way that in conditions of budget deficit, government expenditures decrease and in conditions of budget surplus, government expenditures increase.

Our findings show that the tax-expenditure hypothesis is confirmed for in the short-run; in a way that is consistent with Friedman's hypothesis; by a decrease in tax, for two seasons government expenditures decrease, but after a year, it increases. Hence in Iranian economy, cutting taxes could not be used in order to restrict growth in government size. Because according to the fiscal illusion phenomenon by cutting taxes, government expenditures are increased within a year, and this leads to government size expansion. Also, as an increase of tax revenues is not a Granger cause for changes of government expenditures, in case of government budget deficit, increasing taxes could be used as an efficient tool to compensate the budget deficit; because in case of a decrease of tax revenues, government expenditures are increased after a year, which generally leads to an increase in government's budget deficit.

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